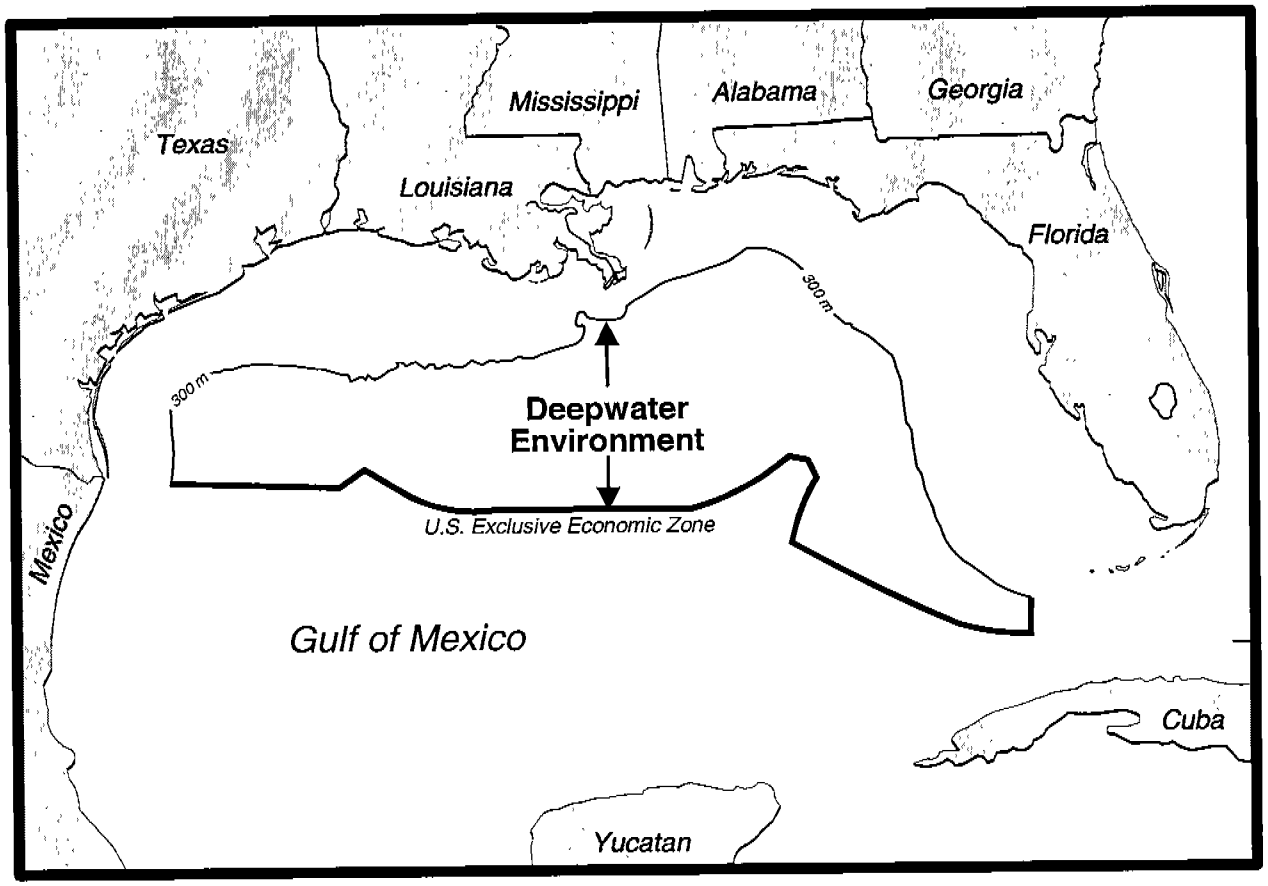
OCS Study
MMS 2000-050

# Deepwater Gulf of Mexico Environmental and Socioeconomic Data Search and Literature Synthesis

## Volume II: Annotated Bibliography




MMS U.S. Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Region

OCS Study
MMS 2000-050

# Deepwater Gulf of Mexico Environmental and Socioeconomic Data Search and Literature Synthesis

## Volume II: Annotated Bibliography

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## Volume II: Annotated Bibliography

**Preface** ..... **1**
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# Preface

One goal of this study was to produce a computerized, annotated bibliography of environmental, socioeconomic, and technological literature for the deepwater Gulf of Mexico. This preface briefly describes how the bibliography was compiled and explains how it is formatted.

## Methods

A preliminary bibliography was compiled from an in-house library at Continental Shelf Associates, Inc. References were then added from computer searches of online databases and from personal libraries of chapter authors. Online databases were searched using the DIALOG Information Retrieval Service. All DIALOG searches were conducted by the librarians at Harbor Branch Oceanographic Institution Inc. (HBOI). Database searches were conducted for each topic area specified in the contract (physical, geological, chemical, biological, and socioeconomic data). The following databases were searched:

- Aquatic Science and Fisheries Abstracts;
- BIOSIS Previews (Biological Abstracts);
- CA Search (Chemical Abstracts);
- CENDATA;
- Conference Papers Index;
- D&B - Donnelley Demographics;
- Dissertation Abstracts;
- Energy Science and Technology;
- GEOREF (American Geological Institute);
- Life Sciences Collection;
- Meteorological and Geoastrophysical Abstracts;
- National Technical Information Service (NTIS);
- Oceanic Abstracts;
- Pollution Abstracts;
- Scisearch Database (Science Citation Index); and
- Zoological Record.

The results of in-house and electronic searches were incorporated into a preliminary list and sent to the chapter authors. The authors added or deleted citations from their own libraries and submitted final lists. These lists were sent to the HBOI librarians, who obtained citations and abstracts for as many as possible from electronic sources. This step minimized additional typing and editing. Most entries had electronic abstracts. Others were not available electronically and were typed from copies of the articles. Some citations had no abstracts at all and needed to be summarized from the original documents.

The final annotated bibliography database was compiled and indexed in a bibliographic computer program, ProCite[1]. ProCite incorporated results from tagged DIALOG searches directly into a bibliographic database, including abstracts and keywords.

[1] ProCite is a trademark of Research Information Systems, Carlsbad, CA.

## Format of the Bibliography

There are two parts to the Annotated Bibliography: (1) a printed bibliography sorted by author and date; and (2) a set of data files, on PC-compatible floppy disks, that have been indexed with ProCite to allow searching by author, date, topic and geographic keywords, and words in the title and source.

The annotated bibliography consists of 822 references, of which 638 (78%) have abstracts. Each reference includes a reference number, a citation, an abstract, and keywords as illustrated below:

**EXAMPLE OF BIBLIOGRAPHIC ENTRY**

3.
Beardsley G. and R. Conser. 1981. An Analysis of Catch and Effort Data From the U.S. Recreational Fishery for Billfishes (Istiophoridae) in the Western North Atlantic Ocean and Gulf of Mexico, 1971-78. Fishery Bulletin 79(1):49-68.

ABSTRACT: In 1971, the National Marine Fisheries Service's Southeast Fisheries Center initiated research on the billfish stocks of the western North Atlantic Ocean and Gulf of Mexico. The purpose of this research was to develop and evaluate a method of determining changes in relative abundance of billfish stocks using catch and effort data from the recreational fishery. This report has been prepared to present a description of this research, evaluate the reliability of the sampling techniques, and make a preliminary determination of the validity of catch and effort data from the recreational fishery as an indicator of changes in relative abundance of billfish populations. The results indicate that catch and effort statistics for white marlin in the Gulf of Mexico appear to be reliable and can be aggregated to provide a means of indexing relative abundance of these species. The model did not appear to be appropriate for blue marlin, however. The general trend in catch per unit effort from 1972 to 1978 for sailfish and white marlin in the Gulf of Mexico appears to be downward.

KEYWORDS: fisheries; pelagic fishes; sport fishing statistics; population number; *Istiophorus platypterus*; *Tetrapturus albidus*; *Makaira nigricans*; *Xiphias gladius*; *Tetrapturus pfluegeri*; Gulf of Mexico.

*Reference Number*: These numbers were assigned sequentially once all references were sorted by author, date, and title.

*Citation*: The citation begins on the line following the reference number. The citation format follows a modified version of the Council of Biology Editors style manual.

*Abstract*: The abstract is a brief summary of the document contents. Where no abstract was available, the word "None" appears in the field.

*Keywords*: Topic keywords were applied to each reference in order to allow searching with ProCite. The topic key words followed the major topics discussed in the Synthesis Report (technology, geology, physical oceanography, chemistry, water column biology, benthic biology, protected species, fisheries, socioeconomics).

# Annotated Bibliography

**1.**

Addy, S.K. and E.W. Behrens. 1980. Time of accumulation of hypersaline anoxic brine in Orca Basin (Gulf of Mexico). Marine Geology 37(3-4):241-252.

ABSTRACT: The Orca basin is an intraslope basin of 400 sq km area at a depth of approx 2400 m, on the continental slope in the northern Gulf of Mexico, containing 200m of highly saline anoxic brine. The sedimentary units in a core from this basin are black mud from 0 to 485 cm with three turbidite beds of gray mud totalling 70 cm and gray mud from 485 cm to the bottom of the core at 1079 cm. It is interpreted that the black mud was deposited in a highly anoxic saline environment, and gray mud deposition took place in an oxic environment. The lack of sulfate reduction and bioturbation in the black mud, the occurrence of a manganese oxide peak in the gray mud, and geochemical differences between black and gray mud support this interpretation. The major black-gray boundary at 485 cm which has been dated by SUP-14 C to be 7900 170 yrs represents the time when brine began to accumulate in the Orca basin and the depositional environment became anoxic. The interstitial water salinity in the core decreases from 238 g/kg at the top to 112 g/kg at the bottom, suggesting that the Orca brine did not diffuse from the sediments underneath but entered the basin from the surrounding slopes. The salinity profile in the sediments calculated for a downward-diffusing brine is similar to the observed profile and supports the beginning of brine accumulation at 7900 yrs BP. Possible exposures of a salt surface to the sea water to the southeast and north of the basin are interpreted from two multichannel seismic profiles.

KEYWORDS: Chemistry; brines; anoxic basins; sedimentology; accumulation rates; salinity; Gulf of Mexico; Geology.

**2.**

Agee, M.A. 1999. Taking GTL Conversion Offshore. Proc. 31$^{th}$ Annual Offshore Technology Conference (OTC paper 10762).

ABSTRACT: While technological advances within the energy industry have made dramatic improvements in lowering the cost of finding, producing and refining oil, vast quantities of remote and stranded gas still wait to be developed. Emerging gas-to-liquids (GTL) technologies may play a significant role in helping oil companies develop and monetize these resources. These factors are particularly important to offshore applications given that roughly half of the world's stranded gas is located in water. This paper will consider potential offshore gas reserves that could represent applications for GTL technology. It will also examine current GTL process developments and their significance relative to offshore petroleum operations, including discussion of air-based vs. oxygen based GTL systems. In conventional synfuel processes, syngas is generated from natural gas via partial oxidation with oxygen, requiring an air separation plant to provide the oxygen. In these approaches, nitrogen is eliminated from the synthesis gas stream as an unwanted inert. In an air-based system the syngas step, by contrast, uses air-carried oxygen, rather than separated oxygen, to produce a nitrogen-diluted synthesis gas. This eliminates the expense of an air separation plant needed to produce oxygen used in typical plants. It thus reduces capital costs, making possible plants with considerably smaller footprints, and also provides for a safer operating environment. In addition, this paper will examine some of the strategic implications facing the petroleum industry from the growing potential of applying GTL technology.

KEYWORDS: Technology.

**3.**

Aharon, P., H.H. Roberts, and R. Snelling. 1992. Submarine venting of brines in the deep Gulf of Mexico: Observations and geochemistry. Geology. 20(6):p. 483-486.

ABSTRACT: Brine-issuing vents have been observed at 1920 m water depth on top of Green Knoll, an isolated salt diapir rising seaward of the Sigsbee Escarpment in the northern Gulf of Mexico. The brines are seven times saltier than ambient sea water. Their venting, both by lateral flow and by diffusion upward through the underlying sediments, gives rise to drainage patterns similar to braided streams. Brine transport pathways are floored by unindurated red-orange deposits similar to the iron oxide deposits of the Red Sea brine pools. The relations between major and minor constituents (Na, K, Cl, SO sub(4), Br, and Li) and the delta super(18)O compositions indicate that brines are formed by congruent sea-water dissolution of the underlying Louann salt containing a mixture of halite, sylvite, and anhydrite. Net removal of Mg corresponding to a proportional increase in Ca suggests that dolomitization is active in the subsurface. Ferrous iron is extracted from the salt diapir and precipitated as ferric hydroxide on floors of drainage networks during the venting and mixing of the brines with the oxygen-rich ambient water. The Green Knoll brines, whose chemistry is uncompromised by severe diagenetic overprints, could serve as an end-member analogue for formation waters that have acquired complex chemical histories during their long migration in sedimentary basins.

KEYWORDS: Chemistry; Mexico, Gulf, Sigsbee Escarpment; Diapirs; Brines; Seepages; Geo; Salt Domes; Deep Water.

**4.**

Aharon, P., H.P. Schwarcz, and H.H. Roberts. 1997. Radiometric dating of submarine hydrocarbon seeps in the Gulf of Mexico. Geological Society of America Bulletin 109(5):568-579.

ABSTRACT: Massive abiotic carbonates and calcareous shells of the chemosynthetic mytilid Bathymodiolus sp. containing a detailed history of hydrocarbon seepage were investigated using radiocarbon and U-series isotopes. Stable carbon isotopes and $^{87}Sr/^{86}Sr$ ratios were also determined in order to provide insights on the carbon source and the nature of the hydrocarbon-rich fluids. Samples from five seepage sites on the northern Gulf of Mexico sea floor overlying subsurface salt diapirs and encompassing depths from 125 to >2000 m were selected as representative of the spectrum of active and extinct seeps examined from submersible dives. Radiometric ages from extinct and senescent seep sites at upper bathyal depths indicate that hydrocarbon seepage occurred there during late Pleistocene time (195-13 ka). Ages derived from nascent seep sites at mid-bathyal and abyssal depths (12.3-0.0 ka) indicate that currently vigorous seepage was initiated at the end of the last deglaciation.

KEYWORDS: Chemistry; Bathymodiolus sp. ; Gulf of Mexico ; Uranium Series Dating ; Hydrocarbon Seep ; Salt Diapir ; Quaternary ; Bivalve ; Mytilid ; Bathymodiolus ; Gas Seepages; Hydrocarbons; Salt Diapirs ; Radiometric Dating; Bivalves.

**5.**

Al-Abdulkader, K. 1996. Spatial and temporal variability of phytoplankton standing crop and primary production along the Texas-Louisiana continental shelf. Ph.D. dissertation. Texas A&M University. College Station, TX.

ABSTRACT: An ecological study of the phytoplankton along the Texas-Louisiana continental shelf that was conducted during five cruises between May 1992 and May 1993 showed strong spatial and temporal variability in both phytoplankton standing crop (as chlorophyll *a*) and primary production. The inner shelf (<40 m) was richer and more productive than the combined middle shelf (40-80 m) and the outer shelf (> 80 m), accounting for 70% (395 gC $m^{-2}$ $y^{-1}$) of Texas-Louisiana shelf primary production. There were marked east-west gradients in both chlorophyll *a* and primary production; highest values were found close to the Mississippi River delta and the lowest values were off the Texas coast. The vertical distribution of chlorphyll *a* was characterized by the presence of subsurface chlorophyll maxima. The positions of the chlorophyll maxima either corresponded with the depth of 1-4% of the surface light level or the top of the nutricline. Seasonally, biomass and primary production showed the highest values in the winter of 1993 and the lowest values in the summer of 1992, and there was also strong interannual variability in standing crop and primary production in May 1992 compared with May 1993. The contribution to the net- (>20 μm), nano- (<20 μm and >1 μm), and pi- coplankton (<1 μm) showed considerable variation spatially and temporally. The nanoplankton-sized spectrum dominated the phytoplankton population along the Texas-Louisiana shelf, contributing averages of 59% and 50% to the standing crop and primary production, respectively. The picoplankton contribution was nearly half that of the nanoplankton; the averages for the standing crop and primary production were 27%, and 25% respectively. Netplankton accounted for only 14% of the standing crop and 25% of the primary production. The diatoms dominated the phytoplankton population during spring and winter, with the highest contribution (91% of the catch) reported from the inner shelf. The proportion of diatoms decreased during the summer, when blooms of the blue-green alga Trichodesmium thiebautii were abundant, especially in the outer shelf. Principal Component Analysis (PCA) showed a higher correlation between the nutrient input from the Mississippi and Atchafalaya rivers than any of the physical, chemical, and biological factors governing phytoplankton distribution and production on the Texas-Louisiana shelf.

KEYWORDS: Biology.

**6.**

Amery, G.B. 1969. Structure of Sigsbee scarp, Gulf of Mexico. American Association of Petroleum Geologists Bulletin 53(12):2480-2482.

ABSTRACT: A sparker profile across the Sigsbee scarp shows an interval with an anomalously high velocity which is interpreted to be salt extruded a distance of 10 km over flatlying beds south of the scarp. The extrusion and the topographic form of the scarp are related to basinward flow of sediments and salt from under the thick shelf- slope sedimentary wedge.

KEYWORDS: Geology; Petroleum Geology; Gulf of Mexico; Petroleum Geology; Sedimentation.

**7.**
Amery, G. B. 1978. Structure of continental slope, northern Gulf of Mexico. Studies in Geology. 7:141-53.

ABSTRACT: The continental slope in the northern Gulf of Mexico contains four structurally distinct provinces: northwest slope, central slope, Mississippi slope, and lower slope. Structural provinces are recognized through variations in structural styles which are related to the shape of diapirs and normal faults. On the central slope diapirs are large, regular, and closely spaced or interconnecting. In the lower slope, diapirs are large, irregular, and interconnect at shallow depths. On the northwestern slope, diapirs are more widely spaced and a continuous (240 km) down-to-basin fault system develops at the shelf-slope edge. The Mississippi slope is structurally similar to the northwest slope. Differences in structural style may result from variations in initial thickness of the salt layer and loading rates as related to depositional rates and thickness of adjacent sediments. The central slope is an area where initial salt deposits were probably thick and sediment loading rates were high (3.6 km of Quaternary sediments alone at the shelf-slope boundary). Salt was initially thick, but sediments are thinner and loading rates were less in the lower slope. On the northwestern slope and Mississippi slope, salt was initially thinner and sediment loading rates were moderate to low. Relative initial salt thickness can only be estimated on the basis of present salt volume in diapirs. Salt domes and growth faults of the continental slope are similar to those that were ancestors to the domes and faults of the present coastal plain and shelf. Study of present slope features provides a better understanding of the evolution of diapirs from immature abyssal plain, continental rise, and slope features to the more mature features of the present coastal and plain shelf.

KEYWORDS: Geology.

**8.**
Anderson A.L. and Bryant W.R. 1990. Gassy sediment occurrence and properties: northern Gulf of Mexico. Geo-Marine Letters 10(4):209-220.

ABSTRACT: Gassy sediment patches are between 250 and 500 m in horizontal size. Often the gassy layers are within 100 m from the sea floor and are only a few meters thick. Both biogenic and thermogenic gas hydrates have been recovered. Stability values of temperature and pressure indicate that hydrates can exist in water depths less than 500 m.

KEYWORDS: Geology; Acoustic Property; Sound Speed; Seafloor; Gassy Sediment; Gas; Acoustic Properties; Sea Floor; Usa, Gulf of Mexico; Gulf of Mexico.

**9.**
Anderson, D.L.T. and R.A. Corry. 1985. Seasonal transport variations in the Florida Straits: A model study. Journal of Physical Oceanography 15(6):773-786.

ABSTRACT: In a Previous study, Anderson and Corry used a wind-driven two-layer model to study the effects of topography and islands on the seasonal variation of western boundary currents. The work is continued here with topography, geography and winds appropriate to the North Atlantic to examine the seasonal cycle of the Florida Straits transport. A summer maximum of transport is predicted consistent with observations. The areas of importance and processes giving rise to the seasonal cycle are considered.

KEYWORDS: Physical Oceanography; mass transport; seasonal variations; Florida Straits; Gulf of Mexico.

**10.**
Anderson, E.D. 1990. Estimates of large shark catches in the western Atlantic and Gulf of Mexico, 1960-1986, pp 443-454. In: Pratt HLJr, Gruber SA, T. Taniuchi, (Editor). Elasmobranchs as living resources: advances in biology, ecology, systematics, and status of the fisheries. NOAA Technical Report NMFS 90. National Marine Fisheries Service,

ABSTRACT: None.

KEYWORDS: Elasmobranchs; Fisheries; by catch; Gulf of Mexico; shark Fisheries; stock assessment.

**11.**

Anderson, R.K., R.S. Scalan, P.L. Parker, and E.W. Beherens. 1983. Seep oil and gas in Gulf of Mexico slope sediment. Science 222:619-621.

ABSTRACT: Concentrations in Gulf of Mexico slope sediment of material soluble in methanol and benzene as high as 4.5% are shown to be attributable to biodegradated petroleum. Associated carbonate deposits and organic sulfur are the products of the microbial oxidation of petroleum and sulfate reduction. The results of chemical and carbon isotope analyses indicate that high concentrations of hydrocarbon gases, from methane to pentane, are petroleum rather than microbiologically derived. These hydrocarbons, believed to have been produced thermally at depth, probably reached the surface through faults and fractures associated with salt diapirs. -Authors.

**12.**

Anderson, W. W. and M. J. Lindner. 1971. Contributions to the biology of the royal red shrimp, *Hymenopenaeus robustus*. Smith. Fish. Bull. 69(2):313-.

ABSTRACT: The royal red shrimp, *Hymenopenaeus robustus*, has been located in commercial concentrations in three areas off the coast of the United States in depths from about 250 to 550 m: one area, known as the St. Augustine Grounds, is off the east coast of Florida; another is off the Dry Tortugas; and the third is off the Mississippi River Delta. Information on the biology of the species on the St. Augustine Grounds was collected intermittently from 1957 to 1967. The reproductive systems of males and females are described and illustrated. The ovaries of ripe females are dark red or maroon, and the exceedingly large spermatophores are bright yellow. We observed no indication of sex reversal. Burrowing and swimming habits as observed from the research submarine *Aluminaut* are summarized. The early life history of *H. robustus* is unknown. Neither larval nor postlarval stages were encountered in the plankton collection of the M/V *Theodore N. Gill*. Juveniles under 50 mm total length were not caught. Size of shrimp was not correlated with depth but appeared to be correlated with latitude. Usually shrimp were larger north of lat 29°39' N than between lat 29°00' and 29°39' N. Males mature at about 125 mm and females at about 155 mm total length. In each sex, maturity is reflected by a change in the regression of carapace length on total length. Spawning probably occurs throughout the year, but the peak is between January and May. Year classes are evident in the length distributions. Recruitment on the fishing grounds begins when the shrimp are approaching 1 year of age and are less than 100 mm total length. They reach maturity at about 3 years, and minimum life span appears to be no less than 5 years. Recruitment is probably not complete until at least 2 years. Most of the shrimp on the fishing grounds are mature.

KEYWORDS: Biology.

**13.**

Antoine, J.W. 1971. Structure of the Gulf of Mexico, pp 1-34. In: Rezak R, V.J.Henry, (Editors). Contirbutions on the Geological and Geophysical Oceanography of the Gulf of Mexico. Texas A&M University Oceanographic Studies Volume 3. Gulf Publishing Company, Houston, TX.

ABSTRACT: Shallow seismic reflection profiles demonstrate the unique geologic characteristics of the seven provinces of the Gulf of Mexico. These reflection data, when considered along with other information that has been collected from coring, dredging, magnetic and gravity investigations, make it possible to theorize on the origin of these provinces and their relationship to the total Gulf of Mexico evolution. (Author).

KEYWORDS: Geology; Marine Geology; Mexico Gulf; Structural Geology; Sedimentation; Thickness; Echo Ranging; Reflection; Ocean Bottom Sampling; Gravity; Continental Shelves; Reprints; Oceanic Crust; Seismic Reflection Method; Ntisn.

**14.**

Antoine, J.W. and W.R. Bryant. 1968. The major transition zones of the Gulf of Mexico; DeSoto and Campeche Canyons. Transactions Gulf Coast Association of Geological Societies 18(55).

ABSTRACT: Deep well information throughout the Gulf of Mexico coastal plain has indicated the Gulf margins can be divided into two distinct provinces, the subsided southeast section which is carbonate and the northwest section that is predominately clastic, with complicated surface and subsurface structures controlled mainly by the influence of upward salt migration. Recent geophysical studies in the offshore areas indicate that DeSoto Canyon represents the transition zone between these clastic and carbonate provinces in the northern Gulf and that the Campeche Canyon plays a similar role in the southwestern section of the basin. In addition to representing clastic-carbonate margins, both these canyons mark the terminus of salt diapirs prevalent toward the west. The geophysical data from the DeSoto Canyon indicate that erosion has played an important part in its development. Two mechanisms for the formation of the canyon are suggested: 1) the loop current of the eastern Gulf of Mexico and associated circulation in the northeastern Gulf have sufficient velocity along the bottom during specific periods of time to effect a scouring action and/or keep sediments in suspension, and 2) erosion by turbidity flows during periods of low sea level stands associated with glacial stages. The fact that the DeSoto Canyon extends over parts of two distinct geologic provinces, the northeast Florida platform and the Mississippi cone, adds credence to an hypothesis involving erosional rather than tectonic processes. Although there are sufficient data available to determine the origin of the Campeche Canyon, it is suggested that, unlike the DeSoto Canyon, its topographic expression probably is more the result of adjacent salt tectonics than of erosion. Some workers suggested that an alignment from the the DeSoto Canyon to Campeche Canyon may represent a fracture zone across the Gulf basin. The hypothesis that this alignments forms the southeastern boundary of the Gulf of Mexico salt province is contradicted by the presence of diapirs in northwestern Matanzas Province, Cuba, and by the discovery of some possible diapiric structures in the Florida Straits and Yucatan Channel.

KEYWORDS: Geology.

**15.**

Applied Technology Research Corporation. 1994. Louisiana, Gulf of Mexico Outer Continental Shelf Offshore Oil and Gas Activity: Impacts. Applied Technology Research Corporation.

ABSTRACT:None.

KEYWORDS:Socioeconomics; Louisiana.

**16.**
Armbrust R. 1977. Managing the socioeconomic impacts of energy development. A guide for the small community. Energy Research and Development Administration Washington, DC.

ABSTRACT: Decisions concerning large-scale energy development projects near small communities or in predominantly rural areas are usually complex, requiring cooperation of all levels of government, as well as the general public and the private sector. It is unrealistic to expect the typical small community to develop capabilities to independently evaluate a highly technical development which to them is a one-time occurrence. Thus, local officials must be aware of resources which they may tap for information and assistance at other levels of government. This handbook advises local officials on how they should organize to most effectively participate with developers, government officials, and consultants in assessing, planning, and managing energy development and how to insure that information is collected and analyzed to reflect local priorities and future planning needs. Discussed are the key areas of impact requiring study--employment, personal income, housing, education, transportation, water supply, solid waste collection and disposal, waste water treatment, health care, recreation, and safety. The handbook provides guidance on organizing a capital improvements program to generate revenues to cover the expanded public facilities usually resulting from energy development. Also discussed is the development of the necessary administrative structure to regulate, monitor, and permit public and private development. (NEC).

KEYWORDS: Socioeconomics; Community Development; Community Planning; Community Services; Costs; Economic Factors; Financial Support; Government Role; Industrialization; Local Government; Local Issues; Needs Assessment; Resource Allocation; Rural Development; Socioeconomic Influences; Energy Development; Impact Studies.

**17.**
Armentrout, J.M. 1987. Integration of biostratigraphy and seismic stratigraphy: Plio-Pleistocene, Gulf of Mexico. SEPM Gulf Coast Section Eighth Annual Research Foundation Conference : 6-14.

ABSTRACT: None.

KEYWORDS: Geology.

**18.**
Armstrong, D.W. 1974. Some dynamics of carbon, nitrogen, and phosphorous in the marine shelf environment. MS Thesis. Texas A&M University. College Station, TX.

ABSTRACT: In order to study some dynamics of carbon, nitrogen, and phosphorus in Mississippi Fan sediments 100 samples from 25 gravity cores were taken in that area. In addition, three suspended matter samples and two sediment samples were taken from the Mississippi River itself. The interstitial water of the marine sediments were analyzed for $Cl^-$, $NH_3$, $PO_4^{3}$, $SO_4^{2}$, and alkalinity; and the solid phase of these sediments were analyzed for organic carbon, total nitrogen, and organic and inorganic phosphorus. The Mississippi River suspended matter was analyzed for inorganic phosphorus and the solid phase of the sediments were analyzed for organic carbon, total nitrogen, and organic and inorganic phosphorus. The use of scatter plots of C:N, C:P, and N:P ratios of both interstitial water and solid phase material, shown relative to the average planktonic ratio of C:N:P =106:16:1 by atoms, allowed quick visualization of any trends, relationships, or anomalies in carbon, nitrogen, and phosphorus concentrations of the Mississippi Fan. Low organic C:N and C:P ratios as well as low organic carbon content (.31% to .91%) of the shelf sediments are apparently the result of a diluting effect caused by a large influx of Mississippi River sediment. Areas not as affected by Mississippi River sediment are easily distinguished by higher organic C:N and C:P ratios. Leaches of wet and dried sediments with deionized water and 1 M Magnesium Acetate [Mg $(C_2H_3O_2)$] have shown that little or no $NH_4^+$ from the interstitial water was fixed in clay lattices, or lost as $NH_3$ upon drying the sediments. However, the low C:N ratios of sediment taken from the Mississippi River (1.8:1) may be a result of $NH_4^+$ fixed on land or by a high concentration of nitrogen containing organic compounds.

KEYWORDS: Chemistry; sediments.

**19.**

Armstrong, R.S. and J.R. Grady. 1968. The late-summer waters of the Gulf of Mexico. Commerical Fisheries Review 30(8-9):56-60.

ABSTRACT: None.

KEYWORDS: Physical Oceanography.

**20.**

Austin, G.B.Jr. 1955. Some recent oceanographic survyes of the Gulf of Mexico. Transactions American Geophysical Union 36(5):885-892.

ABSTRACT: An apparently semi-permanent, large scale, anti-cyclonic eddy repeatedly observed on four earlier oceanographic surveys was investigated in greater detail during Cruise 54-10 of the A.A. Jakkula, August-September, 1954. Evidence from the five surveys made in the region of the eddy indicates that the eddy is an integral part of the Gulf Stream system in the Gulf of Mexico. From the single ship survey of Cruise 54-10 an attempt was made (1) to locate and define the eddy and (2) to establish whether or not it was a temporary or permanent feature of the Gulf of Mexico and the Yucatan Current or to determine whether or not it changed physically in space and time or both.

KEYWORDS: Physical oceanography.

**21.**

Auyong, J., R.B. Ditton, and V.C.J. Reggio. 1985. Offshore petroleum structures lure fishermen seaward in the Central Gulf of Mexico. Oceans '85 Proceedings: Ocean Engineering And The Environment. Oceans '85 1:561-567.

ABSTRACT: Based on over 12,000 sightings of boat fishing activity by industry volunteers on over 300 major platforms, the study indicated that access, shelf characteristics, transportation networks, demographics and the interrelationship of these factors influence the amount and location of offshore platform fishing. These factors produced an uneven distribution of activity along the coast and seawards; in fact, one-fifth of the study platforms accounted for more than half of all the fishing activity. Such findings on the use patterns associated with offshore structures have implications for planning and evaluating artificial reef systems as well as supplement biological and engineering knowledge.

KEYWORDS: Fisheries; offshore structures; fishermen; fishing operations; Gulf of Mexico.

**22.**

Bacigalupi, S.M., C.J. Kinler, D.A. Marin, and M.T. Prendergast. 1995. Estimated Proved and Unproved Oil and Gas Reserves, Gulf of Mexico,Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. MMS 96-0061.

ABSTRACT:None.

KEYWORDS:Technology.

**23.**
Ballard, J. A. and R. H. Feden. 1970. Diapiric structures on the Campeche Shelf and slope, western Gulf of Mexico. Geological Society of America Bulletin 81(2):505-12.

ABSTRACT: Recently collected seismic reflection profiles reveal numerous emerged and buried diapiric structures along the Campeche Shelf and slope, south of 20° N. latitude. Slope diapirs have steep sides relatively flat tops, and a subsurface reflector which may be an expression of caprock. Shelf diapirs are buried structures characterized by uniformly stratified sediment strapped between rising intrusives or displaced by numerous high-angle faults. The limited east-west distribution and lack of magnetic signature suggest that Campeche Shelf and slope diapirs are salt structures co-linear with previously mapped salt domes in the Tabasco-Campeche Basin and the Sigsbee Knolls.

KEYWORDS: Geology.

**24.**
Ballard, R. D. and E. Uchupi. 1970. Morphology and quaternary history of the continental shelf of the Gulf Coast of the United States. Bulletin of Marine Science 20(3):547-59.

ABSTRACT: Sea-level fluctuations of the Quaternary have greatly influenced the surface morphology of the continental shelf off the Gulf coast of the United States. Two prominent shorelines, at 60- and 160-meter depths, and other features found on the gulf shelf can be related to the relatively recent events of the Quaternary, particularly those of the Holocene transgression. Landward of the 40-meter contour, the slow rise of the sea surface and modern sedimentation have produced a complex mixture of topographic expressions. Diapiric structures, which are abundant from DeSoto Canyon westward, appear to be of secondary importance in contributing to the shelf's surface relief.

KEYWORDS: Geology.

**25.**
Barron Jr, C.N. and A.C. Vastano. 1994. Satellite observations of surface circulation in the northwestern Gulf of Mexico during March and April 1989. Continental Shelf Research 14(6):607-628.

ABSTRACT: Two tracks demonstrate cross-slope and cross-shelf motion northward from the central western Gulf toward Louisiana. These two drifters join three others to define a coastal current flow westward from near the Mississippi delta to Galveston and then southwestward along the Texas coast. Two other trajectories indicate a relatively low- energy mid-shelf regime over the northwestern portion of the outer continental shelf. Five drifter groundings locate a convergence in the nearshore and littoral flows on the Texas coast between Matagorda Peninsula and southern Padre Island. Strong wind-driven events in the northwestern Gulf demonstrate instances of coherent shelf response over 7 degrees of longitude and 3 degrees of latitude. Infrared satellite imagery indicates the regional context and structure of the spatial scales of Gulf of Mexico surface circulation. -from Authors.

KEYWORDS: Physical Oceanography; surface circulation ; drifting data buoys; (Northwest); Gulf of Mexico.

**26.**

Bass, R.M. and C.G. Langner. 1998. Direct Electric Heating of Pipelines. Proceedings of The10th Deep Offshore Technology Conference .

ABSTRACT: A DeepStar Joint Industry Program is under way to develop and demonstrate direct electrical heating of externally insulated offshore pipelines and flowlines for the purpose of preventing or removing plugging due to hydrates or wax deposition. Two systems are being studied and tested: one requiring complete electrical insulation of the flowline from the seawater; the other requiring periodic electrical communication with the seawater through anodes or other means. A theoretical model to predict electrical and thermal performance is being developed. Among the tests to be performed are combined bending and high voltage tests to determine insulation integrity at the field joints, and an offshore test of a ¼ -mile long section of 6" flowline to verify the predicted electrical and thermal performance of the two systems. The overall objective of the program is to provide a heated flowline up to 25 miles in length, with 25 year lifetime, which is capable of being installed in 10,000 feet of water.

KEYWORDS: Technology.

**27.**

Baumgartner, M.F. 1995. The distribution of select species of cetaceans in the northern Gulf of Mexico in relation to observed environmental variables. M.S. thesis. University of Southern Mississippi. Hattiesburg, MS.

ABSTRACT: Marine mammal surveys were conducted in the northern Gulf of Mexico in the springs of 1992, 1993 and 1994 aboard the NOAA Ship Oregon II. Environmental data were also measured during these cruises via CTD/XBT casts, thermosalinograph, surface chlorophyll samples and plankton tows. These environmental data were processed into several variables (e.g., surface temperature, surface temperature gradient, surface salinity, plankton biomass and surface chlorophyll concentration) which may define a preferred habitat for specific cetacean species. For those species having a sufficient sample size for the three spring cruises combined ($n \geq 25$), an analysis of cetacean distribution in relation to each of the selected environmental variables was conducted. *Tursiops truncatus, Grampus griseus, Stenella attenuata, Stenella* species (*Stenella coeruleoalba, Stenella longirostris* and *Stenella clymene*) and *Kogia* species (*Kogia simus* and *Kogia breviceps*) were all found to have a preferred depth range within the northern Gulf of Mexico (at least $p < 0.05$ for each) while *Physeter macrocephalus* demonstrated no significant difference from a uniform distribution with respect to depth ($p > 0.005$). After adjusting the analysis for these depth preferences, each species or species group exhibited varying degrees of correlation with the observed environmental variables. The distributions of both *G. griseus* and *Kogia* species were strongly related to a subset of the observed environmental variables. The analysis of the distributions to *T. truncatus*, *Stenella* species and *P. macrocephalus* yielded results that were suggestive of a preferred habitat but were more difficult to interpret. No meaningful relationships were detected between the distribution of *S. attenuata* and any of the observed environmental variables.

KEYWORDS: Endangered Species.

**28.**

Baumgartner, M. F. 1997. The distribution of Risso's dolphin (*Grampus Griseus*) with respect to the physiography of the northern Gulf of Mexico. Marine Mammal Science 13(4):614-38.

ABSTRACT: The distribution of Risso's dolphin (*Grampus Griseus*) was examined with respect to two physiographic variables, water depth and depth gradient (sea floor slope), in the northern Gulf of Mexico, using shipboard and aerial survey data collected from 1992 to 1994. Univariate $X^2$ analyses demonstrated that Risso's dolphins are distributed non-uniformly with respect to both depth and depth gradient. A bivariate analysis of the shipboard data indicated that Risso's dolphins utilize the steep sections of the upper continental slope in the northern Gulf of Mexico. This narrow core habitat is in waters bounded by the 350 m and 975 m isobaths with depth gradients greater than 24 m per 1.1 km and consists of only 2% of the surface area of the Gulf of Mexico. Sighting rates inside this region were nearly 5 and 6 times the average for the shipboard and aerial surveys, respectively. Of the groups sighted outside this region, 40% (shipboard) and 73% (aerial) were encountered within 5 km of it. Since it is unlikely that the physiography alone can attract dolphins, oceanographic mechanisms that may concentrate prey along the steep upper continental slope are discussed. The implications of this distribution, including potential prey species, foraging strategies, and impacts of proposed mineral exploration and development, are also considered.

KEYWORDS: Endangered Species.

**29.**

Beard, J.H. 1973. Pleistocene-Holocene boundary and Wisconsinan substages, Gulf of Mexico. Geological Society of America Memoir 136:277-316.

ABSTRACT: Late Pleistocene-Holocene climatic fluctuations and environmental conditions in the Gulf of Mexico are reflected by changes in the vertical distribution of planktonic foraminifers in the bottom sediments. The events are related closely by radiocarbon dates to continental Wisconsin glacial-interglacial substages. The almost inverse relationship between abundances of two species, *Globorotalia menardii* (warm) and *Globorotalia inflata* (cold), allows recognition of three major episodes of climatic cooling during the Wisconsinan. Moreover, minor fluctuations of climate are reflected in detail by the combined distributional patterns of warm- versus cold-water planktonic species. Paleotemperature curves quantitatively derived from the frequency ratio of warm- versus cold-water species from the Gulf of Mexico are strikingly similar to the oxygen-isotope curve of Emiliani (1966) from the Caribbean for about the last 75,000 yrs. Morphologic changes in the *Globorotalia menardii* group and the withdrawal of cold-water species, such as *Globorotalia inflata,* from the Gulf of Mexico characterize two climatically distinct assemblages. The older assemblage corresponds to the late Pleistocene and is characterized by *Globorotalia menardii flexuosa* (warm) and by *Globorotalia inflata* (cold). Withdrawal of *Globorotalia inflata* occurred between 4,000 and 11,000 yrs ago and corresponds closely to an incursion of abundant *Globorotalia tumida, Globorotalia ungulata,* and other warm-water species. This faunal boundary is interpreted to represent the transition from the last glacial to postglacial conditions in the Gulf of Mexico. Assuming a constant average rate of deposition for pelagic sediment, the age estimated for the boundary agrees very closely with that of the radiocarbon bracketed date of 7,000 yrs B.of Frye and others (1968) for the Wisconsinan-Holocene boundary. Paleontologic events and paleotemperature curves from the Gulf of Mexico correlate almost exactly with those from the Caribbean and adjacent Atlantic. Widely differing opinions expressed by several authors on Wisconsinan nomenclature in the marine section are based on correlations using different paleontological criteria and different geochemical dating methods. Carbon-14 determination reported in this study indicate ages considerably younger than the other published dates for what certainly appears to be a paleontologically equivalent unit. Climatic events recognized in the Gulf of Mexico can be correlated precisely on the basis of radiocarbon dates with the continental Wisconsinan glacial-interglacial substages and, therefore, development of an independent nomenclature for the marine section is neither necessary nor desirable.

KEYWORDS: Geology.

**30.**

Beard, J. H., J. B. Sangree, and L. A. Smith. 1982. Quaternary chronolgy, Paleoclimate, Depositional Sequences, and Eustatic Cycles. The American Association of Petroleum Geologists Bulletin 66(2):158-69.

ABSTRACT: Pleistocene alternations of ocean volumes, expressed as relative changes in sea level, are symptomatic of the accumulation and melting of continental ice sheets and resulted in lowstands of sea level during glacial periods and highstands during interglacial periods. A lowstand-highstand couplet constitutes a eustatic cycle. Eight cycles that occurred during the last 2.5 to 3.0 m. y. are recognized in the Gulf Coast region. These cycles are identified by multiple criteria, including paleontologic, sedimentologic, and seismic evidence. Eustatic cycle concepts can be used in seismic stratigraphy to identify seismic (depositional) sequences. Such seismic-sequence analyses are based on identification of discrete stratigraphic units within relatively conformable intervals of strata by using reflection patterns on the seismogram. For example, glacial periods may exhibit chaotic bedding surfaces on the seismogram, whereas interglacial periods may display parallel bedding surfaces. Seismic sequence analyses provide a sound basis for applying the global system of geochronology to seismic data for the improvement of stratigraphic and structural interpretations. Moreover, seismic sequence analyses in new exploration areas allow for reliable predictions of geologic age ahead of drilling and facilitate preliminary tectonostratigraphic reconstructions.

KEYWORDS: Geology.

**31.**

Beardsley, G. and R. Conser. 1981. An Analysis of Catch and Effort Data From the U.S. Recreational Fishery for Billfishes (Istiophoridae) in the Western North Atlantic Ocean and Gulf of Mexico, 1971-78. Fishery Bulletin 79(1):49-68.

ABSTRACT: In 1971, the National Marine Fisheries Service's Southeast Fisheries Center initiated research on the billfish stocks of the western North Atlantic Ocean and Gulf of Mexico. The purpose of this research was to develop and evaluate a method of determining changes in relative abundance of billfish stocks using catch and effort data from the recreational fishery. This report has been prepared to present a description of this research, evaluate the reliability of the sampling techniques, and make a preliminary determination of the validity of catch and effort data from the recreational fishery as an indicator of changes in relative abundance of billfish populations. The results indicate that catch and effort statistics for white marlin in the Gulf of Mexico appear to be reliable and can be aggregated to provide a means of indexing relative abundance of these species. The model did not appear to be appropriate for blue marlin, however. The general trend in catch per unit effort from 1972 to 1978 for sailfish and white marlin in the Gulf of Mexico appears to be downward.

KEYWORDS: Fisheries; pelagic fishes; sport fishing statistics; population number; Istiophorus platypterus; Tetrapturus albidus; Makaira nigricans; Xiphias gladius; Tetrapturus pfluegeri; Gulf of Mexico.

**32.**

Beckmann, M.M., M.L. Byrd, J. Holt, J.W. Riley, C.K. Snell, C. Tyer, and D. Brewster. 1996. Offshore Technology Conference, Annual Proceedings 4 .

ABSTRACT: Abstract: BP Exploration's Pompano Subsea Development, in 1865 ft of water in the Gulf of Mexico, uses a subsea production system to produce oil to a host platform 4 one half miles away. The 10-slot subsea template/manifold supports Through FlowLine (TFL) wells, which are controlled by means of an electrohydraulic control system. All process components of the system are retrievable with ROV intervention. This paper describes the template/manifold system, TFL tree system and ROV intervention systems.

KEYWORDS: Offshore oil well production; Oil field development; Offshore pipelines; Production platforms; Flowlines; Hydraulic control; equipment; Submersibles; Christmas trees (wellheads).

**33.**
Behrens, E.W. 1988. Geology of a continental slope oil seep, northern Gulf of Mexico. American Association of Petroleum Geologists Bulletin. 72(2):p. 105-114.

ABSTRACT: An oil and gas seep was documented by replicate sampling with piston corer, abundant high-resolution and sparse multichannel seismic reflection profiling, and chemical and isotopic analyses. The seep occurs on the upper continental slope over a salt ridge interpreted to split and plunge eastward, northeastward, and northward. The relatively shallow diapir over which the seepage occurs is manifested at the surface by a graben in strike section and by a half-graben in dip section. Faulting over the crest is commonly associated with loss of reflected energy or acoustic wipeouts.

KEYWORDS: oil seepages; continental slope; gas seepages; marine geology; ASW, Gulf of Mexico.

**34.**
Behrens, E.W. and Addy S.K. 1980. Extrapolation of physical properties of sediments from a localized area in the Gulf of Mexico, based on a conceptual geological model. Marine Geology 38(1-3):93-102.

ABSTRACT: In a 9 m midslope core (depth 1006 m) in the NE Gulf of Mexico, there are 2 c.60 cm zones (at the core top and from 750 to 810 cm) which have distinctly higher foraminiferal sand and clay contents than the rest of the core. The pattern is distinctive and extends over about 4000 km SUP 2 on this continental slope. Several investigators have concluded the foram-rich zones represent warm, interglacial or interstadial periods dominated by pelagic sedimentation in the deep-sea, whereas the siltier zones represent glacial periods of low sea-level stands during which moreterrigenous sediment was delivered to the continental margins and transported to adjacent ocean basins by various gravity flow mechanisms.- from Authors.

KEYWORDS: Geology.

**35.**
Behringer, D.W., R.L. Molinari, and J.F. Festa. 1977. The variability of anticyclonic current patterns in the Gulf of Mexico. Journal of Geophysical Research 82(34):5469-5476.

ABSTRACT: A recent twofold increase in the number of temperature observations available in the Gulf of Mexico has prompted a reappraisal of several ideas regarding the temporal variability of the Loop Current in the eastern gulf and the anticyclonic gyre in the western gulf. The analysis includes both synoptic data drawn from 47 cruises in the eastern gulf and monthly maps of temperature at 200 m prepared from observations over the entire gulf. It is found that on average the penetration of the Loop Current into the gulf increases during the winter and spring, reaching a maximum in the early summer, at which time a large anticyclonic eddy probably separates from the loop. It is also found that there are substantial deviations from this average sequence of events; during the past dozen years the period between eddy separations has been as short as 8 months and as long as 17 months. The data coverage of the western gulf is sparse, but there is evidence for the year-round persistence of the anticyclonic gyre and some indications that the gyre may be strongest in summer and winter.

KEYWORDS: Physical Oceanography; water circulation; gyres; seasonal variations; water temperature; Water Currents; Water Temperature; Gulf of Mexico.

**36.**

Bennington, J.P. 1979. Luminescent bacteria and deep-sea macrourids (Pisces: gadiformes) from the Gulf of Mexico. Texas A&M UniversityA taxonomic analysis of luminescent bacteria from the light organs of five different species (four genera) of fishes of the family Macrouridae, 39 non-symbiotic luminescent isolants from nearshore and offshore marine environments, and non-luminescent bacteria from fishes and nearshore environments, was conducted to assess ecologic relationships between organisms found in various environments and those from photophores of macrourid fishes. Four species of luminescent bacteria described in the literature are present in the Gulf of Mexico. Luminescent bacteria from the macrourid photophore were all found to be strains of *Photobacterium phosophoreum*. Strain differences appeared to be more related to geographic origin than to host. *Beneckea harveyi* organisms were found in nearshore sediment and water samples. *Photobacterium fischeri* organisms were isolated from both nearshore and offshore water and sediment samples. *Photobacterium leiognathi* were found in the alimentary canal of a chlorophthalmid fish. The results indicate that a single luminescent bacteria species occurs in the photophores of macrourid fishes in the Gulf of Mexico. Data from growth requirement analysis indicate that host factors together with physical characteristics of the deep-sea environment probably influence the microecology of the light organ such that one specific luminescent bacterial form exists in that organ.

KEYWORDS: Biology.

**37.**

Berger, T.J., P. Hamilton, J.J. Singer, R.R. Leben, and G.H. Born. 1996. Louisiana/Texas Shelf Physical Oceanography Program: Eddy Circulation Study. Final Synthesis Report., Volume 1. Technical Report. Physical oceanography Minerals Management Service, New Orleans, LA. Gulf of Mexico OCS Region.

ABSTRACT:The study objectives monitoring and characterizing three classes of mesoscale circulation patterns important in the open sea and slope waters of the northwestern Gulf of Mexico; providing efficient, centralized logistics support, including Service Argos liaison for drifting buoys, air deployed expendable bathythermograph (AXBT) and current profiler (AXCP) probes, and expendable bathythermograph (XBT) probes for a ship-of-opportunity program; and disseminating information collected during this study to other investigators on a regular basis.

KEYWORDS:Physical Oceanography; Continental shelf; Eddies(Fluid mechanics); Ocean circulation; Louisiana; Texas; Ocean surface; Sea roughness; Water waves; Ocean dynamics; Tracking; Satellite altimetry; Data acquisition; Data quality; Oceanographic data; Aerial surveys; Oceangraphic surveys; Maps; Ntisdimms; Gulf of Mexico.

**38.**

Berger, T.J., P. Hamilton, J.J. Singer, R.R. Leben, and G.H. Born. 1996. Louisiana/Texas Shelf Physical Oceanography Program: Eddy Circulation Study. Final Synthesis Report., Volume 2. Appendices. Physical oceanography Minerals Management Service, New Orleans, LA. Gulf of Mexico OCS Region.

ABSTRACT:Table of Contents: Gulf of Mexico Sea Surface Topography Climatology Derived from GEOSTAT Altimeter Data; Gulf of Mexico Significant Wave Height Climatology Derived from GEOSTAT Altimeter Data; and Gulf of Mexico Wind Speed Climatology Derived from GEOSAT Altimeter Data.

KEYWORDS:Physical Oceanography; Continental shelf; Eddies(Fluid mechanics); Ocean circulation; Louisiana; Texas; Ocean surface; Sea roughness; Water waves; Ocean dynamics; Tracking; Satellite altimetry; Data acquisition; Data quality; Oceanographic data; Aerial surveys; Oceangraphic surveys; Maps; Ntisdimms; Gulf of Mexico.

**39.**

Bergman, E.M. and T.R. Hammer. 1995. Characteristics and Possible Impacts of a Restructured OCS Oil and Gas industry in the Gulf of Mexico,Appendix A: Summary of Findings from Exploratory Interviews. U.S. Department of Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA MMS 95-0055.

ABSTRACT:None.

KEYWORDS:Socioeconomics.

**40.**

Bernard, B.B., J.M. Brooks, and W.M. Sackett. 1976. Natural gas seepage in the Gulf of Mexico. Earth and Planetary Science Letters 31(1):48-54.

ABSTRACT: Hydrocarbon compositions and delta /sup 13/C values for methane of fourteen natural seep gases and four underwater vents in the northwestern Gulf of Mexico are reported. The C/sub 1//(C/sub 2/+C/sub 3/) ratios of the seep gas samples ranged from 68 to greater than 1000, whereas delta /sub PDB//sup 12/C values varied from -39.9 to -65.5%. Compositions suggest that eleven of the natural gas seeps are produced by microbial degradation whereas the remaining three have a significant thermocatalytically produced component. Contradictions in the inferences drawn from molecular and isotopic compositions make strict interpretation of the origins of a few of the samples impossible.

KEYWORDS: Oceanography; Organic Compounds; Sediments; Gulf of Mexico; Methane; Underwater Vents; Microbial Degradation; Isotopic Compositions; Natural Gas Seepage; Hydrocarbon Composition; Molecular Composition; Thermocatalytic Processes.

**41.**

Betzer, P.R. and M.E.Q. Pilson. 1971. Particulate Iron and the Nepheloid Layer in the Western North Atlantic, Caribbean and Gulf of Mexico. Deep-Sea Research 18:753-761.

ABSTRACT: None.

KEYWORDS: Chemistry.

**42.**

Bianchi, T.S., C.D. Lambert, P.H. Santschi, and L. Guo. 1997. Sources and transport of land-derived particulate and dissolved organic matter in the Gulf of Mexico (Texas shelf/slope): The use of lignin-phenols and loliolides as biomarkers. Organic Geochemistry 27(1-2):65-78.

ABSTRACT: The fate and transport of terrestrial organic matter across the continental margin in the Gulf of Mexico was studied in 1992 and 1993 using chemical biomarkers. Lignin-phenols were utilized as biomarkers for terrestrial inputs and indicated that much of the terrestrial organic matter inputs were deposited on the shelf/break and slope. The lignin-phenol concentrations (normalized to carbon) in POC, HMW DOC, and sediments in slope waters were considerably higher than at other open ocean sites studied previously. The dominant mechanism for transport of terrestrially-derived POC and HMW DOC across the shelf and slope was hypothesized to be advection of riverine and estuarine discharges through benthic nepheloid layers. Based on loliolide concentrations in the water column, we believe that lateral transport of these materials at the shelf /break (through extensions of benthic nepheloid layers) may have been an important mechanism for the injection of terrestrially-derived organic matter into deep slope waters.

KEYWORDS: Chemistry; Sediment; Particulate Organic Matter; Dissolved Organic Matter; Transport Processes; Terrigenous Sediments; Detritus; Provenance; Continental Margins; Texas; Gulf Coast; , Gulf of Mexico; Phenols; Tracers; Biomarkers; Loliolides; Lignins.

**43.**

Biggs, D.C. 1992. Nutrients, plankton, and productivity in a warm-core ring in the western Gulf of Mexico. Journal of Geophysical Research 97(C2):2143-2154.

ABSTRACT: Argos drift buoy trajectory data showed that a region of anticyclonic circulation about 100 km in diameter was present over the upper continental slope of the NW corner of the Gulf of Mexico in September-October, 1988. The presence of a subsurface salinity maximum greater than 36.5 psu within the upper 150 m of this anticyclone indicated that it had originated as a warm-core eddy of the Loop Current; however, a maximum of only 36.54 psu at $sigma_t$= 25.5 in contrast to as much as 36.88 psu at this density surface in a "fresh" ring indicated that this feature had spent many months in the western gulf since its separation from the Loop Current. Biologically, the warm-core ring was oligotrophic: its surface waters were generally depleted in nitrate to depths of more than 100 m, and chlorophyll standing stocks, primary productivity, and zooplankton biomass were all extremely low. By comparison, at ring periphery where there was measurable nitrate at 100 m, chlorophyll standing stocks and primary production in the surface mixed layer were 1.5-2 times higher.

KEYWORDS: Water column biology; nutrients (mineral); plankton; primary production; Gulf of Mexico; ocean circulation; CTD observations; oceanic eddies; water masses; surface mixed layer; mesoscale features; mesoscale eddies; Gulf of Mexico; Loop Current; current rings.

**44.**

Biggs, D.C., G.S. Fargion, P. Hamilton, and R.R. Leben. 1996. Cleavage of a Gulf of Mexico Loop Current eddy by a deep water cyclone. Journal of Geophysical Research 101(C9):20.

ABSTRACT: Eddy Triton, an anticyclonic eddy shed by the Loop Current in late June 1991, drifted SW across the central Gulf of Mexico in the first 6 months of 1992, along the "southern" of the three characteristic drift paths described by Vukovich and Crissman [1986] from their analyses of 13 years of advanced very high resolution radiometer sea surface temperature data. At eddy age 9-10 months and while this eddy was in deep water near 94 degree W, it interacted with a mesoscale cyclonic circulation and was cleaved into two parts. Because Eddy Triton's cleavage took place just before the start of marine mammals (GulfCet) and Louisiana-Texas physical oceanography (LATEX) field programs, the closely spaced CTD, XBT, and air dropped XBT (AXBT) data that were gathered on the continental margin north of 26 degree N in support of these programs allow a detailed look at the northern margin of the larger fragment of this eddy. Supporting data from the space-borne altimeters on ERS 1 and TOPEX/POSEIDON allow as to track both pieces of Eddy Triton in the western Gulf and follow their spin down in dynamic height, coalescence, and ultimate entrainment in January 1993 into another anticyclonic eddy (Eddy U).

KEYWORDS: Physical Oceanography; Atlantic; Loop Current; ocean circulation; current meandering; current rings; hydrographic surveys; current observations; statistical analysis; Gulf of Mexico.

**45.**

Biggs, D.C. and F.E. Muller-Karger. 1994. Ship and satellite observations of chlorophyll stocks in interacting cyclone-anticyclone eddy pairs in the western Gulf of Mexico. Journal of Geophysical Research 99(C4):7371-7384.

ABSTRACT: When anticyclonic eddies shed by the Loop Current of the Gulf of Mexico reach the western margin of the gulf, they influence the surface circulation over the continental slope and rise. Of particular interest is the generation of cyclone (cold-core)-anticyclone (warm-core) pairs when aging Loop Current eddies interact with the continental margin. The authors describe the physical and biological characteristics of these cyclone-anticyclone pairs. Their objective was to determine how eddy pairs affect the distribution of phytoplankton in the region and how satellite ocean color measurements are applicable to tracing of the eddies. They present shipboard data collected between 1980 and 1982 on the hydrography, chlorophyll stocks, and nutrient concentrations of eddy pairs in the western Gulf of Mexico and compare these data with coastal zone color scanner (CZCS) images collected during the time frame of the cruises. Surface pigment concentrations followed a seasonal cycle, with low concentrations found within cyclones and anticyclones from April through early November and higher concentrations found in the winter. CZCS pigment concentrations were locally high in the flow confluence of cyclone-anticyclone pairs. The CZCS imagery shows that some cyclone-anticyclone geometries transport high-chlorophyll shelf water seaward at least 100-200 km off-shelf.

KEYWORDS: Water column biology; Oceanographic Regions; Oceanographic Techniques; Remote Sensing; Ocean; Circulation; Current; Measurement Technique; Remote Sensing; Satellite Observation; Chlorophyll Stock; Cyclone-Anticyclone Eddy Pair; Gulf of Mexico; Plankton; Marine Biology; Dynamics; Anticyclonic Eddies; Loop Current; Western Margin ; Surface Circulation; Continental Slope; Color; Chlorophyll; Nutrient Concentration.

**46.**

Biggs, D.C. and D.J. Murphy. 1991. Underway measurements of temperature, salinity, chlorophyll, and near-surface currents from R/V Gyre in support of the Texas Institutions Gulf Ecosystem Research initiative. Proceedings of the Marine Technological Society Conference :58-64.

ABSTRACT: Three times each year, 9-10 day Training & Research cruises are fielded aboard R/V Gyre by Texas A&M University in support of the Texas Institutions Gulf Ecosystem Research (TIGER) initiative. The principal area of TIGER operations is the Texas continental shelf and the northwest Gulf of Mexico continental slope west of 93'W and north of 26'N. CTD and XBT data are collected and discrete bottle samples are analyzed for salinity, dissolved oxygen, nutrients, and for chlorophyll + phaeopigments at standard hydrographic stations that are revisited on each of these cruises. These data are shared with the National Oceanographic Data Center.

KEYWORDS: Physical Oceanography; CTD observations; XBTs; salinity data; dissolved oxygen; nutrients (mineral); chlorophylls; standard ocean sections; ocean stations; current observations; Texas; R; V Gyre; Gulf of Mexico.

**47.**

Biggs, D.C. and L.L. Sanchez. 1997. Nutrient enhanced primary productivity of the Texas-Louisiana continental shelf. Journal of Marine Systems 11(3-4):pp. 237-247.

ABSTRACT: Light bottle and dark bottle $^{14}C$ uptake was measured on deck in 4-6 h shipboard incubations at 12 locations on the NW continental margin of the Gulf of Mexico in July and at 9 locations in October 1990. In July, rates of $P_{max}/m^3/h$ were higher than previously reported for the Texas-Louisiana shelf, and daily production calculated from these 4-6 h incubations was 1-1.4 g $C/m^2/d$ at most inner and middle shelf locations. However, in May-June 1990 freshwater discharge from the nitrate-rich Mississippi-Atchafalaya river system and from the Trinity River had reached highest recorded outflows in many years; near-surface nitrate concentrations over the Texas-Louisiana shelf remained well above the 0.05 mu M/l limit of detection into July. In contrast, near-surface nitrate concentrations were close to or at the limit of detection in October. Reflecting this variation in nitrate inventory, in July the production index (P/B ratio) at stations near riverine and estuarine nutrient sources and over the inner shelf reached 40 mg C fixed/$m^3$/h/(mg chl $m^{-3}$, whereas in October this index generally was 2- to 3-fold lower. Thus, primary productivity of the Texas-Louisiana continental margin appears to be moderate when not enhanced by the high "new" nitrogen nutrient loads that enter via riverine/estuarine outflows. Since the volume of freshwater discharge varies markedly on seasonal and interannual time scales, we suggest that "discharge driven" is a more appropriate description of the primary productivity of this subtropical continental margin than is its spatial partition into regions of high (250-500), medium (150-250) and low (100-150 mg C /$m^2$/d) mean production.

KEYWORDS: Water column biology; river discharge; carbon fixation; primary production; nutrients (mineral); continental shelves; continental shelf; nutrients; primary productivity; river wash; USA; Gulf of Mexico.

**48.**

Biggs, D.C., A.C. Vastano, R.A. Ossinger, A.G. Zurita, and A.P. Franco. 1988. Multidisciplinary study of warm and cold-core rings in the Gulf of Mexico. Memorias Sociedad De Ciencias Naturales La Salle 48(3):11-31.

ABSTRACT: In April 1987, Texas A&M University oceanographers surveyed a portion of a closed, mesoscale cyclonic feature over the NW slope of the Gulf of Mexico. In the elliptical cold core of this springtime feature, which stretched approximately 100 by 30 km along a NE-SW major axis, 15C water domed upward to within 105 m of the surface. In November 1987, a cooperative program between TAMU and Mexico's Naval Oceanographic Division observed the western portion of another mesoscale cyclonic circulation over the continental slope off Texas and Mexico. In the cold core of this autumn feature, which was about 150 km in diameter, 15C water domed upward to within 140 m of the surface. Although phytoplankton and zooplankton standing stocks in the upper 100 m of these mesoscale features were not elevated above coincident levels found in the adjacent slope water, both cyclonic features had high nitrate concentrations in excess of 10ug-at/liter just underlying the mixed layer. We suggest that cyclonic circulation regions such as these are responsible for literature reports that primary production over the northwest continental slope averages 2-5 fold higher than other oceanic regions of the Gulf of Mexico, rivaling that of the continental shelf.

KEYWORDS: Water column biology; Gulf of Mexico(United States); Continental Slope ; Zooplankton.

**49.**

Biggs D. C., Zimmerman R. A., R. Gasca, Castellanos I., E. Suarez-Morales, and Leben R. R. 1997. Note on plankton and cold-core rings in the Gulf of Mexico. Fishery Bulletin 95:369-375.

ABSTRACT: None.

KEYWORDS: Water column biology; Ecology; Marine Ecology; Methods and Techniques; Biomass; Cold-core rings; Primary production.

**50.**
Björnberg, T.K.S. 1971. Distribution of plankton relative to the general circulation system in the area of the Caribbean Sea and adjacent regions, pp. 343-35. Symposium on Investigations and Resources of the Caribbean Sea and Adjacent RegionsWillemstad, Curaçao, Netherlands Antilles. Paris, France: United Nations Educational, Scientific, and Cultural Organization (UNESCO).

ABSTRACT: None.

KEYWORDS: Caribbean Sea/ Gulf of Mexico/ Zooplankton/ Water column biology.

**51.**
Blaha, J. and W. Sturges. 1981. Evidence for Wind-Forced Circulation in the Gulf of Mexico. Journal of Marine Research 39(4):711-734.

ABSTRACT: A study is conducted into the response of sea level and dynamic height to fluctuations of alongshore wind stress and wind stress curl at periods greater than a few months per cycle. Monthly tide gauge data from Key West to Progreso, Mexico, during 1954 to 1974 are adjusted to remove the effects of local atmospheric pressure and seasonal steric heating. The adjusted mean monthly sea level elevations are significantly greater from Progreso to Port Isabel than they are elsewhere in the Gulf. This observation remains unchanged after the elevations are reduced for the effect of local alongshore winds. Among the tide gauges in the western Gulf, Galveston is the most coherent with the local alongshore wind forcing at periods greater than 2 mo/cycle, exhibiting a phase with the winds not significantly different from pi . At the other coastal sites, at least half of the elevation signal remains. This residual signal is presumed to be caused by the geostrophic fluctuations of an offshore boundary current.

KEYWORDS: Physical Oceanography; wind-driven circulation; sea level variations; tide height; coastal waters; wind circulation; sea level; tide heights; Gulf of Mexico.

**52.**
Bloom, A.L. 1983. Sea level and coastal morphology of the United States through the Late Wisconsin glacial maximum., pp 215-229. In: Porter S.C. Late-Quaternary environments of the United States. Vol. 1 University of Minnesota, Minneapolis, MN.

ABSTRACT: This review is divided into two parts. The first is a review of sea-level changes at the end of Middle Wisconsin time, from about 28 000 to 23 000 yr BP. That was a time of generally lower global sea level falling from a relatively high interstadial position. Questions about that Middle Wisconsin high sea level continue to bother researchers. The second part reviews the paleogeography of the continental margins of the United States during the sea-level minimum associated with the Late Wisconsin glacial maximum (23 000 to 15 000 yr BP) and the subsequent rapid rise of sea level until about 10 000 yr BP. -from Author.

KEYWORDS: Geology.

**53.**
Blumer, M. 1972. Submarine seeps: are they a major source of open ocean oil pollution? Science 176:1257-1258.

ABSTRACT: None.

KEYWORDS: Chemistry; seeps.

**54.**
Bogdanov, D.V., V.A. Sokolov, and N.S. Khromov. 1968. Regions of high biological and commercial productivity in the Gulf of Mexico and Caribbean Sea. Oceanology 8:371-381.

ABSTRACT: None.

KEYWORDS: Caribbean Sea; Gulf of Mexico; Zooplankton; Water column biology; phytoplankton.

**55.**

Bonnell, S.A., M.S. Blackmore, and C.K.W. Tam. 1999. Pipeline Routing and Engineering for Ultra-Deepwater Developments. Proceedings of the 31th Annual Offshore Technology Conference ( OTC paper 10708).

ABSTRACT: As oil and gas explorations venture into deeper water and more hostile, "frontier" subsea conditions, pipeline routing and engineering activities become more critical to the planning and realization of these projects. Of particular importance is the requirement that survey and engineering activities are planned and started early, to ensure that a complete technical and economic model can be established at the outset and that risks are well understood and managed. This paper provides an overview of the governing issues relating to the successful execution of route planning and surveys for ultra-deepwater pipeline projects. It includes the importance of desktop studies, the planning and execution of survey techniques and equipment, and "semi-real time" engineering performed onboard the survey vessel. The use of Limit State Design concepts is also briefly discussed.

KEYWORDS: Technology.

**56.**

Booth, J.S. 1979. Analyses of, and results of laboratory tests on, surficial sediments from the upper continental slope across the northern Gulf of Mexico. U.S. Geological Survey Open-File(79-579).

ABSTRACT: None.

KEYWORDS: Geology.

**57.**

Booth, J.S. 1979. Recent history of mass-wasting on the upper continental slope, northern Gulf of Mexico, as interpreted from the consolidation states of the sediment., pp 153-164. In: Doyle L.J., Pilkey Jr O.H., (Editor). Geology of continental slopes . Society of Economic Paleontologists and Mineralogists,

ABSTRACT: Off S.Texas evidence related to the repeated occurrence of overconsolidated sediment indicates frequent mass movement involving sections tens of meters thick. The Mississippi Depocenter can be characterized by rapid and variable deposition and frequent small-scale mass-wasting events. In contrast, the Mississippi Trough, located on the SW periphery of the active depocenter, shows little evidence of recent mass-wasting. It is typified by highly underconsolidated sediment near the head. -from Author.

KEYWORDS: Geology.

**58.**

Boothe, P.N. and B.J. Presley. 1987. The effects of exploratory petroleum drilling in the Northwest Gulf of Mexico on trace metal concentrations in near rig sediments and organisms. Environmental Geology and Water Science 9(3):173-182.

ABSTRACT: For a typical offshore petroleum well, 500-1000 t (dry weight excluding cuttings) of drilling fluid solids are discharged into the sea. In this study, concentrations of selected trace elements present in drilling fluids (Ba, Cd, Cr, Cu, Fe, Pb, Ni, V), were determined in surface sediments and macroepifauna around a Gulf of Mexico exploratory drilling site before, during, and the after drilling operations. Observed significant increases in the level of Fe in organisms and Ba and Cr in sediments were attributable to drilling discharges.

KEYWORDS: Chemistry; Gulf of Mexico; Oil and Gas Industry; Environmental Impact; Marine Organisms; Epifauna; Pollution Effects; Marine Pollution; Sediment Pollution; Drilling Fluids; Trace Elements; , Gulf of Mexico.

**59.**

Boothe, P.N.andB.J. Presley. 1989. Trends in sediment trace element concentrations around six petroleum drilling platforms in the northwestern Gulf of Mexico, pp 3-21. In: Englehardt FR, Ray J.P., Gillam AH. Drilling wastes. Elsevier Science,

ABSTRACT: Characterises sediment gradients of elements known to be major constituents of drilling fluids e.g. Ba, and of trace elements of environmental concern which may be released during drilling. Statistically significant elevations in surficial sediment Hg and Zn concentrations, i.e. within 125 m of the site, Hg 4-7 fold above background, Zn 5-10 fold, were observed at these two deep water sites. Significant elevations, e.g. 3-5 times background, in other trace metals (Cd, Cu, Pb, Zn) were not common and generally restricted to sediments within 125 m of the drilling site. -from Authors.

KEYWORDS: Chemistry; Drilling Platform; Sediment Gradient; Trace Metals; Petroleum Recovery; Gulf of Mexico.

**60.**

Boss, K. J. 1968. New species of Vesicomyidae from the Gulf of Darien, Caribbean Sea (Bivalvia; Mollusca). Bulletin of Marine Science 18(3):606-.

ABSTRACT: Three new species of the family Vesicomyidae, deep-sea, heterdont bivalves of unusual size, are described from material taken by the R/V Pillsbury in the Gulf of Darien in the Caribbean Sea. The new species, belonging to three different genera, *Vesicomya*, *Calyptogena*, and *Ectenagena*, live in depths beyond 400 meters and possess shells that are relatively heavy and of a chalky structure. The possible affinities of the family with the Cyprinidae and Veneridae are discussed.

KEYWORDS: Geology.

**61.**

Boudreaux, S. 1988. Effects of the Declining Oil and Gas Industry on Elementary and Secondary Education, pp 366-369. Ninth annual Gulf of Mexico information transfer meeting, December, 1988. Minerals Management Service, Gulf of Mexico OCS Region.,

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana; Education.

**62.**

Bouma, A.H. 1979. Continental slopes., pp 1-15. In: Doyle L.J., Pilkey Jr O.H., (Editor). Geology of continental slopes . 27. Society of Economic Paleontologists and Mineralogists,

ABSTRACT: The continental slope is defined as the zone extending from the shelf break and terminating at the continental rise where the gradient becomes less than 1:40 or where the slope is bounded by a deep-sea trench or a marginal plateau. The slope province can be smooth or terraced, may contain steep escarpments or intraslope basins, or can be very irregular as a result of slumping, fault scarps, or diapirs. Most slopes are cut transversely at many places in their upper part by submarine canyons that connect to deep-sea fans which form constructive sediment bodies on lower slopes, rise, trenches, and parts of the abyssal plain. -from Author.

KEYWORDS: Geology.

**63.**

Bouma, A.H. 1981. Depositional sequences in clastic continental slope deposits, Gulf of Mexico. Geo-Marine Letters 1(2):115-121.

ABSTRACT: Tertiary and Quaternary sediments, overlying diapiric older Tertiary shales and Louann Salt on the continental slope in the W Gulf of Mexico, show cyclicity based on seismic-reflection patterns. A set of indistinct parallel reflections or an acoustically semi-transparent zone, normally onlapping onto diapir flanks, alternates with a set of distinct parallel reflections that drape the sea bottom. The indistinct reflections represent deposits employed by bottom transport during a lowering of sea level. Sea level rise and high stand are characterized by hemipelagic sediments that form blanket-type deposits. Differential sediment loading causes diapiric activity that may reach maximum upward velocities when sea level rises.-Author.

KEYWORDS: Geology; Tertiary; Quaternary Sediments; Cyclicity; Seismic Reflection.

**64.**

Bouma, A.H. and W.R. Bryant. 1994. Physiographic features on the northern Gulf of Mexico continental slope. Geo-Marine Letters 14:252-263.

ABSTRACT: The continental slope of the northern Gulf of Mexico is diapirically controlled and is comprised of coalescing salt sheets, salt withdrawal basins, salt ridges, salt tongues and sills, and submarine canyons. Bathymetric information from single-beam data has resulted in several published maps. Many of the map areas have been re mapped, using multibeam surveys, by the US National Ocean Service, and names have been given to the major physiographic features. The multibeam program was discontinued before complete coverage of the slope was accomplished. We provide charts of the remaining areas with names of features that have been accepted by the US Board of Geographic Names.

KEYWORDS: Geology.

**65.**

Bouma, A. H., W. R. Bryant, and J. W. Antoine. 1972. Origin and configuration of Alaminos Canyon, northwestern Gulf of Mexico. Texas A&M University, Oceanographic Studies 3:153-79.

ABSTRACT: A submarine canyon-like feature, called Alaminos Canyon, is located in the trend of Sigsbee Scarp between 94° 15 and 94° 45' west longitudes. The more or less North-South running system terminates just south of the 26° parallel.
Bathymetric and seismic profiling records reveal a complex area in which many single and multiple canyon sections can be observed in a single tract over the area. The sides of the depressions are sometimes steep, and occasionally terrace-like features are found. Subbottom profiles show that some depressions are half or completely filled with sediments. Diapiric structures and faults are also observed. Sediment cores collected in the deepest parts of the canyon present a lithology which is a combination of a Globigernia ooze and a clayey pelite. No sand layers have been encountered. The interpretation of this complex area varies between a complex submarine canyon system and a hummocky area underlain by salt diapirs. It seems likely that a combination of both ideas is present.

KEYWORDS: Geology.

**66.**

Bouma, A.H., O. Chancey, and G. Merkel. 1971. Alaminos Canyon Area,Texas A&M University. Oceanographic Studies, Volume 3.

ABSTRACT:A complex submarine canyon-fan valley area is located approximately 120 miles south of Galveston, Texas. The main system of valleys, basins and highs has a north-south direction, starting at about the 100-fm contour and terminating in the abyssal plain. A more simple system comes from the west, runs SSE and meets the first system in the abyssal plain. Original connections to the Colorado-Brazos-Trinity Rivers and the Rio Grande are likely. Possible coalescing of salt fronts, active salt diapirism, faulting and folding have created a complex system of canyons and a blocking off of canyons which barely resemble other submarine canyon-fan valley systems. (Author).

KEYWORDS:Geology; Ocean Bottom Topography; Mexico Gulf; Salts; Deposits; Faults(Geology); Echo Ranging; Sedimentation; Anomalies; Texas; Reprints; Alaminos Canyon; Submarine Canyons; Bathymetry; Abyssal Plains; Ntisn.

**67.**

Bouma, A.H., Coleman J.M., A. Meyer, and et al. 1986. Initial reports of the Deep Sea Drilling Project, Leg 96, Ft. Lauderdale, Florida to Galveston, Texas, 1983.,Government Printing Office. Washington, DC.

ABSTRACT:The volume covers Leg 96 of the DSDP which traversed a course from Ft. Lauderdale, Florida to Mobile, Alabama and covered an area of the E Gulf of Mexico. Twenty holes were drilled at 9 sites which can be divided into 6 groups: middle Mississippi Fan channel, Overbank area, upper lower Mississippi Fan with switching channels, termination of channels area of the lower Mississippi Fan, slump area of the youngest fan lobe and intraslope basin sites. The cores were examined in detail and methodology and principal results recorded for each site. Results are examined further in the following sections: seismic stratigraphic and sedimentologic studies, chronostratigraphic observations, geochemical studies of water and sediments, and geotechnical studies. Extensive use is made of photographs, diagrams and tables to illustrate the results.- S.King.

KEYWORDS:Geology; Leg 96; Gulf of Mexico; Seismic Stratigraphic; Sedimentologic Studies; Chronostratigraphic Observations; Geochemical Studies of Water and Sediments.

**68.**

Bouma, A.H., J.M. Coleman, A.A. Wright-Meyer, and C.E. Stelting. 1985. Mississippi Fan: DSDP Leg 96 drilling results. Seventeenth Annual Offshore Technology Conference 1985 Proceedings 2(OTC 4909):105-112.

ABSTRACT: The Mississippi Fan in the Gulf of Mexico is a Pleistocene accumulation of deepwater deposits, about 300,000 km $^2$ in areal extent and up to 4 km thick. Seismic reflectors of regional continuity divide the fan into at least seven individual, slightly lenticular, bodies called fanlobes. A general migration from west to east and basinward occurred through the Pleistocene. Each fanlobe is characterized by a channel-overbank complex divisible into four main areas: canyon, upper-, middle-, and lower fan. The youngest fanlobe starts at the Mississippi Canyon, a feature formed by retrogressive slope failures. This canyon changes into an erosive and slightly aggradational channel on the upper fan (1200-2200 m water depth). The middle fan is an aggradational body; its maximum width is about 250 km and its maximum thickness about 400 m. It is convex in cross-section with a sinuous, migratory channel along its apex. The channel fill consists of gravel and sand at its base, overlain by silty and clayey muds. The coarse sediment can be recognized on seismic reflection as an acoustically high-amplitude zone which migrated laterally and aggraded vertically with time. The overbank deposits are mainly clays and contain some silt and sand turbidites. Average sedimentation rates for both the channel fill and the overbank deposits were nearly 12 m/1000 years during the late Wisconsin glacial. The lower fan starts at about 3200 m water depth where the sinuous channel changes into a laterally switching mode with one channel being active at any given time. Drilling showed alternations of channel-fill and overbank deposits. Downfan the channel decreases in size and occasionally bifurcates and the depositional system changes to a sheet sand depositional mode; the youngest fanlobe contains 41% net sand and the underlying one 65% net sand. Sand layers range from about 8 cm to 30 m in thickness. Average accumulation rates are about 6 m/1000 years.

KEYWORDS: Geology.

**69.**
Bouma, A.H., W.R. Bryant, D.K. Davies, and T.T. Tieh. 1968. Study of the continental shelf of the Gulf of Mexico,U.S. Geological Survey. 14-08-0001-10866.

ABSTRACT:None.

KEYWORDS:Geology.

**70.**
Bouma, A.H., R.G. Martin, and W.R. Bryant. 1980. Shallow structure of upper continental slope, central Gulf of Mexico. Proceedings of the 12th Annual Offshore Technology Conference 4(OTC 3913):583-592.

ABSTRACT: The upper continental slope of the central Gulf of Mexico is characterized by a hummocky topography and complicated subbottom structure that are revealed by seismic-reflecton data. Major causes for this bottom and subbottom complexity are salt and shale diapirs, slides and slumps, growth faults, and variations in sediment lithologies. 29 refs.

KEYWORDS: Geology; Geology; Subaqueous; Foundations; Soil Structure Interaction.

**71.**
Bouma, A.H., C.E. Stelting, and J.M. Coleman. 1984. Mississippi Fan; internal structure and depositional processes. Geo-Marine Letters 3(2-4):147-153.

ABSTRACT: The Mississippi Fan is a Quarternary accumulation composed of more than seven elongated fan lobes. Isopach and structure maps show frequent lobe shifting. The Mississippi Canyon, formed by retogressive slumping, connects to the youngest fan lobe. The upper fan-lobe is characterized by a large, incised, partially infilled, leveed channel. The middle fan-lobe is aggradational, convex in cross section, with a channel-levee complex on its apex. The lower fan-lobe contains a recently active small channel and several abandoned ones. Depositional patterns can be explained by several processes: "fluvial," debris flows, and turbidity currents.

KEYWORDS: Geology; Atlantic Ocean; Bottom Features; Cenozoic; Changes of Level; Currents; Deep Sea Drilling Project; Gulf of Mexico; Marine Geology; Mississippi Fan; North Atlantic; Ocean Floors; Oceanography; Quaternary; Submarine Fans; Turbidite; Turbidity Currents.

**72.**
Bourgeois, T.M. 1995. Journal of Petroleum Technology 47(4):312-313.

ABSTRACT: Abstract: Shell Offshore Inc.'s Auger field is in the ultradeep waters in the Gulf of Mexico. This paper is an overview of the surface and subsurface developments to produce the Auger field.

KEYWORDS: Production platforms; Geographical regions; Petroleum; prospecting; Hydrocarbons; Oil fields; Project management; Drilling; equipment; Petroleum pipelines; Marine risers; Identifiers: Auger tension leg platform; Mexico; Ultradeep waters.

**73.**
Brabant, S. 1984. Education in the Coastal Zone Parishes., pp 135-164. In: Gramling RB, S. Brabant, (Editor). The Role of Outer Continental Shelf Oil and Gas Activities in the Growth and Modification of Louisiana's Coastal Zone. U.S. Department of Commerce, National Oceanic and Atmospheric Administration; Louisiana Department of Natural Resources, Lafayette, LA.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Education.

74.
Bradshaw, B.E. and J.S. Watkins. 1995. Cenozoic growth-fault trends as secondary indicators for deep basement structures in the northwestern Gulf of Mexico Basin. American Association of Petroleum Geologists 1995 Annual Convention (Abstracts) 4:12A.

ABSTRACT: The northern Gulf of Mexico is a rifted continental margin in which deep-seated tectonic forces have been essentially absent since Mesozoic times. A massive influx of siliciclastic sediments into the northern Gulf triggered by the late Cretaceous Laramide Orogeny has infilled the rift basin with a maximum thickness of up to 15 km of strata. This enormous thickness of post rift strata in conjunction with extensive salt and overpressured shale masses generally prevents imaging of basement structures on seismic reflection data. Indirect evidence for deep-seated basement structures is possible through a comprehensive analysis of post-rift salt and shale withdrawal structures. Such indirect evidence is applied to the Texas shelf margin in the northwestern Gulf of Mexico. We believe that areas of extensive shale withdrawal indicate relative basement highs in which mid-Jurassic salt was thin or absent. In contrast, areas of extensive salt deformation represent deep salt basins formed over highly attenuated crust. A distinct transition from shale to salt withdrawal structures is evident on the Texas shelf, this transition systematically decreasing in age and occurring further basinwards from the southwestern to northwestern Texas shelf margin. Such observations are consistent with the presence of a series of northwest-southeast trending strike-slip transfer faults that right laterally offset rifted basement. Inferred locations for transfer faults are supported by regional gravity and crustal extension (B value) data, and line up with onshore structural trends such as the San Marcos Arch, Llano Uplift, Marathon Uplift, Rio Grande Embayment and Houston Embayment. Our interpretations are also consistent with previously inferred locations of Permo-Triassic transforms by researchers in the Texas Gulf coast.

KEYWORDS: Geology; tectonics.

75.
Bransetter, S. and J.D. McEachran. 1983. A first record of the bigeye thresher, *Alopias superciliosus* , the blue shark, *Prionace glauca*, and the pelagic stingray, *Dasyatis violacea*, from the Gulf of Mexico. Northeast Gulf Science 6(1):59-61.

ABSTRACT: First records of bigeye thresher, *Alopias superciliosus*, blue shark, *Prionace glauca*, and pelagic stingray, *Dasyatis violacea*, from the Gulf of Mexico were reported. These new records were documented by examining catches from commercial longline vessels working in the Gulf of Mexico.

KEYWORDS: Epipelagic fishes; Gulf of Mexico; elasmobranchs.

**76.**

Bright, T.J. 1968. A survey of the deep sea bottom fishes of the Gulf of Mexico below 350 meters. University of WyomingDeep sea bottom fishes obtained through dredging in the Gulf of Mexico by the Texas A&M research vessel R/V ALAMINOS are reported on. No correlation between species distribution and sediment type, within the soft bottom category, is demonstrated. The number of fishes captured, per 1000 meters of bottom traversed, decreases with increasing depth. Diversity, in terms of number of species, is greatest between 350 and 1,000 meters. Fishes caught above 1000 meters are one and a half to two times larger than fishes caught below that depth. Polychaetes and crustaceans appear to be preferred as food. Three modes of feeding are recognized: (1) predation upon small, truly benthonic organisms, accompanied by ingestion of significant amounts of sediment; (2) predation upon small bentho-pelagic or planktonic, organisms; (3) active predation upon large macro-benthonic, planktonic, or nektonic animals. Lack of selectivity in feeding, within the first group at least, may account for the poor correlation between sediment type and distribution of fish species. A check list, including distributional and ecological data, of the bottom fishes of the Gulf below 350 meters is presented. Two basic elements of the ichthyofauna are recognized: (1) those species having affinities with the continental shelf fauna, and (2) those representative of the truly deep sea fauna. The first group is largely restricted to the lower continental shelf and upper continental slope, above 1000 meters. The average bathymetric range of fishes occurring below 1000 meters is about three times that of species occurring between 350 and 1000 meters. The deep sea bottom ichthyofauna of the Gulf is primarily an extension of that of the Caribbean. Sills at the entrance and exit of the Gulf are not significant barriers to dispersal of these fishes. Direction of dispersal is apparently governed by the direction of the prevailing currents.

KEYWORDS: Biology; Demersal Fishes; Benthos.

**77.**

Bright, T.J. 1970. Food of deep-sea bottom fishes, pp 245-252. In: W.E. Pequegnat. Contributions on the Biology of the Gulf of Mexico. 1. Texas A&M University Oceanographic Studies,

ABSTRACT: Examination of the gut contents of 81 small deep-sea bottom fishes from the Gulf of Mexico indicates that their primary source of nutriment is small benthonic and epibenthonic crustaceans and polychaetes. Detritus, although indirectly essential to their survival, is not an important immediate source of food for these fishes except in the case of occasional opportunistic scavenging of large dead organisms falling from above. On the basis of their occurrence in the fish guts, it is speculated that gammarid amphipods are the predominant small macrobenthonic crustaceans in the Gulf, followed by Cumacea, Tanaidacea, Ostracoda, and Harpacticoida in descending order of abundance. Calanoid copepods must be quite abundant just above the bottom in the deep waters of the Gulf.

KEYWORDS: Biology; Demersal fishes; Benthos.

**78.**

Bright, T.J., P.A. LaRock, R.D. Lauer, and J.M. Brooks. 1980. A brine seep at the East Flower Garden Bank, Northwestern Gulf of Mexico. Int. Rev. Gesamt. Hydrobiol 65(4):535-549.

ABSTRACT: Dissolution of Triassic-Jurassic, intrusive salt deposits within 150 m of the sea floor produces a hypersaline brine seep (approx 200 o/oo) at 71 m water depth on the East Flower Garden Bank. The anoxic, sulfide-rich brine supports large populations of sulfur oxidizing bacteria. Toxic effects of the brine on surrounding epifauna, infauna and fishes are limited to the brine and a very narrow surrounding zone. Leafy algae, coralline algae, foraminifers, sponges, bryozoans, anemones, polychaetes, sipunculids, amphipods and pelecypods live on the hard substratum within 2 cm of the brine-seawater interface. Sixty meters from the brine outflow, at dilutions of 50 to 1, the carbonate sand harbors polycheates, ostracods, nematodes, amphipods, tanaidaceans, isopods, copepods, pelecypods and gastropods. Certain species of fish momentarily enter the brine and brine-seawater mixtures.

KEYWORDS: Salinity tolerance; toxicity; East Flower Garden Bank; Ecological Distribution; Community Composition; Anoxic Conditions; Anaerobic Bacteria; Check Lists.

**79.**

Bright, T.J. and W.E. Pequegnat. 1969. Deep sea hatchet fishes of the Gulf of Mexico. Quarterly Journal of the Florida Academy of Sciences 32(1):26-36.

ABSTRACT: Four cruises of the R/V ALAMINOS made during 1965 to 1966 employed Issacs-Kidd midwater trawl to collect mesopelagic fishes. Ten species of marine hatchetfish (Sternoptychidae) were collected: *Argyropelecus affinis*, *A. gigas*, *A. hemigymnus*, *A.amabilis*, *A. aculeatus*, *A. olfersi*, *A. lynchus*, *Sternoptyx diaphana*, *Polypinus asteroides*, and *P. laternatus*. These species were divided into two groups. The first group consisted of eight species distributed gulfwide; the second group included two species, *A. amabilis* and *P. laternatus,* considered transients that entered and exited the eastern gulf via the Loop current. Hatchetfishes appeared not to be associated with the sound scattering layers above 200m in the Gulf of Mexico. The data suggested that *A. aculeatus* and most other members of the family ascended in the water column at night and descended during the day. The reverse was the case for *A. hemigymnus.* The major depth distribution for the family in the Gulf of Mexico lies between 250 and 1500 m water depths.

KEYWORDS: Water column biology; *Argyropelecus hemigymnus*; *Sternoptyx diaphana*; behavior; New records; mesopelagic fishes.

**80.**

Bringedal, B., T. Ingebretsen, and K. Haugen. 1999. Subsea Separation and Reinjection of Produced Water. Proceedings of the 31th Annual Offshore Technology Conference (OTC paper 10967).

ABSTRACT: Some of the most significant recent development in subsea design has been within subsea processing, in particular the removal of produced water from the oil closer to the reservoir and subsequent reinjection of this water. Significant effort is being put into both downhole and seabed based separation and re-injection systems for produced water. This paper addresses seabed based solutions. Although subsea processing has been about for at least the last decade, it is first now (with Troll Pilot) oil companies are gaining enough confidence in the technology to actually consider it a viable development option. A big question mark is still set on the long-term operational experience. Will the system give satisfactory availability without frequent costly interventions? Major challenges are related to process/flow assurance and other operability issues. This paper starts with a brief discussion of these challenges in general and concludes with a typical case (Troll Pilot) where this is discussed in more details. The Troll Pilot case shows how significant effort went into process design of the system in order to minimize the uncertainties and risks associated with this novel subsea processing system.

KEYWORDS: Technology.

**81.**

Brooks, D.A. 1983. The wake of Hurricane Allen in the western Gulf of Mexico. Journal of Physical Oceanography 13(1):117-129.

ABSTRACT: In August 1980, Hurricane Allen pased over a moored array of instruments recording current, temperature and conductivity in the western Gulf of Mexico. An alongshore surge occurred during the storm passage, with the horizontal current speed reaching 91 cm $s^{-1}$in the thermocline (200 m) and diminishing to 15 cm $s^{-1}$ 32 m above the bottom (732 m). A wake of near-inertial frequency internal waves commenced after the storm passed the array. The alongshore current oscillations were clockwise polarized and slightly elliptical, with a period of 22-23 h or about 85% of the local inertial period. Near uniform upwelling of plus or minus 20 m occurred in the thermocline region (200-300 m) during the most intense part of the wake. Depth-leading phases of the horizontal current and temperature oscillations indicated downward radiation of wake energy. (100 km) scales of the array.

KEYWORDS: Physical Oceanography; storm surges; hurricanes; current measurement; upwelling; Hurricane Allen; Gulf of Mexico.

**82.**

Brooks, D.A. 1984. Current and hydrographic variability in the northwestern Gulf of Mexico. Journal of Geophysical Research 89(C5):8022-8032.

ABSTRACT: From July 1980 to February 1981, ten current meters on three moorings were deployed in the 200- to 700-m-depth range over the continental slope in the northwestern Gulf of Mexico. The currents were characterized by energetic fluctuations with time scales of a week to several months. Westward drifting Loop Current anticyclones provided the principal driving mechanism for the fluctuations. Longshore current speeds at the 200-m depth occasionally exceeded 70 cm/s and were persistently >50 cm/s during a 2-month period in the fall. The currents were only marginally coupled with the wind.

KEYWORDS: Physical Oceanography; Oceanography; Ocean Current; Dynamics; Ad 1980; Ad 1981; Westward Drifting; Longshore Current; Hydrographic Variability; Energetic Fluctuations; Loop Current Anticyclones; Mechanism; Gulf of Mexico.

**83.**

Brooks, D.A. and R.V. Legeckis. 1982. A ship and satellite view of hydrographic features in the western Gulf of Mexico. Journal of Geophysical Research 87(C6):4195-4206.

ABSTRACT: In April 1980, nearly synoptic hydrographic observations were obtained in the western Gulf of Mexico by satellite and ship. A meandering surface thermal front which turned northeastward from the Mexican coast near 23 degree N was prominent in the satellite infrared observations. The front separated a southern anticyclone and a northern cyclone, both of which had horizontal scales of several 100 km and were prominent in the subsurface hydrographic observations. The eastward geostrophic volume transport in the confluent leg of the two features was roughly equal to that of the Florida Current. A shallow layer of fresh, cool water from the Texas shelf region extended similar to 300 km seaward into the cyclone along the northern side of the front. Remnant Subtropical Underwater in the core of the April anticyclone indicates its origin in the eastern Gulf Loop Current.

KEYWORDS: Physical Oceanography; hydrographic data; mesoscale features; satellite sensing; Gulf of Mexico.

**84.**

Brooks G.R., Doyle L.J., and McNeillie J.I. 1986. Initial reports DSDP, Leg 96, Ft. Lauderdale to Galveston, Texas, 1983 1986,A massive carbonate gravity-flow deposit intercalated in the lower Mississippi Fan.

ABSTRACT:Deposition in the deep Gulf is dominated by the construction of the Mississippi Fan. However, this marine terrigenous depocenter is located between two large carbonate depocenters, the West Florida continental margin on the east and the Yucatan peninsula on the southwest. Periodically, the carbonate slope in these two regions fails, injecting carbonate gravity flows into the accreting terrigenous deep-sea fan.

KEYWORDS:Geology; Geology; Sedimentology.

**85.**

Brooks, I.H. 1979. Fluctuations in the transport of the Florida Current at periods between tidal and two weeks. Journal of Physical Oceanography 9(5):1048-1053.

ABSTRACT: During an 83-day period in the spring and summer of 1974, 41 complete dropsonde transects were made across the Florida Current at a section just north of Bimini. The total transport through the section had a mean value of 33.3 x $10^{-6}$ m SUP-3 $s^{-1}$, standard deviation of 2.6 x $10^{-6}$ $m^{-3}$ $s^{-1}$, and minimum and maximum values at 27.6 and 38.2 x $10^{-6}$ $m^{-3}$ $s^{-1}$, respectively. Fluctuations were observed with periods of from several days to two weeks. Three mechanisms are discussed to explain these fluctuations and their cross-stream structure: mass flow variations confined to the anticyclonic side of the straits, cross-stream meanders of the axis of the current and tidal responses.

KEYWORDS: Physical Oceanography; mass transport; variations; water currents; Florida Current; Gulf of Mexico; Meanders (Oceanic); Tidal Effects; Gulf of Mexico.

**86.**
Brooks, I.H. and P.P. Niiler. 1977. Energetics of the Florida Current. Journal of Marine Research 35(1):163-191.

ABSTRACT: During the summer of 1974, fifty free-drop transport profiles and STD/XBT profiles were carried out in the Florida Current at 14 stations along the 2551.00' N latitude. From these data and from the historical free-drop data 12 km to the south, a computation is made of the energy flow from the mean current to the fluctuations over the entire cross-section of the Florida Straits. Statistically significant areas of both potential and kinetic energy conversion are computed. In the absence of the influence of pressure gradients on the energy flux, a local transfer can occur both to and from the fluctuations. The net flux over the cross-sectional area is not significant; it would lead to a decay time of total perturbation energy in 50 days which is far in excess of the time required for the water mass of the Florida Current to travel through the Straits of Florida. The authors conclude that pressure forces must locally balance the energy flow so that an equilibrium exists between the fluctuations and the mean Florida Current.

KEYWORDS: Physical Oceanography; water currents; energy transfer; oceanographic data; Florida Current; Bathythermographic Data; Gulf of Mexico.

**87.**
Brooks, J.M. 1990. Seep community found in deep gulf. Gulf Coast Oil World 8(4):28-29.

ABSTRACT: None.

KEYWORDS: Biology; Chemistry; seeps; benthos.

**88.**
Brooks, J.M., B.B. Bernard, W.M. Sackett, and J.R. Schwarz. 1979. Natural gas seepage on the south Texas shelf. Proceedings of the 11th Annual Offshore Technol Conference 1:471-478 .

ABSTRACT: An area of extensive gas seepage has been found on the South Texas shelf. The seep area extends for a distance of approximately 25 miles. Water depths range between 65 and 130 meters. During nine samplings over a three year period, elevated near-bottom concentrations of methane, ethane, and propane compared to nearby surface and other near-bottom waters were observed. Anomalous gaseous hydrocarbon levels were also observed in the interstitial waters at three stations sampled in the region. Ethane and propane concentrations were typically one order of magnitude higher in these sediments compared to typical South Texas shelf sediments. Significantly higher percentages of hydrocarbonoclastic bacteria were observed in the seep area. These may be a direct result of hydrocarbon seepage. 20 refs.

KEYWORDS: Geology; Petroleum Prospecting; Natural Gas Wells; Offshore; Natural Gas Seepage.

**89.**
Brooks, J.M., T.J. Bright, B.B. Bernard, and C.R. Schwab. 1979. Chemical aspects of a brine pool at the East Flower Garden bank, northwestern Gulf of Mexico. Limnology and Oceanography 24(4):735-745.

ABSTRACT: A small pool on the flank of the East Flower Garden bank at a depth of 72 m in the Gulf of Mexico contains anoxic, hypersaline (approx 200 g/kg) water. The flux of brine into and out of the pool contributes to erosional processes on the bank. The bulk ionic composition of the brine is similar to that of the Orca Basin brine, but differences between the 2 in gaseous hydrocarbon and carbon isotope content indicate different modes of origin. High levels of bacterial activity in the brine are indicated by ATP (>80 ng/l), hydrogen sulfide (>2,000 mol/l), isotopically light |CO SUB-2 ( SUP-13 C = -23 o/oo), and the apparent generation of elemental sulfur.

KEYWORDS: brines; chemical composition; Gulf of Mexico,; East Flower Garden Bank; bacteria; Erosion; Anoxic Conditions; Atp; Hydrogen Sulphide; Carbon Dioxide; Sulphur; Salinity; Anaerobic Environments; Saline Environments; Pools; Brine; Anaerobic Bacteria; Atlantic Ocean; Marine Environments.

**90.**

Brooks, J.M. and W.R. Bryant. 1985. Geological and Geochemical Implications of Gas Hydrates in the Gulf of Mexico. Final Report,Department of Energy. United StatesDOE/MC/21088-1964.

ABSTRACT:This document presents the results of a study of the geological and geochemical implications of gas hydrates in the Gulf of Mexico. The report is based primarily on data obtained from available seismic surveys of the Green Canyon, Garden Banks, Mississippi Canyon, and Orca Basins areas of the northern continental margin of the Gulf of Mexico. The study also includes the data and analysis obtained from several gas hydrate cores recovered in these areas. The report provides new data relevant to gas hydrate research for more in-depth research of the Gulf of Mexico gas hydrates and provides significant information which advances the knowledge and understanding of gas hydrate formations in the natural environment. The report contains several high resolution seismic surveys. In the four hydrate sites studied in detail, the seismic "wipeout" zones were all associated with collapsed structures, fault scarps, and/or salt piercement structures. These features provide conduits for the upward migration of either biogenic or thermogenic gas from depth. 35 refs., 47 figs., 9 tabs. (ERA citation 11:010958).

KEYWORDS:Geology; Carbon; Gas Hydrates; Gulf of Mexico; Natural Gas Hydrate Deposits; Seismic Surveys; 2-Methylpropane; Alkanes; Bioconversion; Biodegradation; Carbon Dioxide; Continental Shelf; Data Analysis; Drill Cores; Ethane; Experimental Data; Exploration; Gas Chromatography; Geochemical Surveys; Geologic Faults; Geologic Traps; Isotope Ratio; Methane; Natural Gas; Organic Matter; Petroleum; Propane; Prospecting; Pyrolysis; Sampling; Sediments; Seeps ; Stability; Erda; 030200; Ntisde.

**91.**

Brooks, J.M., H.B. Cox, W.R. Bryant, M.C. Kennicutt, R.G. Mann, and T.J. McDonald. 1986. Association of gas hydrates and oil seepage in the Gulf of Mexico. Organic Geochemistry 10(1-3):221-234.

ABSTRACT: None.

KEYWORDS: Florida; Warm Mineral Springs; geochemistry; gas hydrates; oil seepages; Gulf of Mexico.

**92.**

Brooks, J.M., Kennicut M. C.=II, I.R. MacDonald, D.L. Wilkinson, Guinasso N. L.=Jr., and R.R. Bidigare. 1989. Gulf of Mexico Hydrocarbon Seep Communities: Part IV Descriptions of Known Chemosynthetic Communities. 21st Annual Offshore Technology Conference AstrodomainHouston, Texas.

ABSTRACT: The Geochemical and Environmental Research Group (GERG) at Texas A&M University has discovered vent-type, chemosynthetic communities associated with our recent findings of widespread hydrocarbon seepage, gas hydrates, and authigenic carbonate on the Texas/Louisiana continental slope. These vent-type taxa (clams, mussels and tubeworms) are unique in that they are associated with active gas and oil seepage and harbor endosymbiotic, chemoautotrophic bacteria, including a proven methanotroph.

KEYWORDS: Geology.

**93.**

Brooks, J.M., M.C.I. Kennicutt, R.R. Bidigare, B.C. Klein-Helmuth, and D. Savold. 1987. Oil seep related chemosynthetic ecosystems on the Gulf of Mexico continental slope. AAAS Annual Meeting: 153rd National Meeting-Abstracts.Chicago. p 23.

ABSTRACT: Chemosynthetic organisms (tube worms, mussels and/or clams) have been identified at 17 sites on the Gulf of Mexico continental slope. All of these sites co-occur with seismic "wipe-out" zones which are associated with gas, oil and/or gas hydrates in the sediments. These discoveries significantly expand previous findings that these organisms are present at two sites on the continental slope offshore of Louisiana (600-800 m). Of 39 trawls in "wipe-out" zones, chemosythetic-based tube worms, clams and mussels, or their remains, were recovered in 21, 10 and 4 trawls, respectively. Carbon isotopic analysis of more than 200 organisms confirmed the presence of chemosynthesis. All of the tube worms and mussels were carbon isotopically light, as compared to background fauna.

KEYWORDS: Chemistry/ continental slope/ benthos/ chemosynthesis/ hydrocarbons/ seepages/ ecosystems/ Gulf of Mexico.

**94.**

Brooks, J.M., M.C.I. Kennicutt, and B.D.J. Carey. 1986. Offshore surface geochemical exploration. Oil and Gas Journal 84(42):66 .

ABSTRACT: The migration of fluids, both brines and hydrocarbons, in the subsurface is a well established geologic phenomenon. Surface geochemical exploration is based on the premise that the detection of upward migrated hydrocarbons in near-surface sediments from deep sourced rocks, natural gas, or crude oil accumulations is useful information for the petroleum explorationist. Surface geochemical data historically have been used both to map fields and as regional indicators of whether an area is oil or gas prone. The Geochemical & Environmental Research Group (GERG) at Texas A&M University has been developing surface geochemical exploration methodologies through cooperative programs with the oil industry for the last 5 years. GERG has analyzed more than 35,000 samples from the Gulf of Mexico, California, Alaska, North Sea, West Africa, eastern South America and the Caribbean Islands during this period.

KEYWORDS: Chemistry; geochemical surveys; methodology; oil and gas exploration; sediment.

**95.**

Brooks, J.M., M.C.I. Kennicutt, R.R. Fay, T.J. McDonald, and R. Sassen. 1984. Thermogenic gas hydrates in the Gulf of Mexico. Science 225(4660):409-411.

ABSTRACT: Thermogenic gas hydrates were recovered from the upper few meters of bottom sediments in the northwestern Gulf of Mexico. The hydrates were associated with oil-stained cores at a water depth of 530 meters. The hydrates apparently occur sporadically in seismic "wipeout" zones of sediments in a region of the Gulf continental slope at least several hundred square kilometers in area.

KEYWORDS: Animal ecology; Gulf of Mexico; gas hydrates; sediment composition; Green Canyon; Thermogenic.

**96.**

Brooks, J.M., M.C.I. Kennicutt, C.R. Fisher, S.A. Macko, K. Cole, J.J. Childress, R.R. Bidigare, and R.D. Vetter. 1987. Deep-sea hydrocarbon seep communities: Evidence for energy and nutritional carbon sources. Science 238(4830):p. 1138-1142.

ABSTRACT: Mussels, clams, and tube worms collected in the vicinity of hydrocarbon seeps on the Louisiana slope contain mostly "dead" carbon, indicating that dietary carbon is largely derived from seeping oil and gas. Vestimentiferan tube worms and three clam species contain intracellular, autotrophic sulfur bacterial symbionts. Mussels with symbiotic methanotrophic bacteria reflect the carbon isotopic composition of the methane source. Isotopically light nitrogen and sulfur confirm the chemoautotrophic nature of the seep animals. Sulfur-based chemosynthetic animals contain isotopically light sulfur, whereas methane-based symbiotic mussels more closely reflect the heavier oceanic sulfate pool. The nitrogen requirement of some seep animals may be supported by nitrogen-fixing bacteria.

KEYWORDS: Gulf of Mexico; deep sea; energy resources; nutrient sources; hydrocarbons; trophic status; carbon; seepages; trophic relationships; food webs; symbionts; symbiosis; nutrients (mineral); zoobenthos; bioenergetics; Louisiana; chemosynthesis; Invertebrata; bacteria.

**97.**

Brooks, J.M., D.F. Reid, and B.B. Bernard. 1981. Methane in the Upper Water Column of the Northwestern Gulf of Mexico. Journal of Geophysical Research 86(C11):11029-11040.

ABSTRACT: Shallow subsurface dissolved methane maxima were commonly observed in the northwestern Gulf of Mexico during a series of cruises between 1975 and 1977. Although there were often several methane maxima at various depths at any one particular station, the most prevalent and widespread occurred over a narrow band of sigma sub(t) in a range from 24 to 26 and could be traced as layers extending along and outward from the continental shelf. These layers generally followed the local stratification and were associated with the upper part of the pycnocline. Advection was undoubtedly of importance in determining the extent and distribution of these methane maxima layers, but in situ production appears to have supported them. Some vertical profiles revealed associations between methane, ATP, and suspended matter maxima. It is postulated that methane forms in situ in reducing microenvironments associated with suspended particulates, which are advected from the shelf of which have accumulated in the upper pycnocline due to increase in buoyancy forces.

KEYWORDS: Chemistry; vertical profiles; methane; dissolved gases; water column; , Gulf of Mexico.

**98.**

Brooks, J.M., D.A. Wiesenburg, R.A.J. Burke, and M.C. Kennicutt. 1981. Gaseous and Volatile Hydrocarbon Inputs From a Subsurface Oil Spill in the Gulf of Mexico. Environmental Science and Technology 15(8):p. 951-959.

ABSTRACT: Low-molecular-weight (C sub(1)-C sub(4)) and volatile liquid hydrocarbons (C sub(5)-C sub(14)) were determined in water and oil samples around the IXTOC-I well blowout on the Campeche Shelf. Volatile liquid hydrocarbon (VLH) concentrations as high as 400 mu g/L were measured in the surface seawater near the wellhead. However, rapid dilution down plume reduced VLH levels to 63 and 4 mu g/L at 6 and 12 mi, respectively, from the wellhead. VLHs away from the immediate vicinity of the blowout were dominated by light aromatic compounds (benzene arrow right o-xylene). VLHs and low-molecular-weight hydrocarbons (LMWHs) showed similar concentration patterns. Concentrations of both VLHs and LMWHs in the water decreased by 1, 1.5, 2, and 3 orders of magnitude at stations 6, 12, 18, and 24 mi, respectively, downstream from the blowout site. The decrease was due to both dilution and hydrocarbon venting to the atmosphere. VLHs were also rapidly lost from the oil/mousse floating on the sea surface. This loss was principally a result of evaporation and occurred within a few miles downstream of the blowout.

KEYWORDS: Gulf of Mexico; oil pollution; oil spills; hydrocarbons; fate; dispersal; volatile hydrocarbons; dispersion; Gulf of Mexico.

**99.**

Brooks, J. M., D. A. Wiesenburg, H. Roberts, R. S. Carney, I. R. MacDonald, C. R. Fisher, N. L. GuinassoJr., W. W. Sager, S. J. McDonald, R. A. BurkeJr. and others. 1990. Salt, seep, and symbiosis in the Gulf of Mexico, A preliminary report of deepwater discoveries using DSV Alvin. The Oceanography Report, Eos 71(45):1772-33.

ABSTRACT: The cruise produced a number of firsts, including first direct observation of an exposed salt dome on the deep Gulf of Mexico seafloor, first observations and samplings of brine seeps derived from salt dissolution on the lower slope (Sigsbee Escarpment and Green Knoll), first direct observations of hydrocarbon seeps and the "growing rocks" and associated chemosynthetic communities from the basin floor (best collection of deep rocks from the Gulf of Mexico), first direct observation of the Sigsbee Escarpment, and first dives into the Orca Basin. The cruise results support our understanding of the relationship between hydrocarbon seepage, carbonate rock production and chemosynthetic communities. Observations also confirmed that seafloor cementation by seep-associated carbonates is taking place from the edge of the continental shelf to the basin floor. The occurrence of carbonate buildups, or "false-reefs" as they appear on high-resolution seismic records is directly related to hydrocarbon seepage, which in turn can be associated with faulting of the seafloor and he sedimentary units beneath it. Salinity gradients associated with deep brine pools produce unique faunal zonation that might be studied as "natural exclusion and enrichment experiments." Major findings of the cruise are outlined below.

KEYWORDS: Physical Oceanography.

**100.**

Browder, J., B. Brown, W. Nelson, and A. Bane. 1991. Multispecies fisheries in the Gulf of Mexico. ICES Marine Science Symposium :194-197.

ABSTRACT: This paper reviews the recent rapid evolution of fisheries of the Gulf of Mexico. It emphasizes mechanisms that are likely to make biological and technological species interactions important. An integrated approach of simple models, experimental management, and follow-up monitoring of indicators is proposed.

KEYWORDS: commercial species; Fisheries; fishery economics; Gulf of Mexico; management.

**101.**

Brown, C. and G. Scott. 1996. Catch estimates of yellowfin tuna, Thunnus albacares, in the 1987-1994 U.S. Atlantic and Gulf of Mexico rod and reel fisheries. Collective Volume of Scientific Papers. International Commission for the Conservation of Atlantic Tunas 45(3):202-207.

ABSTRACT: Rod and reel catch estimates for yellowfin tuna (Thunnus albacares) off the southern and eastern coasts of the US were developed using data obtained from 2 separate surveys of anglers. The Large Pelagic Survey, conducted annually from North Carolina through Maine during June-October, specifically targets fishing effort directed at large pelagic fish such as tunas. Data concerning fishing activity outside of the time-area coverage of the Large Pelagic Survey were collected through the Marine Recreational Fishery Statistics Survey, which targets all marine recreational fishing effort.

KEYWORDS: Fisheries; tunas; Gulf of Mexico; Recreational Fisheries; pelagic fishes.

**102.**

Brown, D. 1998. Follow the tube worm trails, "critters" tip off deep gulf seeps. American Association of Petroleum Geologists, Explorer (October):18-19, 37.

ABSTRACT: None.

KEYWORDS: Biology; seeps; Benthos.

**103.**

Brown, L.R., M. Light, and C.D. Minchew. 1980. Geographic distribution of petroleum hydrocarbons in surficial bottom sediments of the Gulf of Mexico, pp 181-205. In: Geyer RA. Marine Environmental Pollution, 1 Hydrocarbons. 27A. Elsevier Scientific Publishing Company, New York.

ABSTRACT: It is necessary to obtain a multiplicity of samples from each area over a period of years to obtain a reasonable assessment of the hydrocarbon distribution in the sediments in a given area. A minimum of five samples were collected at each station during this investigation, to help to increase the validity of the statistical analyses. Furthermore, many of the stations were sampled at six separate times over a 31-month period yielding a total of 1380 sediment samples which were analyzed. Attempts were made to develop a method to graphically display the data, thus affording an opportunity to make a rapid visual assessment of the relative hydrocarbon concentrations in the sediments. Of the three methods tested, the most satisfactory results were obtained by plotting the average of the logarithms of the hydrocarbon concentrations. The statistical evaluation of the data revealed two key points: (1) It was readily apparent that the sediments varied not only in total hydrocarbon content but also in petrogenic hydrocarbon content. Differentiation of petrogenic hydrocarbons from total hydrocarbons is considered vital to developing a satisfactory monitoring program at the DWP sites, since the input from the DWP operation would be petrogenic in nature. (2) It was found that the consolidation of the sediments had a considerable influence on the interpretation of the results. Therefore, it was concluded that both the petrogenic and total hydrocarbon content of the sediments should be determined and that they should be reported on a dry and wet weight basis. In this way the influence of hydrocarbons from sources other than those originating at the DWP site, and the effect of natural phenomena, e.g., storms, river input, etc., may be taken into account. On the basis of the data obtained, it appears likely that one or more areas in the vicinity of a DWP site can be identified with further investigations to serve as a control site for a DWP monitoring program, even though the control site may not be identical in every respect.

KEYWORDS: Biology.

**104.**

Bryant, W.R., J.R. Bryant, M.H. Feeley, and G.R. Simmons. 1990. Physiographic and bathymetric characteristics of the continental slope, northwest Gulf of Mexico. Geo-Marine Letters 10:182-199.

ABSTRACT: Bathymetric charts of the continental slope of the northwestern Gulf of Mexico reveal the presence of over 90 intraslope basins with relief in excess of 150 m. The evolution and the general configuration of the basins are a function of halokinesis of allochthonous salt. Intraslope-interlobal and intraslope-superlobal basins occupy the upper and lower continental slope, respectively. Other structures on the slope associated with salt tectonics are The Sigsbee Escarpment, the seaward edge of the Sigsbee salt nappe, and the Alaminos and Keathley canyons. Major erosional features are the Mississippi Canyon and portions of the submarine canyon on the southern extreme of the Sigsbee Escarpment.

KEYWORDS: Geology.

**105.**

Bryant, W.R., J. Lugo, C. Cordova, and A. Salvador. 1991. Physiography and bathymetry, pp 13-30. In: Salvador A, (Editor). The geology of North America The Gulf of Mexico Basin. J. Geological Society of America, Boulder, CO.

ABSTRACT: None.

KEYWORDS: Geology.

**106.**

Bryant, W.R., J.Y. Liu, and J. Ponthier. 1995. The engineering and geological constraints of intraslope basins and submarine canyons of the northwestern Gulf of Mexico. Transactions Gulf Coast Association of Geological Societies 45:95-101.

ABSTRACT: Future hydrocarbon finds on the upper and lower continental slope and rise of Texas and Louisiana well necessitate innovative methods for the construction of platforms and pipelines in a very difficult engineering and complex geological environment. There are 105 intraslope basins and eight submarine canyons on the continental slope of the northwestern Gulf of Mexico, all of which may be prime targets for hydrocarbon production. Examinations of the physiographic, geophysical, and geotechnical characteristics of the intraslope basins of Pigmy and Vaca basins and the Alaminos submarine canyon are used as examples to typify the various engineering and geological constraints that are most likely to be encountered on the continental slope and rise and along the Sigsbee Escarpment in the northwestern Gulf of Mexico. High-resolution bathymetry identifies such constraints as high angle intraslope basin walls; walls that exceed 40 degrees are common. Sediment slumps and other instabilities, such as long-term sediment creep and other affects of halokinesis and contemporaneous faulting, are evaluated from high-resolution geophysics. The small canyons and large gullies that dissect the perimeter of Alaminos Canyon, which may be the results of both recent and old turbidity and currents and debris flows, are structures that require engineering consideration in the implacement of seafloor structures in, near or down-slope of these features.

KEYWORDS: Geology.

**107.**

Bryant, W.R., G.R. Simmons, and P. Grim. 1992. The morphology and evolution of basins on the continental slope northwest Gulf of Mexico. Transactions Gulf Coast Association of Geological Societies 41:73-82.

ABSTRACT: Newly constructed bathymetric maps (TAMU) and recent multibeam swath mapping surveys by NOAA of the continental slope of the northwestern Gulf of Mexico reveal the presence of over 90 intraslope basins with relief in excess of 150 meters. Bathymetry in conjunction with multichannel seismic data is extremely valuable for studying the halokinetic style of the slope. The evolution and the general configuration of the basins on the continental slope off Texas and Louisiana are a function of halokinesis of allocthonous salt. Intraslope-interlobal and intraslope-supralobal basins occupy the upper and lower continental slope respectively. The intraslope-interlobal basins of the upper continental slope are commonly elongate in shape with a north to south and northwest to southeast orientation. These basins are located in areas where salt is more deeply rooted than in the lower slope. The intraslope-supralobal basins of the lower slope have a more circular geometry and are located in the Sigsbee Salt Nappe complex, the Sigsbee Escarpment being the southern boundary of the nappe.

KEYWORDS: Geology.

**108.**

Bryant, W.R., J. Antoine, M. Ewing, and B. Jones. 1968. Structure of Mexican continental shelf and slope, Gulf of Mexico. American Association of Petroleum Geologists Bulletin 52(7):1204-1228.

ABSTRACT: Structurally the Mexican shelf and slope are composed of a series of anticlines that start from the continental rise and continue under the continental shelf. The general trend of these features is in the direction of the shelf break. The structural features observed on theeastern Mexican shelf and slope are postulated to have originated by the possible mechanism of (1) compressional folding, resulting from gravity sliding along a decollement surface or other tectonic stresses; or (2) vertical movement of shale or salt masses related to static loading.

KEYWORDS: Geology; Anticlinal; Anticlines; Atlantic Ocean; Continental Margin; Folds; Gulf of Mexico; Mexican Continental Margin; Mexico; North Atlantic; Structural Geology; Structure.

**109.**

Buffler, R.T. 1983. Structure and stratigraphy of the Sigsbee salt dome area, deep south-central Gulf of Mexico. The American Association of Petroleum Geologists, Studies in Geology 15(2):2-56.

ABSTRACT: None.

KEYWORDS: Geology; maps.

**110.**

Buffler, R.T., F.J. Shaub, R. Huerta, A.B.K. Ibrahim, and J.S. Watkins. 1981. A model for the early evolution of the Gulf of Mexico basin. Oceanologica Acta 4 (suppl.C3):129-36.

ABSTRACT: Interpretation of new seismic reflection and refraction data along with all previous data allow the authors to suggest a model or scenario for the early geologic evolution of the Gulf of Mexico basin. The model suggests that new ocean crust formed in the Gulf at the same time (Triassic-Jurassic) and by the same mechanisms involved in the evolution of the early North Atlantic margin as North American separated from Africa-South America. Major features include: (1) the seismic character and symmetrical distribution of inferred oceanic vs. transitional crust; (2) the distribution of salt on either side of oceanic crust; and (3) the inferred subsidence history of the basin. The early geologic evolution of the basin is divided into two main periods; a rift phase and a drift and subsidence phase. Each phase is discussed in detail.

KEYWORDS: Geology; Geology; Oceanic Crust; Tectonics; Plate Tectonics; Geology; Oceanic Crust; Structure; Model; Evolution; Gulf of Mexico Basin.

## 111.

Buffler, R.T., J.S. Watkins, F.J. Shaub, and J.L. Worzel. 1980. Structure and early geologic history of the deep central Gulf of Mexico basin, pp 3-16. In: Philger RH, (Editor). The origin of the Gulf of Mexico and the early opening of the central North Atlantic Ocean: Proceedings of a symposium. Louisiana State University, Baton Rouge, LA.

ABSTRACT: Multifold seismic reflection data (27,000 km) and OBS refraction data collected recently by the University of Texas Marine Science Institute in the deep Gulf of Mexico provide the basis for a preliminary interpretation of the early (pre-middle Cretaceous) geologic history of the basin. The following observations can be made regarding the structure and stratigraphy of the deep central Gulf: 1) a thinned and rifted "transitional" crust (6-20 km thick) underlies the southern part of the deep central Gulf and extends up to 100 km seaward of the Bay of Campeche Escarpment; 2) the upper part of this transitional crust in places contains rift basins; 3) a major unconformity (strong, smooth reflector) truncates this transitional crust; 4) an oceanic crustal layer (5-6 km thick) underlies the rest of the central Gulf. The top of this layer corresponds to a strong irregular reflector seen on the seismic reflection data; 5) an outer basement high occurs along the boundary between oceanic crust and transitional crust; 6) a thick salt section overlies the transitional crust. It is bounded on the north and west by the outer basement high and pinches out depositionally to the south along the base of the Campeche Escarpment against the major unconformity (3 above). Salt appears to be absent or possibly very thin in the areas of oceanic crust; 7) there was an early period of deformation of salt and sedimentary rocks probably due to gravity flowage of the salt associated with the early rapid subsidence of the basin; 8) a younger undeformed sedimentary sequence onlaps the oceanic crust, the outer basement high and the deformed salt and sedimentary rocks. The upper part of this sequence probably represents the deep-water equivalent of the Lower Cretaceous carbonate banks that rimmed the early Gulf basin; 9) these older sedimentary sequences are truncated by a major regional unconformity that is tentatively correlated with a major middle Cretaceous (Cenomanian 97 my) unconformity and drop in sea level. The symmetrical distribution of transitional crust and thick salt on either side of oceanic crust as well as other data suggest that the Gulf basin evolved somewhat along the same lines as the North Atlantic, both as to timing and as to structure and stratigraphy. A model for the early evolution of the Gulf is proposed based on our interpretations and consists of four main phases as follows: a) a long period (Triassic-Early Jurassic) of regional uplift, doming, rifting, erosion and filling of rift basins with continental sediment and volcanics (Rift Phase). Formation of thinned continental crust or transitional crust ; b) formation of a medial uplift due to mantle upwelling (Late Rift Phase). Initial subsidence, incursion of seawater and deposition of the thick shallow-water evaporites in basins on either side of medial uplift (Middle Jurassic); c) a period of seafloor spreading in Late Jurassic-Early Cretaceous and formation of oceanic crust (Drift Phase). Rapid subsidence of the basin due to cooling of the crust. Deposition of deep-water sediments in the central Gulf and shallow-water sediments on adjacent margins overlying the salt. Early deformation due to gravity flowage of salt basinward; and d) abortion of seafloor spreading due to major plate reorganization about 130 my ago. Continued subsidence of the basin through Lower Cretaceous as crust continues to cool (Subsidence Phase). Deposition of deep-water sediments across the deep basin and buildup of carbonate banks on the margins controlled by a structural hinge zone. Formation of a major middle Cretaceous (97 my) unconformity due to a combination of a continued subsidence and a major drop in sea level.

KEYWORDS: Geology.

## 112.

Buffler, R.T., J.L. Worzel, and J.S. Watkins. 1978. Deformation and origin of the sigsbee scarp -- lower continental slope, northern Gulf of Mexico.

ABSTRACT: Multichannel seismic data from the Texas-Louisiana lower continental slope, Sigsbee Scarp, and the Mississippi Fan provide additional new data for interpreting the structure and geologic history of the area. These data confirm the suggestion by previous workers that the entire lower slope is dominated by salt tectonics, but suggest that the structural style varies considerably. It is assumed that the basic cause of salt mobilization is sediment loading, both directly from sediment overburden and laterally from the Pliocene-Pleistocene depocenter updip. 18 refs.

KEYWORDS: Geology; Geophysics; Subaqueous; Offshore Technology.

**113.**
Bullis, H.R.Jr. 1955. Preliminary report on exploratory long-line fishing for tuna in the Gulf of Mexico and the Caribbean Sea. Commerical Fisheries Review 17(10):1-15.

ABSTRACT: None.

KEYWORDS: Fisheries; exploratory fishing; fishing operations; Gulf of Mexico; longlining; pelagic fishes; Thunnus thynnus; Thunnus albacares.

**114.**
Bullis, H.R.Jr. 1955. Recent explorations for yellowfin in the Gulf of Mexico. Proceedings of the 7th Annual Meeting of the Gulf and Caribbean Fisheries Institute :64-67.

ABSTRACT: None.

KEYWORDS: Fisheries; exploratory fishing; commercial species; Thunnus albacares; pelagic fishes; Gulf of Mexico.

**115.**
Bullis, H.R.Jr. 1956. Preliminary results of deep-water exploration for shrimp in the Gulf of Mexico by the M/V OREGON (1950-1956). Commerical Fisheries Review 18(12):1-12.

ABSTRACT: The exploratory fishing vessel OREGON made 308 trawl hauls between the 100 and 500 fathom curves in the Gulf of Mexico. Two areas (off the Dry Tortugas and off the Mississippi Delta) in the Gulf of Mexico contained sufficient quantities of deep-water royal red shrimp to permit profitable exploitation throughout most of the year. The magnitude of this potential resource, in terms of continuing yield, is unknown. Although these two areas embrace a total area of several hundred square miles, high concentrations are not found throughout either area at any one time. Therefore, the number of vessels that could sustain profitable production is probably small in relation to the number of large shrimp vessels available for deep-water shrimping, after carrying out winch and rigging modifications. From preliminary work along the South Atlantic coast, it appears promising that additional and more extensive grounds will be available for royal-red shrimp exploitation.

KEYWORDS: Fisheries; exploratory fishing; fishing operations; Gulf of Mexico; royal red shrimp.

**116.**
Bullis, H.R.Jr. and J.R. Thompson. 1965. Collections made by the exploratory fishing vessels OREGON, SILVER BAY, COMBAT, and PELICAN made during 1956 to 1960 in the southwestern North Atlantic. U.S. Fish and Wildlife Service Special Scientific Report Fisheries (510):1-130.

ABSTRACT: None.

KEYWORDS: Fisheries; exploratory fishing; demersal fishes; pelagic fishes; Gulf of Mexico.

**117.**
Burk, C.A., M. Ewing, J.L. Worzel, A.O.Jr. Beall, W.A. Berggren, D. Bukry, A.G. Fischer, and A.E.Jr. Pessagno. 1969. Deep- sea drilling into the Challenger Knoll, center of Gulf of Mexico. American Association of Petroleum Geologists Bulletin 53(7):1338-47.

ABSTRACT: During the recent pioneering cruise of a deep- sea coring project, a series of holes was drilled into the deep floor of the Gulf of Mexico and the western North Atlantic. One of the holes, in the Sigsbee Knolls area of the center Gulf of Mexico encountered salt- dome caprock saturated with oil, gas, and sulfur. The objectives of this coring project are scientific and the discovery of petroleum was not an intended part of the program, even through the possibility had been recognized.

KEYWORDS: Geology; Petroleum Geology; Gulf of Mexico.

**118.**

Callender, W.R. and E.N. Powell. 1992. Taphonomic signature of petroleum seep assemblages on the Louisiana upper continental slope: recognition of autochthonous shell beds in the fossil record. Palaios 7(4):388-408.

ABSTRACT: Chemoautotrophically-based benthic communities on the Louisiana continental slope are currently producing the only significant localized, autochthonous shell accumulations in the northern Gulf of Mexico shelf and slope region. Five distinctive biofacies are associated with petroleum seepage, dominated respectively by vestimentiferan tubeworms, lucinid, thyasirid and vesicomyid clams and mytilid mussels. The taphonomy of petroleum seeps includes dissolution as the most pervasive mode of shell alteration throughout all the biofacies. The degree of fragmentation is high and is likely caused by biological breakage and extreme dissolution. Characteristics common to seep and many ancient autochthonous assemblages include: (1) low species richness; (2) high density; (3) size frequency dominated by large individuals; (4) variable articulation frequency. The community taphonomic attributes of petroleum seep death assemblages are very similar to ancient autochthonous benthic assemblages. -from Authors.

KEYWORDS: Taphonomy ; Petroleum Seep ; Cold Seep ; Continental Slope ; Shell Bed ; Autochthonous Assemblage; Gulf of Mexico.

**119.**

Callender, W.R. and E.N. Powell. 1997. Autochthonous death assemblages from chemoautotrophic communities at petroleum seeps: palaeoproduction, energy flow, and implications for the fossil record. Journal of Paleontology 12(3-4):??

ABSTRACT: The hypothesis that cold-seep assemblages can be discriminated by unique biological or community attributes rather than taphonomic attributes is tested. To test this hypothesis, several cold seeps on the Louisiana upper continental slope were compared to heterotrophic sites on the Louisiana slope and to a putative seep site in the middle-late Campanian Pierre Shale near Pueblo, Colorado. Seep assemblages are characterized by a unique tier and guild structure, size-frequency composition, and animal density that together identify the palaeoenergetics structure of these communities and distinguish them from the other assemblages of the shelf and slope. All seep assemblages were dominanted by primary consumers, whereas the heterotrophic assemblage was dominated by carnivores. Carnivore dominance seems to be typical of shelf (or euhaline) death assemblages. Seep assemblages, in contrast, retain the theoretically-expected rarity of predaceous forms in fossil assemblages. Epifauna and semi-infauna dominate the tier structure of the heterotrophic assemblage as is typical for continental shelf and slope assemblages.

KEYWORDS: Gulf of Mexico ; Usa; Colorado; Pueblo ; Taphonomy ; Death Assemblage ; Cold Seep ; Petroleum Seep ; Palaeoecology ; Chemoautotrophic Community ; Petroleum ; Hydrocarbon Seep ; Fossil Assemblage ; Community Structure ; Chemoautotrophic Community ; Cold Seep Organisms; Chemoautotrophic Communities; Death Assemblages; Petroleum; Palaeoecology.

**120.**

Callender, W.R., G.M. Staff, E.N. Powell, and I.R. MacDonald. 1990. Gulf of Mexico hydrocarbon seep communities. V. Biofacies and shell orientation of autochthonous shell beds below storm wave base. Palaios 5(1):2-14.

ABSTRACT: Clam and mussel assemblages associated with petroleum seepage on the Louisiana continental slope form the only substantial shell accumulations below storm wave base on the northwestern Gulf of Mexico shelf and slope. Four distinct biofacies are present at the seeps, dominated respectively by mussels, lucinid clams, vesicomyid clams and tubeworms. Each primary seep site is typically composed of a series of not necessarily contiguous, autochthonous beds dominated by one biofacies. Mussels and tubeworks often co-occur, but neither normally co-occur with lucinid or vesicomyid clams. -from Authors.

KEYWORDS: Continental Slope; Wave Base; Mussel; Clam; Biofacies; Shell Bed; Seep; Usa; Louisiana; Gulf of Mexico Shelf.

**121.**

Carney, R. S. 1994. Consideration of the oasis analogy for chemosynthetic communities at the Gulf of Mexico hydrocarbon vents. Geo-Marine Letters 14:149-59.

ABSTRACT: The analogy between desert oasis and the deep-sea chemosynthetic community arose for the biomass contrast between vents and the relatively depauperate background benthic fauna. Fully developed, the analogy helps pose questions about interactions with the background fauna with respect to resources, colonization, and persistence. The chemosynthetic sites of the Gulf of Mexico provide an opportunity to consider possible interactions between vent and nonvent fauna over a 3000-m depth range. It is postulated that deep chemosynthetic communities require the operation of geochemical transporting and concentrating processes to overcome low levels of in situ methane and sulfide production. Clathrate reservoirs may serve these functions. A few chemosynthetic species at the Gulf of Mexico upper slope sites are related to shallow water sulfide species, but it can be speculated that the dominant chemosynthetic fauna may have originated in a wide spread deep sulfide biome at the Cretaceous. Generic endemism of consumers is low in Gulf of Mexico sites, suggesting a high level of colonization from the surrounding benthos. Chemosynthetic communities may avoid excessive colonization by predators in spite of the apparent food limitation of the surrounding benthos due to toxicity or an evolutionary mechanism selecting against specialized predators. The abundance of large predators is related to the composition of the surrounding benthos and is high at the Gulf of Mexico upper slope sites. Exclusion of chemosynthetic communities from shallower depths may be due to excessive predation by generalists.

KEYWORDS: Geology.

**122.**

Carney, R.S. 1998. Final rept, Carney, R. S. Workshop on Environmnetal Issues Surrounding Deepwater Oil and Gas Development.New Orleans. p 172p.

ABSTRACT: A Minerals Management Service workship was held April 22-24, 1997, in New Orleans to identify concerns surrounding the effects of deepwater oil and gas development and to assess the knowledge base for resolving such concerns. General information was provided in plenary sessions covering the topics of MMS concerns, evolving industry plans, and the state of knowledge for socioeconmics and physical, geological, and biological oceanography. Four working groups addressed these same topics, with breakout groups for fisheries conflicts and the changes in environmental threat associated with new technologies.

KEYWORDS: Socioeconomics/ Energy source development/ Deep water/ Offshore drilling/ Gas production/ Oil recovery/ Environmental issues/ Mexico Gulf/ Offshore platforms/ Offshore operations/ factors/ Meetings/ Fisheries/ Marine biology/ Water pollution/ Physical oceanography/ Environmental impacts/ Geology/ Economic conditions/ Outer Continental Shelf/ Ntisdilmla.

**123.**

Carney, R.S.Jr. 1971. Some aspects of the ecology of *Mesothuria lactea* Theel, a common bathyal holothurian in the Gulf of Mexico. M.S. thesis. Texas A&M University. College Station, TX.

ABSTRACT: During dredgings of the deep Gulf of Mexico by Texas A&M University over one hundred specimens of the common bathyal holothurian, *Mesothuria lactea* Theel, were collected. The anatomy of these specimens is discussed and the description compiled by previous workers is greatly expanded. Particular attention is paid to the changes in morphology undergone during aging. The taxonomy of the species is discussed in light of the additional morphological data, and all previously proposed varieties are rejected. The vertical distribution in two areas of the Gulf of Mexico are discussed in terms of possible causative factors. The geographic distribution is extended to the west coast of N. America. Preliminary investigation of reproduction were conducted. The condition of the gonads of many specimens are shown and size-frequency histograms for each dredging station presented. Possible parameters for studying the dynamics of reproduction are suggested.

KEYWORDS: Biology.

**124.**

Carsey, J.B. 1950. Geology of Gulf coastal area and continental shelf. Bulletin of the American Association of Petroleum Geologists 3:361-385.

ABSTRACT: A coastal plain varying in width to more than 100 miles borders the Gulf of Mexico in the southern part of the United States. This plain is tilted about 5 feet per mile toward the Gulf. This almost imperceptible slope extends out into the open water where the gradient is 8 12 feet per mile on top of the continental shelf, but steepens to 400 600 feet per mile off the edge of the shelf. This change in slope occurs at the 70 fathom line. The shelf is about 50 miles wide south of Mobile Bay and 70 miles wide at the mouth of the Rio Grande, but reaches maximum width of 140 150 miles between these points south of the Sabine River. Several hundred salt domes have been discovered on the coastal plain, and domes have already been located by geophysical work in the open water. More than 140 dome-like topographic prominences, with relief varying from 12 feet to 600 feet, are present along the edge of the shelf. The Mississippi River is building its delta across the shelf at the rate of one mile in 16 to 17 years and is now within 12 15 miles of the edge of the shelf. The natural levee along the Mississippi River serves as a ramp from which oil operations have taken place, and ten or more domes are now producing from this ram These domes are well out on the shelf; thus, there is actually nothing new about oil production from the shelf area.

KEYWORDS: Geology.

**125.**

Caruthers, J.W. 1969. Water masses at intermediate depths, pp 53. In: L.R.A. Capurro . Contributions on the Physical Oceanography of the Gulf of Mexico. Volume 2 Gulf Publishers, Houston, Texas.

ABSTRACT: Potential temperature-salinity characteristics of the Gulf of Mexico are analyzed in considerable detail. The analysis involves a quantitative comparison of *è*-S data throughout the Gulf with a "standard" *è*-S relation established in the Yucatan Channel. The standard is represented by a least squares polynomnial fit to 33 *è*-S data pairs. The comparison involves computing the salinity deviations from the standard for various stations throughout the Gulf. The analysis reveals subtle, but distinct, variations in the intermediate water mass of the Gulf in the winter of 1962 and suggests flow patterns and mixing. Analyses of other *è*-S data for the Gulf are also discussed.

KEYWORDS: Physical Oceanography.

**126.**

Cary, C., B. Fry, H. Felbeck, and R.D. Vetter. 1989. Multiple tropic resources for a chemoautotrophic community at a cold water brine seep at the base of the Florida Escarpment. Marine Biology 100(3):411-418.

ABSTRACT: The biological community that surrounds the hypersaline cold water brine seeps at the base of the Florida Escarpment is dominated by two macrofaunal species: an undescribed bivalve of the family Mytilidae and a vestimentiferan worm, Escarpia laminata . These animals are apparently supported by the chemoautotrophic fixation of carbon via bacterial endosymbionts. Water column and sediment data indicate that high levels of both sulfide and methane are present in surface sediments around the animals. The vestimentiferan E. laminata , and the mytilid bivalve (seep mussel) live contiguously but rely on different substrates for chemoautotrophy. Enzyme assays, patterns of elemental sulfur storage and stable isotopic analyses indicate that E. laminata relies on sulfide oxidation and the seep mussel on methane oxidation for growth.

KEYWORDS: carbon fixation; chemosynthesis; sulfides; methane; sediment chemistry; growth; animal metabolism; energy flow; food; enzymatic activity; symbionts; *Escarpia laminata*; Mytilidae; Florida Escarpment.

**127.**
Centaur Associates, I. 1986. Indicators of the Direct Economic Impacts Due to Oil and Gas Development in the Gulf of Mexico, Results of Year 1., Volume 1. Executive Summary. Minerals Management Service, Metairie, LA. Gulf of Mexico OCS Regional Office.

ABSTRACT:The study investigated the direct employment and salary impacts of oil and gas activities on the Federal Outer Continental Shelf in the Gulf of Mexico during 1984. The study also documented the geographic distribution of these impacts. Primary data for the study were provided by nine major oil and gas operations in the Gulf of Mexico and by several contractors to these companies.

KEYWORDS:Socioeconomics; Gas production; Petroleum industry; Economic impact; Economic analysis; Reserves; Salaries; Data; Gulf of Mexico(United States).

**128.**
Centaur Associates, I. 1986. Indicators of the Direct Economic Impacts Due to Oil and Gas Development in the Gulf of Mexico, Results of Year 1., Volume 2. Narrative. Minerals Management Service, Metairie, LA. Gulf of Mexico OCS Regional Office.

ABSTRACT:The study investigated the direct employment and salary impacts of oil and gas activities on the Federal Outer Continental Shelf in the Gulf of Mexico during 1984. The study also documented the geographic distribution of these impacts. Primary data for the study was provided by nine major oil and gas operations in the Gulf of Mexico and by several contractors to these companies.

KEYWORDS:Socioeconomics; Gas production; Petroleum industry; Economic impact; Economic analysis; Reserves; Data; Gulf of Mexico(United States).

**129.**
Centaur Associates, I. 1986. Indicators of the Direct Economic Impacts Due to Oil and Gas Development in the Gulf of Mexico, Results of Year 1., Volume 3. Exhibits and Data. Minerals Management Service, Metairie, LA. Gulf of Mexico OCS Regional Office.

ABSTRACT:The study investigated the direct employment and salary impacts of oil and gas activities on the Federal Outer Continental Shelf in the Gulf of Mexico during 1984. The study also documented the geographic distribution of these impacts. Primary data for this study were provided by nine major oil and gas operations in the Gulf of Mexico and by several contractors to these companies.

KEYWORDS:Socioeconomics; Gas production; Petroleum industry; Economic impact; Economic analysis; Reserves; Salaries; Data; Gulf of Mexico(United States).

**130.**
Chesbrough, G.L. 1967. Sea surface temperature as an indicator of ocean currents. Masters Thesis. Texas A&M University. College Station.

ABSTRACT: None.

KEYWORDS: Physical oceanography.

**131.**
Chianis, J. and Poll P. 1999. Studies clear TLP cost, depth limit misconceptions. Offshore Magazine 57(7).

ABSTRACT: None.

KEYWORDS: Technology.

**132.**

Chiensa, G., L. Ursini, and G. Ferrari Aggradi. 1998. DMBS: A deepwater multiphase boosting system to support the economical exploitation of deepwater fields. Proceedings of the 10th Deep Offshore Technology Conference .

ABSTRACT: Further to the successful completion of the long term underwater operation at the Agip Prezioso Field, the paper describes the deepwater configuration of the subsea multiphase boosting system as derived from the extensive development and qualification effort carried out to date. First, the complete set of available multiphase twin screw pumps is described together with the main performance characteristics (flowrate capacity, differential pressure) of each class of pumps. Details on the subsea concept of the twin screw pump are also given together with indications on the adopted design solutions driven by the field operating experience to achieve the required reliability projections. Moreover, the electric power supply chain configuration is described with special emphasis on the proposed subsea electric motor variable speed drive system. Operability issues are then addressed to discuss start up/shut down sequences as well as the operating philosophies during the reservoir production lifeline. Finally, the full engineered DMBS configuration is presented with particular focus on its suitability to fit different deepwater integration scenarios with the subsea hardware. Specific consideration is also given to those features of the proposed concept that enable the system deployment and intervention for maintenance by using a medium size DSV.

**133.**

Childress, J.J., C.R. Fisher, J.M. Brooks, M.C.I. Kennicutt, R.R. Bidigare, and A.E. Anderson. 1986. A methanotrophic marine molluscan (Bivalvia, Mytilidae) symbiosis: Mussels fueled by gas. Science 233(4770):1306-1308.

ABSTRACT: An undescribed mussel (family Mytilidae), which lives in the vicinity of hydrocarbon seeps in the Gulf of Mexico, consumes methane (the principal component of natural gas) at a high rate. The methane consumption is limited to the gills of these animals and is apparently due to the abundant intracellular bacteria found there. This demonstrates a methane-based symbiosis between an animal and intracellular bacteria. Methane consumption is dependent on the availability of oxygen and is inhibited by acetylene. The consumption of methane by these mussels is associated with a dramatic increase in oxygen consumption and carbon dioxide production. As the methane consumption of the bivalve can exceed its carbon dioxide production, the symbiosis may be able to entirely satisfy its carbon needs from methane uptake.

KEYWORDS: Mytilidae; bacteria; symbiosis; methane; Gulf of Mexico; food consumption.

**134.**

Chin, Y.D., J.G. Bomba, and Brown K.R.J. 1998. Structural and Thermal Optimization of Cased Insulated Flowlines. Proceedings of the 31$^{th}$ Annual Offshore Technology Conference (OTC paper 11042).

ABSTRACT: Flow assurance and associated thermal insulation of pipelines is an important part of deepwater reservoirs. Insulated pipelines and bundles offer a reliable and cost effective solution for deepwater flow assurance. Flexibility of pipe-in-pipe configuration in selection of geometrical parameters, pipe materials, and insulation materials allows optimizing thermal and structural properties of pipelines for specific water depth and operation requirements. The model proposed herein addressed the synergy between the design issues related to the structural performance and the thermal performance of the pipelines. The structural design of pipe-in-pipe is governed by buckling and collapse resistance of both inner and outer pipes, as well as the weight and overall stiffness of the pipeline. The stress in each layer needs to be calculated during installation, operation, and maintenance conditions to address the structural design issues. The thermal insulation characteristics of the bundles are primarily governed by the geometric parameters and thermal conductivity of pipe materials, especially that of the insulation layer.

KEYWORDS: Technology.

**135.**

Chuang, W.S. and W.J.J. Wiseman. 1983. Coastal sea level response to frontal passages on the Louisiana-Texas shelf. Journal of Geophysical Research 88(C4):2615-2620.

ABSTRACT: Sea level variations resulting from wind forcing along the Louisiana-Texas shelf are examined on 5-month winter records. Local weather patterns during the winter are dominated by cold-front passages. The associated surface wind field is well organized, predominantly in the cross-shelf direction. Regional sea level response, however, shows considerable variability; it is mainly a response to alongshore wind at Galveston, but cross-shelf wind at Eugene Island. This spatially nonuniform response appears to be due to the different water depth over the inner shelf, which is shallower off Eugene Island and favors direct cross-shelf wind setup. A friction model is applied to each region, and the results compare well with observations.

KEYWORDS: Physical Oceanography; sea level variations; atmospheric fronts; wind fields; winter; Gulf of Mexico.

**136.**

Cicin-Sain, B., R. B. Gramling, R. W. Johnson, and C P Wolf. 1992. The Evolution of the Federal OCS Program: National and Regional Perspectives (appendix c), pp 107-137. In: National Research Council., (Editor). Assessment of the U.S. outer continental shelf Environmental Studies Program: III. Social and Economic Studies. National Academy Press, National Academy of Sciences, Washington, D.C.

ABSTRACT: None.

KEYWORDS: Socioeconomics.

**137.**

Clark JA, C. A. Warner, and H. E. Walton. 1963. The chronological history of the petroleum and natural gas industries. Clark Book Company Houston, Texas

ABSTRACT: None.

KEYWORDS: Socioeconomics.

**138.**

Clarke, A.J. 1995. Northeastern Gulf of Mexico Physical Oceanography Workshop. Proceedings of a Workshop Held in Tallahassee, Florida on April 5-7, 1994. Minerals Management Service, New Orleans, LA. Gulf of Mexico OCS Region. New Orleans, LA.

ABSTRACT:The report summarizes the Proceedings at the Northeastern Gulf of Mexico Physical Oceanography Workshop held in Tallahassee on April 5-7, 1994. Included are overviews of the physical oceanography of the Mississippi, Alabama and West Florida shelves and summaries of recent measurements, challenging problems, modeling and ongoing and planned measurements relevant to the study region. The report also contains working group summaries of field work suggestion for the inner-, mid- and outer-continental shelf and some pre-workshop strawman experimental plans.

KEYWORDS:Physical Oceanography; Meeting; Continental shelf; Continental slope; Oceanographic data; Ocean circulation; Ocean currents; Ocean tides; Tidal currents; Oil spills; Meteorology; Hydrography; Oceanographic surveys; Florida; Alabama; Mississippi; Gulf Coast(United States); Gulf of Mexico.

**139.**
Clarke, L. 1994. Oil in troubled waters: perceptions, politics, and the battle over offshore drilling. Contemporary Sociology 23(5):692-693.

ABSTRACT: None.

KEYWORDS: Socioeconomics.

**140.**
Cochrane, J.D. 1969. Separation of an anticyclone and subsequent developments in the Loop Current, pp 91. In: L.R.A. Capurro. Contributions on the Physical Oceanography of the Gulf of Mexico. Volume 2 Gulf Publishers, Houston, Texas.

ABSTRACT: In May, 1969, the process of detachment of an anticyclonic current ring from the Gulf of Mexico Loop Current was observed for the first time. In early May, the loop was strongly constricted by two meanders, one protruding into the loop from Campeche Bank, the other from the Florida Shelf. Roughly 10 days later, the meander off Campeche Bank had grown more than 80 nautical miles and joined the meander on the east to form a cyclonic shear zone which cut an anticyclone off from the loop. The anticyclone center moved little between mid-May and mid-June; but by mid-July, it had reached 90 nautical miles west of its May position. By mid-September, the center had migrated still farther west, while the loop had pushed northward. In three well-documented cases of detached anticyclones found in late spring or summer, the separating shear zone was located near the smallest distance from Campeche Bank to Florida Shelf and was a deep-reaching feature characterized by low-salinity Shelf Water in the Thermocline. During spring or summer of each year, a meander appears to form off southeastern Florida Shelf. In some, but not all years, a meander has formed in late spring or summer off eastern Campeche Bank. In such years, the two meanders have grown together to cut an anticyclone off from the loop. Such anticyclones have usually moved west and although interannual differences are great, some of these anticyclones may migrate to the western Gulf.

KEYWORDS: Physical Oceanography.

**141.**
Cochrane, J.D. and F.J. Kelly. 1986. Low-frequency circulation on the Texas Louisiana continental shelf. Journal of Geophysical Research 91(C9):645-659.

ABSTRACT: For the Texas-Louisiana coast west of 92.5 degrees W, long series of data from near Freeport, Texas, together with shorter series from other locations show the strong response of coastal current to wind stress in agreement with coastal jet concepts. The authors infer from coastal winds, scattered current measurements, and distributions of sea-surface salinity and geopotential that a cyclonic gyre elongated along the shelf is the dominant feature of the prevailing shelf circulation. The inshore limb of the gyre is the coastal jet driven by wind with a west or southward (downcoast) component which prevails along much of the coast except in July-August. Because the coast is concave, the shoreward prevailing wind results in a convergence of coastal currents, which marks the downcoast extent of the gyre. Corresponding to the convergence is a seaward flow which forms the southwest limb of the gyre. Further details of the gyre circulation are described.

KEYWORDS: Physical Oceanography; Low Frequency Circulation; Ocean; Texas Louisiana Continental Shelf; Coast; Strong Response; Coastal Current; Wind Stress; Coastal Jet; Cyclonic Gyre; Seaward Flow; Gulf of Mexico.

**142.**

Coleman, J.M., D.B. Prior, and C.E. AdamsJr. 1981. Erosional furrows on continental shelf edge, Mississippi Delta region. Geo-Marine Letters 1(1):11-15.

ABSTRACT: Erosional furrows are recognized on the seafloor off the Mississippi Delta, trending downslope over the shelf edge. They occur in the water depths of 150 to 380 m seaward of presently active mudslides on the delta slope. The furrows cross an area of former mudslide deposition and part of the outer shelf. Their origin is likely to be related to cross-shelf secondary helical flows, although delta-front mass movement could cause similar erosional gouging.

KEYWORDS: Geology.

**143.**

Coleman J.M., Prior D.B., and Garrison L.E. 1980. Subaqueous sediment instabilities in the offshore Mississippi river delta.,Bureau of Land Management. BLM Open File Report 80-01.

ABSTRACT:In 1974, a series of cooperative research projects were begun in the Outer continental Shelf off the delta to a) establish a regional geologic framework of the delta, b) map the distribution and describe the variety of types of subaqueous instabilities, c) characterize the soil properties and their behavior under various stresses, and d) determine the mechanisms responsible for the subaqueous sediment failures. -from US Govt Reports Announcements, 25, 1980.

KEYWORDS:Geology.

**144.**

Coleman, J.M., D.B. Prior, and H.H. Roberts. 1986. Geologic development and characteristics of the continental margins, Gulf of Mexico. Transactions Gulf Coast Association of Geological Societies 36:61-64.

ABSTRACT: The continental slope of the Gulf Basin covers an area of more than 500,000 sq km and consists of smooth and gently sloping surfaces, prominent escarpments, knolls, intraslope basins, and submarine canyons and channels. It is an area of extremely diverse topographic and sedimentologic conditions. The slope extends from the shlef break, roughly at the 200 m isobath, to the upper limit of the continental rise, at a depth of 2800 m. The most complex province in the basin, and one of the most interest to the pertroleum industry, is the Texas-Louisiana slope, occupying an area of 120,000 sq km and in which bottom slopes range from less than 1 degree to greater than 20 degrees around the knolls and basins. The near-surface geology and topography of the slope are functions of the interplay between episodes of rapid shelf edge and slope progradation and contemporaneous modification of the depositional sequence by diapirism. Development of discrete depo-centers throughout the Neogene results in rapid shelf edge progradation, often in excess of 15-20 km per million years. This rapid progradation of the shelf edge leads to development of thick wedges of sediment accumulation on the continental slope. Slope oversteepening, high pore pressures in rapidly deposited soft sediments, and changes in eustatic sea level cause subaqueous slope instabilities such as landsliding and debris flows. Large scale features such as shelf edge separation scars and landslide related canyons often result from such processes. Application of sedimentary load to pre-existing sediments results in salt and shale diapirs and associated faulting. Slope sediments are uplifted, folded, fractured by diapiric action. Local oversteepening on the diapiric flanks and near faults causes additional slope instabilities. Petrogenic and biogenic gas seepage along faults and diapiric induced discontinuities lead to gas and clathrate accumulations in the near-surface sediments. Sea floor erosion and development of low sea level carbonate bioherms often occur on the summits of the diapirs. The intraslope and interdiapiric basins form contemporaneously with diapiric growth, resulting from salt and shale withdrawal. They are commonly the sites of thick accumulations of Neogene sediments derived from the outer shelf and flanks of the neighboring diapirs. The base of the continental slope is marked by prominent features such as Escarpments and fan lobes. The sigsbee Escarpment is the expression of the lobate frontal edge of the northern Gulf diapiric province and its underlain throughout its length by a series of complex salt ridges, overthrust tongues, and steep-sided salt massifs. The continuity of the escarpment is broken locally by several large pronounced reentrants and diapiric outliers.

KEYWORDS: Geology.

**145.**

Coleman, J.M., H.H. Roberts, and W.R. Bryant. 1991. Late Quaternary sedimentation, pp 325-352. In: Salvador A, (Editor). The geology of North America The Gulf of Mexico Basin. J. Geological Society of America, Boulder, CO.

ABSTRACT: None.

KEYWORDS: Geology.

**146.**

Coleman, J.M.G.L.E. 1978. Geological aspects of marine slope stability, northwestern Gulf of Mexico. Marine Geotechnology, Marine Slope Stability 2:9-44.

ABSTRACT: The improvement of sensors such as various high-resolution seismic navigational systems and side-scan sonar, of laboratory analyses has allowed the marine geologist to make more accurate identifications and maps of the distribution of numerous types of marine sediment instabilities, as well as to determine the mechanisms responsible for their occurrence. A large number of data on the continental shelf and upper continental slope off the modern delta of the Mississippi river have been compiled; these data will be used to document the major types of slope instabilities. The continental shelf and slope off the modern Mississippi river delta display various types of sediment instability. High rates of sedimentation (up to 80 m per century), weak, high-water-content clays, and differential weighting of clay sediments characterize this region. The major types of sediment instabilities that have been documented include (a) *Peripheral slumping,* with dimensions of slumps ranging from 200 to 1000 m; slumping often occurring in multiple stairstep arrangement; and downslope movement as high as 700 m per year. (b) *Shallow diapiric intrusions,* ranging in size from a few hundred meters to 2 km in diameter; vertical displacement ranging from 200 to 500 m; rate of sediment movement several meters per year; and intrusions caused by differential sediment loading. (c) *Radial graben (tensional faulting),* with widths from 50 to 500 m and lengths of several kilometers; both vertical and downslope lateral movements occurring; and downslope movements of surface material as much as 5 m per year common. (d) *Circular collapse depression,* with diameters of depressions ranging from 50 to 500 m; topography of depression interiors, hummocky; and depressions possibly caused by dewatering or degassing of sediments under the influence of cyclic wave loading. (e) *Surface mudflows,* thick (often more than 35 m) masses of surface sediment flowage; often bounded by abrupt seaward slope; mudflows often extending laterally for distances in excess of 100 km; movement sporadic and lobate and rates of movement as much as several hundred meters per year; often being associated with extremely hummocky topography and mud volcanoes; and with extrusion of sediments the possible mechanism. (f) *Shelf-edge arcuate slumps,* with large arcuate slumps displacing several hundred meters of sediment; slippage planes are commonly concave. Finally, (g) *Various deep-seated faults,* with faults extending from deep horizons up to modern sediment surface; commonly being associated with abrupt scarps on the seafloor; numerous contemporaneous faults; and local slumping associated with fault scarps.

KEYWORDS: Geology.

**147.**

Collard, S. 1990. Leatherback turtles feeding near a watermass boundary in the eastern Gulf of Mexico. Marine Turtle Newsletter 50:12-4.

ABSTRACT: Neuston and sargassum collections were made during R/V Bellows Cruise B8922 (30 August 2 September 1989) from Pensacola Bay, Florida to the head of DeSoto Canyon (29°10'N 87°W). Sea states were 0-1 during the cruise. Jellyfish were abundant and increased in numbers from the estuary offshore. At 30 m, 250-400 kg of *Aurelia* and a few *Dactylometra* were captured during a 20 minute tow with a 10 m otter trawl. Maximum numbers (ca. 1 $m^{-3}$) occurred in water 100-150 m deep (30°N). At depths exceeding 150 m, jellyfish abundance decreased by approximately an order of magnitude, and other gelatinous forms, including *Thalia democratica, Cestum, Ocyropsis, Beroe, Leucothea*(?), *Pyrosoma, Oikopleura*, unidentified hydromedusae, salps, doliolids, and "marine snow", increased as water color changed from green to blue (Forel-Ule color 13 to 3). The concentration of macroscopic gelatinous plankton exceeded 10 $m^{-3}$ at water depths greater than 100-150 m. Changes in water color, plankton species composition, large numbers of sea gulls (mostly *Larus atricilla*), and large schools of blackfin tuna (*Thunnus albacares*) at about 30°N (surface temperature 31°C, salinity 33 ppt) indicated the presence of a coastal-subtropical watermass boundary region. Between 12301430 hrs on 30 August, eight adult (estimated >2 m in length) leatherback turtles, *Dermochelys coriacea*, were observed at irregular intervals. One turtle was sighted due south of Pensacola Pass (water depth 20 m, surface temperature 28°C, salinity 28 ppt) and seven were seen in the areas of maximum jellyfish abundance (see also Leary, 1957). No other leatherbacks were seen during the cruise. Trawling was discontinued after the first turtle was sighted. All of the turtles sounded as the ship approached to within 300-400 m of their location. Based on published records (Eisenberg and Frazier, 1983), unpublished observations (compiled by Larry Ogren, pers. Comm.), and direct observation by other personnel aboard the *R/V Bellows*, I presume, but cannot personally confirm, that the turtles were feeding on jellyfish. Leatherbacks are known to feed on medusae, including siphonophores and salps, and feed both at the surface (Eisenberg and Frazier, 1983) and possibly at depth as well (Hartog, 1980; Eckert et al., 1989). However, diet is typically inferred from the stomach contents of dead animals (e.g. Bleakney, 1965; Brongersma, 1969; Fritts, 1982; Hartog and van Nierop, 1984; Frazier et al. 1985); published observations of feeding in the wild are rare. The confirmed presence of leatherbacks at a watermass boundary is also of interest, and emphasizes the importance of learning more about relationships between ocean features and the distributions of pelagic sea turtles (e.g., Carr, 1987). Thus, the present note may be a useful addition to the growing literature on the foraging ecology and distribution of leatherback turtles.

KEYWORDS: Endangered species.

**148.**

Collum, L.A. and Fritts T. H. 1985. Sperm whales *Physeter catodon* in the Gulf Of Mexico. Southwestern Naturalist 30(1):101-104.

ABSTRACT: The distribution of the sperm whale, P. catodon, was documented in the Gulf of Mexico during 1979-1981 using regular aerial surveys and opportunistic sightings from ships. Most sightings were in the western Gulf of Mexico in deep waters near the edge of the continental shelf. A total of 47 adults and 12 young animals were sighted in groups containing from 1-14 animals.

KEYWORDS: Endangered Species; Aerial survey; Gulf of Mexico.

**149.**
Compean, G. 1987. Preliminary analysis of the longline fishery in the Gulf of Mexico, 1981-1986. : Collective Volume of Scientific Papers. International Commission for the Conservation of Atlantic Tunas 26(1):42-49.

ABSTRACT: A longline fishery exists in the Gulf of Mexico which has been developing since 1981. The catches fluctuate in 1981-1986 from 11,060 to 771,846 kg, and are principally comprised of yellowfin.This fishery is very similar to the Japanese longline fishery operating in the Gulf of Mexico since 1974. The mean weight is 40.5 kg and the majority of the fish caught in the summer have gonadosomatic indices higher than 30.0, which indicates the spawning of yellowfin tuna in the Gulf of Mexico.

KEYWORDS: Fisheries; tuna Fisheries; longlining; Thunnus albacares; fishery development; Gulf of Mexico.

**150.**
Compean-Jimenez, G. and E. Yanez. 1980. Preliminary analysis of the Japanese longline fishery in the Gulf of Mexico: 1963-1976. Collective Volume of Scientific Papers. International Commission for the Conservation of Atlantic Tunas : 9(1):169-175.

ABSTRACT: An analysis of catch, fishing effort and catch per unit of effort of the Japanese longline fishery in the Gulf of Mexico (1953-1976) is presented. Estimates are made for all species caught, with emphasis on yellowfin tuna, which appears to be one of the most important species.

KEYWORDS: Fisheries; fishery statistics; longlining; Scombridae; Gulf of Mexico.

**151.**
Congdon, B. and C. Fagot. 1999. Gulf of Mexico Deep Water Oil and Gas Production Rises Dramatically, Special Information Release. Minerals Management Service.

ABSTRACT:None.

KEYWORDS:Technology.

**152.**
Conser, R.J. and G.L. Beardsley. 1980. An analysis of billfish catch and effort data from the recreational and longline fisheries in the northern Gulf of Mexico. Collective Volume of Scientific Papers. International Commission for the Conservation of Atlantic Tunas 9(3):606-619.

ABSTRACT: There are several areas along the Atlantic and Gulf coasts of the United States where recreational and longline fishermen compete for billfishes. One area where this occurs most frequently is the northern Gulf of Mexico. Intensive recreational fishing for billfishes takes place from a number of ports from Florida to Texas during the months April through October. During the same period, Japanese longliners fish in the same area for yellowfin and bluefin tunas. Because of these unique attributes, catch and effort data for blue marlin, white marlin, and sailfish from this area are analyzed in order to gain better insight and understanding of the dynamics of this fishery. In particular, the assumptions invoked in many analytical modes that catchability is constant and that there is no interaction between catchability and density are studied for each species. Relative fishing power is computed for those cases where the assumption appears to be valid and indices of abundance are computed.

KEYWORDS: Fisheries; pelagic fishes; catch-effort; Scombridae; Gulf of Mexico.

**153.**

Cooper, C., G.Z. Forristall, and T.M. Joyce. 1990. Velocity and hydrographic structure of two Gulf of Mexico warm-core rings. Journal of Geophysical Research 95(C2):1663-1679.

ABSTRACT: Results from an extensive survey of 2 Gulf of Mexico warm-core rings are presented. The data were taken during a 1-week period in December 1983 using a shipboard acoustic Doppler current profiler (ADCP), expendable current probes (XCP), expendable bathythermographs (XBT), and a CTD. Two rings were observed - an older one in the western Gulf adjacent to the west Texas shelf, and one just separated from the Loop Current. The western ring was of order 200 km in diameter with peak currents of 1 m/s at the 100-m level. Water properties were uniform and characteristic of the high-salinity Caribbean subtropical underwater. The eastern ring was of order 300 km in diameter with peak currents of near 2 m/s at the 100-m level. Water below 200 m is of Caribbean origin, while the surface waters show more variability suggesting some inflow of Gulf of Mexico common water. The evolution of the rings is also described based on the cruise measurements, satellite AVHRR, and other observations of opportunity.

KEYWORDS: Physical Oceanography; ocean circulation; current observations; mesoscale eddies; ocean currents; Loop Current; hydrographic data; current velocity; Gulf of Mexico.

**154.**

Cooper, C. and J.D. Thompson. 1989. Hurricane-generated currents on the outer continental shelf. 1. Model formulation and verification. Journal of Geophysical Research 94(C9):12513-12539.

ABSTRACT: A numerical model is developed to simulate currents generated by hurricanes on the outer continental shelf and slope. Model comparisons are presented for three Gulf of Mexico hurricanes using a 0.2 degree grid. Further model simulations reveal that (1) substantial shelf waves were generated with phase speeds of 4 to 10 ms super(-1), (2) the response is primarily baroclinic even in water as shallow as 200 m, (3) an entrainment law which scales with the velocity difference between the mixed layer and upper thermocline yields markedly better comparisons than one which scales with the wind stress, and (4) deviations from a straight-line storm path can significantly alter the response.

KEYWORDS: Physical Oceanography; dynamical oceanography; ocean-atmosphere system; air-sea interaction; hurricanes; ocean currents; atmospheric forcing; outer continental shelf; Climatology; Gulf of Mexico.

**155.**

Cooper, C. and J.D. Thompson. 1989. Hurricane-generated currents on the outer continental shelf 2. Model sensitivity studies. Journal of Geophysical Research 94(C9):12540-12554.

ABSTRACT: A numerical model described and verified in part 1 of this two-part series (cooper and Thompson, this issue) is applied to study the sensitivity of hurricane-generated currents on the outer shelf and slope. Results reveal the most important factors are (in decreasing order) wind speed, storm translation speed, direction of storm approach, asymmetry in the wind field, entrainment parameterization, and advection at slower storm translation speeds. Response is largely insensitive (less than 10%) to radius of maximum wind, shelf and slope configuration, bottom friction, atmospheric pressure gradients, and further reductions in the model grid size. For a storm approaching cross shelf, the response is primarily baroclinic (greater than 90%) and only weakly dependent (less than 10%) on the water depth at the site.

KEYWORDS: Physical Oceanography; dynamical oceanography; ocean-atmosphere system; air-sea interaction; hurricanes; ocean currents; atmospheric forcing; outer continental shelf; Climatology; Gulf of Mexico.

**156.**

Coutarel, A. 1998. MJ Lay, a modular deepwater pipelay system. Proceedings Offshore Technology Conference 4(OTC 8713):389-395.

ABSTRACT: The discovery of oil-fields in deepwater (up to 5000 ft requires pipelay techniques to be developed in support of these facilities. Many of the associated flowlines are small diameter ( less than 16 inches), perhaps insulated, and relatively short (e.g. 10 miles), connecting the deepwater field to host export facilities in shallow water. End connections may be by subsea tie-in or steel catenary riser (SCR). This paper describes the design and construction of a Modular J-Lay System for installing rigid steel flowlines from a medium-sized vessel of opportunity. This equipment incorporates a 200 ton tensioning device suitable for soft insulation as well as hard anti-corrosion pipe-coatings. Pipe production is by automated gas metal arc welding. The system is adaptable to incorporating sections of flexible pipe in the flowline. It offers operational flexibility and low cost installation of flowlines and SCR's in water depths ranging from 200 ft to 5000 ft. Analytical methods and issues relating specifically to deepwater pipelay are presented, and their influence on the J-Lay system evolution is discussed. Production methods and operational speeds are addressed. Ancillary techniques for deploying PLEM's and handover of SCR's are presented. The dynamics of a monohull vessel are considered with articular reference to areas such as Gulf of Mexico, offshore Brazil and West Africa. A Case Study is presented with installation of the Modular J-Lay System, currently under construction, on a 6000 ton dwt DSV.

KEYWORDS: Submarine pipelines; Steel pipe; Underwater construction; Protective coatings; Corrosion protection; Pipeline laying; Cost; effectiveness; Carbon dioxide arc welding.

**157.**

Cragg, J. and W. Sturges. 1974. Wind induced currents and sea surface slopes in the eastern Gulf of Mexico,Physical Oceanography.

ABSTRACT:Meteorological and tidal records at three Florida Gulf coast stations have been examined for the period 1965-67. Cross spectral analysis of daily winds and sea levels showed a high coherence at periods of 4 to 20 days.|Daily sea levels have been correlated with winds of varying directions and speeds with good results. Sea level was found to be most responsive to winds that were within about 10 degrees of parallel to the direction of the coastline. A longshore wind of 4.5 m/sec caused a sea level fluctuation of 20 cm. Onshore-offshore winds did not produce sea level fluctuations that were discernible above the noise level. Wind components at weather stations separated by up to 300 km were found to have coherence above 0.6 for the periods of 4 to 100 days. (Modified author abstract).

KEYWORDS:Physical Oceanography; Air Water Interactions; Ocean Currents; Sea States; Wind Effects; Florida; Ocean Surface; Spectrum Analysis; Tides; Weather Stations; Wind Direction; Wind Velocity; Gulf of Mexico.

**158.**

Cramer, J. and G. Scott. 1994. Indices of abundance for large bluefin tuna, Thunnus thynnus, from the U.S. mandatory pelagic longline fishery in the Gulf of Mexico and off the Florida east coast. Collective Volume of Scientific Papers. International Commission for the Conservation of Atlantic Tunas 42(1):164-169.

ABSTRACT: Indices of abundance of large bluefin tuna (Thunnus thynnus) from the pelagic longline fishery in the Gulf of Mexico and off the Florida east coast were derived from a selected subset of vessels which consistently caught bluefin tuna between 1987 and 1992.

KEYWORDS: Fisheries; tuna Fisheries; longlining; stock assessment; Thunnus thynnus.

**159.**
Cranswick, D. and J. Regg. 1997. Deepwater in the Gulf of Mexico: America's new frontier., U.S. Department of Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, Louisiana MMS 97-0004.

ABSTRACT:None.

KEYWORDS:Socioeconomics; Louisiana; Mississippi; Offshore operations; Petroleum Industry .

**160.**
Cranswick, D. and J. Regg. 1997. Deepwater in the Gulf of Mexico: America's New Frontier,Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Report 97-0004.

ABSTRACT:None.

KEYWORDS:Technology.

**161.**
Culver, S.J. and M.A. Buzas. 1981. Foraminifera distribution of provinces in the Gulf of Mexico. Nature 290(5804):328-329.

ABSTRACT: Recent benthic foraminifera distribution patterns form the basis of much palaeoenvironmental (particularly palaeobathymetric) interpretation used by geologists. The authors have recently summarized the distribution of recent benthic foraminifera on the Atlantic continental margin of North America and report here the results of an analysis of all published data from the Gulf of Mexico. To obtain a synthesis of foraminiferal distribution in the Gulf of Mexico, a computerized catalogue of all published occurrences (presence or absence data) was compiled. Cluster analysis of these data isolated four large, marginally overlapping areas or provinces exhibiting a spatial correlation with Gulf of Mexico water masses. A fifth, smaller, discrete area (biofacies) was found at the mouth of the Mississippi delta.

KEYWORDS: fossil foraminifera; palaeooceanography; Gulf of Mexico; Distribution; Palaeoenvironments; Benthos; Water Masses; Biofacies.

**162.**
Cummings, J.A. 1984. Habitat dimensions of calanoid copepods in the western Gulf of Mexico. Journal of Marine Research 42:163-188.

ABSTRACT: The vertical distributions of 49 species (53 taxa) of calanoid copepods were determined. The relative intensities of the features varied among seasons, while within seasons the physical structure between features was different. Groups of samples characterized by relatively homogeneous biotic characteristics were related more to depth of the sample than to the season or location (hydrographic feature) in which the sample was taken. Species groups defined by the classification analysis also tended to occupy different depth zones, but the species groups overlapped strongly in the vertical dimension. Significant species structure was found as well, with stability of the rank order of species abundances. Biotic factors are suggested as the dominant causative agents of copepod vertical distribution patterns. On a broad scale the observed constancy of copepod species and vertical spatial structure is probably related to the 'nutrient-limited' and 'light-limited' physiological regimens documented for oceanic phytoplankton species.

KEYWORDS: Zooplankton; Water column biology; copepods; community composition; Gulf of Mexico(United States).

**163.**

Curole, M.A., W.D. Grimes, C.B. Wallace, T.R. Judd, and R.W. Chin. 1997. Proceedings, Annual Convention - Gas Processors Association 1997. 212-218.

ABSTRACT: Industry has recently begun exploiting deepwater petroleum resources in the Gulf of Mexico and other regions of the world. Produced fluids from subsea developments may be pipelined significant distances for separation and processing; at other locations floating structures such as tension leg platforms and ships will be utilized for production handling. The cost of facilities to handle, process and transport fluids is a significant component of the total cost of deepwater projects, which for large developments may exceed dollar 1 billion. There is a great incentive to achieve large cost reductions by minimizing the size and weight of fluid processing facilities. Fluid processing challenges in the deepwater are both numerous and unique. This paper will address a number of these issues, many of which need research solutions and the development of new technologies. Among the topics discussed are: Solids-related problems (e.g. hydrates, paraffins, asphaltenes) aggravated by the low temperature environment of the deepwater; Very high well flow rates and operating pressures; A typical fluid properties which make gas-liquid separations difficult; Excessive condensation of liquids (e.g. NGLs) in gas export pipelines and internally within the production facility; The need for improved gas hydrate control/prevention for subsea developments having limited access; The effect of motion on processing facilities located on floating structures; and Utilization of natural gas in very deep water, remote oil developments not served by pipelines.

KEYWORDS: Offshore oil well production; Production platforms; Petroleum pipelines; Ships; Cost accounting; Cost effectiveness; Liquefied natural gas; Condensation; Flow of fluids; Gas hydrates; Tension leg platforms.

**164.**

D'Souza, R. 1999. FPSO deployment promising for US Gulf of Mexico. Offshore Magazine 59(5).

ABSTRACT: None.

KEYWORDS: Technology.

**165.**

D'Souza, R. 1999. Major Technical and Regulatory Issues for Monohull Floating Production Systems in the Gulf of Mexico. Proceedings of the 31th Annual Offshore Technology Conference (OTC 10704).

ABSTRACT: Monohull based production platforms are the most widely used floating production systems worldwide. They are proven as a reliable workhorse and have provided the industry with a commercially attractive platform for producing large and small offshore oil developments in most major offshore producing regions. The ship-shaped monohull offers low cost "real estate" for production facilities, and its integrated storage and offloading eliminates the oil export pipeline. To date an FPSO * has not been employed in the US Gulf of Mexico because of the extensive infrastructure of existing host platforms and pipelines on the continental shelf. However, in recent OCS lease sales, operators have acquired vast, undeveloped acreage that is increasingly remote from this infrastructure. Beyond the shelf, the potential for a low capital cost platform and elimination of, what can be a cripplingly expensive oil export trunkline, has many operators considering FPSOs to develop these remote, deepwater prospects. This paper examines and discusses major technical and regulatory issues that the industry (regulators, operators, contractors) must collectively address prior to introducing the first FPSO into the US Gulf of Mexico.

KEYWORDS: Technology.

**166.**

Dagg, M.J. 1988. Physical and biological responses to the passage of a winter storm in the coastal and inner shelf waters of the northern Gulf of Mexico. Continental Shelf Research 8(2):167-178.

ABSTRACT: Strong northerly and westerly components of the wind resulted in upwelling of high salinity inner shelf containing low nitrate and chlorophyll concentrations. Low salinity coastal water, with associated high concentrations of chlorophyll and nitrate, was transported offshore at the surface. Isopleths sloping from the surface to the bottom over a distance of approximately 10 km characterized an oceanographic front that separated the two water types of day 1. The frontal boundary became more compact and decreased in slope on day 2, and isopleths were essentially horizontal by day 3, with the coastal water overlying the inner shelf water. Winter storms and the associated redistribution of nutrients and phytoplankton could have significant direct biological consequences in the inner shelf waters of the northern Gulf of Mexico.

KEYWORDS: Physical Oceanography; storms; zooplankton; hydrography; winters; atmospheric fronts; shelf dynamics; biological properties; physical properties; upwelling; Gulf of Mexico.

**167.**

Dagg, M.J., C. Grimes, S. Lohrenz, B. McKee, R. Twilley, and W.Jr. Wiseman. 1991. Continental shelf food chains of the northern Gulf of Mexico, pp 329-345. In: K. Sherman K, Alexander LM, Gold BD, (Eds.). Food Chains, Yields, Models, and Management of Large Marine Ecosystems. Westview Press, Boulder CO.

ABSTRACT: Biological productivity in the northern Gulf is significantly affected by the Mississippi River. The freshwater discharge (577 $km^3$ $yr^{-1}$, approx 10 % of the volume of water on the shelf) contains high concentrations of dissolved nutrients (100-150 $\mu$mol $NO_3$ $l^{-1}$). Flow is primarily constrained by prevailing winds to the continental shelf west of the Mississippi Delta. River plumes are regions of high phytoplankton stock (>30 g Chl $l^{-1}$) and production (5 g C $m^{-2}$ $d^{-1}$), high copepod stocks (nauplius concentrations >1000 $l^{-1}$) and high ichtyoplankton stocks (Larvel concentrations >50 $m^{-3}$). The high temperature of shelf waters assures high physiological rates, implying high rates of trophic transfer and high turnover rates. The primary fate of phytoplankton production is grazing by macrozooplankton and microzooplankton. However, sinking of phytoplankton and other organic material fuels the annual development of a band of hypoxic water along the Louisiana coast. Fisheries production is high; the northern Gulf supports the largest volume fishery in the United States, the Gulf menhaden, *Brevoortia patronus*. The Loop Current in its northernmost position affects shelf processes to the east of the Delta. Anticyclonic rings derived from the Loop Current occasionally impact on the Louisiana shelf west of the Delta but usually drift over to the western Gulf resulting in exchange of oceanic and shelf water off Texas.

KEYWORDS: Continental Shelf ; Ecology; Food Webs; Water column biology.

**168.**
Davies, D.K. and W.R. Moore. 1970. Dispersal of Mississippi sediment in the Gulf of Mexico. Journal of Sedimentary Petrology 40(1):339-352.

ABSTRACT: Pleistocene and Recent Mississippi sediments possess a distinctive heavy mineral assemblage which retains its identity between Cairo, Illinois and the Gulf of Mexico Abyssal Plain. Thus this assemblage may be used to trace the Mississippi contribution to the Gulf of Mexico from fluvial, through deltaic, neritic, and bathyal, to abyssal environments. Significant changes in the heavy mineral assemblage of sediments in the Gulf are related to source changes and not to the reworking or selective sorting of Mississippi sediments. As a result, three distinct sediment input sources may be recognized for detrital sediments in the Gulf of Mexico Abyssal Plain, 1) The Mississippi, 2) The Rio Grande, and 3) the rivers of north-east Mexico. The Mississippi contribution is dominant and is only replaced by other inputs in the northwest and southwest corners of the abyssal plain. On the Louisiana-Texas Continental Shelf, Mississippi sediment forms a veneer which extends between the present delta and the Sabine river. Dredge samples reveal that underlying sediments were derived from the central Texas rivers to the west, probably during a period of regression which occurred between 10,000 and 7,000 B. The interaction of a high zircon content and intense selective sorting in the Inner Continental Shelf sediments has resulted in two areas of zircon enrichment which may be of economic significance. Because of the insensitivity of the heavy mineral assemblage of the Mississippi contribution to processes of selective sorting and reworking, only 200 non-opaque grains from one size fraction of one sample are needed to characterize this contribution.

KEYWORDS: Geology.

**169.**
Davies, D.K. 1968. Carbonate turbidites, Gulf of Mexico. Journal of Sedimentary Petrology 38(4):1100-1109.

ABSTRACT: Cores from the southern edge of the Gulf of Mexico abyssal plain show a vertical repetition of three members: a basal white or gray, medium calcilutite, 30 cm average thickness, commonly cross laminated and with an abundant shallow water benthonic fauna; a light olive-gray fine calcilutite, some 35 cm in average thickness, commonly bioturbated and consisting of a mixture of comminuted shells, micrite, and argillaceous lutite, and with both planktonic and shallow water benthonic faunas; and an olive gray-olive black argillaceous lutite, 50 cm average thickness, either bioturbated or structureless, and containing a scattered planktonic fauna. Deposition was from turbidity currents that originated on the Campeche Shelf followed by a period of abyssal plain sedimentation.

KEYWORDS: Geology; Abyssal Plain; Atlantic Ocean; Carbonate Turbidites; Currents; Gulf of Mexico; North Atlantic; Sedimentary Petrology; Sedimentation; Turbidity Currents.

**170.**
Davis, D.W. 1988. Effects of the Decline on Higher Institutions of Learning. pp . 362-366. Ninth annual Gulf of Mexico information transfer meeting, December, 1988. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region., New Orleans, LA.

ABSTRACT: None.

KEYWORDS: Socioeconomics.

**171.**
Davis, D.W. 1991. Oil in the Northern Gulf of Mexico., pp 139-152. In: H.D. Smith , A. Vallega., (Editor). The Development of Integrated Sea Use Management. Routledge, London.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Offshore oil industry.

172.

Davis, R.W., W.E. Evans, and B. Wûrsig. 1999. Cetaceans, sea turtles and seabirds in the northern Gulf of Mexico: Distribution, abundance and habitat associations,Contract No. 1445-CT09-96-0004 and 1445-IA09-96-0009.

ABSTRACT:The Gulf of Mexico is a semi-enclosed, intercontinental sea with a total area of about 1.5 million square kilometers. As a large marine ecosystem, it has a unique bathymetry, hydrography and productivity. Cetaceans, sea turtles and seabirds are upper trophic level predators that play an important role in the pelagic marine ecosystem of the Gulf of Mexico. In the GulfCet II program, we continue our studies of cetaceans in the northern Gulf of Mexico (Davis and Fargion 1996, Baumgartner 1997, Davis et al. 1998) to determine their seasonal and geographic distribution in areas potentially affected by oil and gas activities now or in the future. This program included systematic aerial surveys and shipboard visual and acoustic surveys to document cetacean and sea turtle populations. This work was accompanied by data acquisition designed to further characterize habitat and reveal cetacean-habitat associations. The objectives of the GulfCet II program were to: 1) estimate the minimum abundances of cetaceans and sea turtles in the Minerals Management Service's Eastern Planning Area (EPA) and 2) characterize the distribution and habitat-associations of cetaceans and seabirds in the eastern Gulf and oceanic northern Gulf, with an emphasis on the continental slope (waters 100 to 2,000 m deep). To accomplish these objectives, we used an integrated approach that included visual (aerial and shipboard) and acoustic (shipboard) surveys of the distribution of cetaceans, sea turtles and seabirds and simultaneous hydrographic measurements. We also used near real-time sea surface altimetry from the TOPEX/POSEIDON and ERS satellites to determine the location of hydrographic features (e.g., cyclones, anticyclones and confluence zones) during shipboard surveys. Archival satellite sea surface altimetry data also allowed us to retrospectively determine the location of hydrographic features for analysis with GulfCet I cetacean sightings collected from 1992-94. In addition to characterizing hydrographic features during GulfCet II, we measured zooplankton and micronekton biomass derived from both net and acoustic sampling to indicate the amount of potential food available for higher trophic level foraging by cetaceans and seabirds. We hypothesized that hydrographic features in the study area had different levels of potential prey that influence cetacean and seabird distribution. We further hypothesized that these food stocks would be locally concentrated in nutrient-rich areas offshore from the Mississippi River, within cyclonic eddies, and along the high-shear edges of cyclonic eddies. Nineteen cetacean species were identified in the oceanic northern Gulf of Mexico during GulfCet II surveys. Abundance estimates ranged from 86,705 (based shipboard surveys) to 94,182 (based on highest estimate for each species from either shipboard or aerial surveys) total animals. Pantropical spotted dolphins were the most abundant species with an estimated 46,625 animals, followed by spinner dolphins (11,251) and clymene dolphins (10,093). Estimates for bottlenose dolphins, striped dolphins, melon-headed whales, Atlantic spotted dolphins, Risso's dolphins and short-finned pilot whales ranged from 4,381 to 1,471. Abundances of all other species were less than 1,000. Cetaceans were sighted throughout the study area, but fewer were sighted in the western Gulf. There are now sighting records during three or more seasons for at least 16 cetacean species. The seasonal abundance of several species (e.g. dwarf/pygmy sperm whale, Risso's dolphin, pantropical spotted dolphin) may very regionally in continental slope waters. Seventeen cetacean species were sighted in the EPA. The abundance estimate based on aerial surveys was 38,184 total animals. In general, cetaceans were found throughout the EPA study area each season. The most abundant species were pantropical spotted dolphins (13,649) and spinner dolphins (8,670). Other species with abundance estimates were over 1,000 based on aerial or ship surveys were bottlenose dolphins, Atlantic spotted dolphins, Risso's dolphins, striped dolphins and cylmene dolphins. Cetaceans in the northeastern and oceanic northern Gulf of Mexico were concentrated along the continental slope in or near cyclones and confluence zones. Cyclonic eddies are mesoscale features with locally concentrated zooplankton and micronekton stocks that appear to develop in response to increased nutrient-rich water and primary production in the mixed layer. In the north-central Gulf, an additional factor affecting cetacean distribution may be the narrow continental shelf south of the Mississippi River delta. Low salinity, nutrient-rich water may occur over the continental slope near the mouth of the Mississippi River (MOM) or be entrained within the confluence of a cyclone-anticyclone eddy pair and transported beyond the continental slope. This creates a deep-water environment with locally enhanced primary and secondary productivity and may explain the presence of a resident, breeding population of endangered sperm whales within 50km of the Mississippi River delta. We suggest that this area may be essential habitat for sperm whales in the northern Gulf. Overall, the results suggest that the amount of prey for cetaceans (and seabirds) may be consistently greater in the cyclone, confluence area, and south of the MOM, making them preferential areas for foraging. Since cyclones in the northern Gulf are dynamic and usually associated with westward moving cyclone-anticyclone pairs, cetacean distribution will be dynamic. However, with near real-time satellite remote sensing of sea surface altimetry, these features can be tracked and used

to predict where pelagic cetaceans may be concentrated. The exceptions are bottlenose dolphins, Atlantic spotted dolphins and possibly Bryde's whale that typically occur on the continental shelf or along the shelf break outside of major influences of eddies. GulfCet II aerial surveys provided the first assessment of sea turtle abundance and distribution over a large area of the oceanic northeastern Gulf of Mexico. Three sea turtle species occurred in the EPA study area: loggerhead, Kemp's ridley, and leatherback sea turtles. The leatherback and Kemp's ridley sea turtles are listed as endangered, and loggerhead sea turtles are listed as threatened. The overall density of loggerhead sea turtles in the EPA shelf was 20 times that of the EPA slope. The majority of loggerheads in the EPA slope were sighted during winter. While many winter sightings were near the 100 m isobath, there were sightings of loggerheads over very deep waters (i.e., > 1000 m). Leatherbacks were sighted throughout the EPA slope and were about 12 times more abundant in winter than summer. The nearly disjunct summer and winter distributions of leatherbacks indicates that specific areas may be important to this species either seasonally or for short periods of time. Seabird species present in the Gulf of Mexico varied by season. The species composition of the sightings during late summer reflected a pattern of migration and transition to a winter distribution. Two of the three most commonly identified species (laughing gull and royal tern) in late summer were year-round residents in the Gulf. Pomarine jaegers, a wintering marine species in the Gulf, were the third most commonly identified species. During midsummer, the black tern was the most abundant species, followed by band-rumped storm-petrels (summer migrant pelagic), frigatebirds (permanent resident), Audubon's shearwaters (summer migrant pelagic) and sooty terns (summer resident). Cyclones had the greatest diversity of the seabird species, although habitat use varied among species. Pomarine jaegers were more likely to be present in the MOM area during late summer. Audubon's shearwaters were more likely to be encountered inside a cyclone, while band-rumped storm-petrels were more likely to be present in the areas other than cyclones, anticyclones or confluence zones during the mid-summer. Black terns were encountered more frequently in the MOM area during mid-summer. Generalized additive models incorporating indicators of plankton standing stock (surface chlorophyll and predicted mean biomass [PMB] of zooplankton and micronekton) best predicted seabird presence for five of the seven species analyzed. Other predicted models were: sea surface properties of temperature and salinity for black tern, sooty tern, and laughing gull; sea surface height for pomarine jaeger; and bathymetry for Audubon's shearwater. Seasonal surveys are needed to better assess community structure and seabird-habitat associations. Eighty-three percent of the crude oil and 99% of the gas production in United States federal waters occurs in the Gulf of Mexico, primarily along the Texas-Louisiana continental shelf and slope. By 2003, oil production in the Gulf is projected to increase 43. Production from deepwater fields (depth>305m) will account for about 59% of the daily oil production and 27% of the daily gas production in the Gulf. The increase in deepwater oil and gas production along the continental slope has resulted from the development of advanced geophysical and drilling technologies. In addition to oil and gas exploration and production, this area has considerable commercial shipping traffic that enters the northern Gulf ports. The long-term forecast for petroleum transportation is for the total volume to increase into the next century. The cumulative impact of these human activities on cetaceans in the northern Gulf cannot be predicted with certainty. However it can be anticipated that cetaceans along the continental slope will encounter increasing oil and gas exploration and production activities that include: surface and subsurface construction; FPSO (Floating Production, Storage and Offloading facilities) activities; waste discharge; service-vessel and aircraft traffic and noise; geophysical surveying; and oil spills. There are critical uncertainties in our understanding of short and long-term effects of seismic and other loud industrial sounds on the behavior and distribution of Gulf cetaceans. Potential impacts of seismic survey sounds include: 1) masking sounds made by cetaceans for communication, navigation, sensing their environment and prey capture, 2) causing animals to abandon or avoid important feeding and breeding areas, or altering migratory routes, 3) affecting the distribution, density and movements of important prey species, 4) causing physiological or psychological stress, and 5) causing temporary of permanent hearing loss. Against the background of growing oil and gas exploration and development, continued research and monitoring are needed to assess the potential impacts of these activities on pelagic cetaceans, sea turtles and seabirds in the Gulf of Mexico. The GulfCet program has demonstrated that any future monitoring programs should be long-term, with intensive sampling effort in order to detect significant changes in the density and distribution of cetaceans.

KEYWORDS:Endangered Species.

**173.**

Davis, R.W. and G.S. Fargion. 1996. Distribution and abundance of cetaceans in the northcentral and western Gulf of Mexico:Final report,OCS Study MMS 96-0027.

ABSTRACT:The purpose of this study (hereafter referred to as the GulfCet Program) was to determine the distribution and abundance of cetaceans (whales and dolphins) in areas potentially affected by future oil and gas activities along the continental slope in the north-central and western Gulf of Mexico. This 3.75 year project commenced on 1 October 1991 and concluded on 15 July 1995. The study area was bounded by the Florida-Alabama border, the Texas-Mexico border, and the 100m and 2,00om isobaths. The distribution and abundance of cetaceans were determined from seasonal aerial and shipboard visual surveys and shipboard acoustic surveys. In addition, hydrographic data were collected *in situ* and by satellite remote sensing to characterize the habitats of cetaceans in the study area. Finally, tagging and tracking of sperm whales using satellite telemetry was attempted. Cetaceans were observed throughout the study area during all four seasons. Nineteen species were identified, including two species (melon-headed whales and Frasier's dolphins) that were previously thought to be rare in the Gulf. Pantropical spotted dolphins, bottlenose dolphins, clymene dolphins, striped dolphins, Atlantic spotted dolphins, and melon-headed whales were the most common small cetaceans. The most common large cetacean was the sperm whale. Only one species of baleen whale, the Bryde's whale, was sighted, and the estimated abundance of this species was very low. The mean annual abundance for all cetaceans was estimated to be 19,198 animals. The oceanography in the study area was complex and dynamic, with mesoscale features that showed large annual and interannual variability. Warm- and cold-core rings (eddies) and the fresh water effluent from the Mississippi River were the most distinctive hydrographic features observed in the study area. The marine habitat for this area can be characterized as tropical to subtropical with a mixed layer that is seasonally deepest in the winter. With the exception of bottom depth, there was no significant correlation of cetacean distribution with any of the hydrographic variables examined. Cetaceans could be divided into three groups relative to bottom depth. The first group, which occurred on the continental shelf or along the shelf break, consisted of Atlantic spotted dolphins and bottlenose dolphins. The second group consisted only of Risso's dolphin and occurred along the mid-to-upper slope. The third group included sperm whales, pygmy /dwarf sperm whales, pantropical spotted dolphins, striped dolphins, and *Mesoplodon* spp. This third or deep-water group typically occurred along the mid-to-lower slope in water over 1,000 m deep. There was some indication that sperm whales may be found in conjunction with the edge of warm-core rings, where upwelling events may enhance productivity and prey abundance. The potential effects of oil and gas exploration and production activity on cetaceans along the continental slope cannot be predicted with certainty. However, it can be anticipated that cetaceans will encounter construction activity, ship traffic, seismic exploration, and underwater noise as the oil and gas industry moves into yet deeper water. The GulfCet Program has demonstrated that any future monitoring programs would need to be long-term, with relatively intensive sampling effort in order to detect significant changes in the abundance and distribution of most cetaceans.

KEYWORDS:Endangered Species.

**174.**

Davis, R.W. and G.S. Fargion. 1996. Distribution and Abundance of Cetaceans in the North-Central and Western Gulf of Mexico. Final Report. Volume 2. Technical Report. Minerals Management Service, New Orleans, LA. Gulf of Mexico OCS Region.

ABSTRACT:The purpose of the study was to determine the distribution and abundance of cetaceans in areas potentially affected by future oil and gas activities along the continental slope of the north-central and western Gulf of Mexico. This 3.75 year project commenced 1 October 1991 and finished 15 July 1995. The study area was bounded by the Florida-Alabama border, the Texas-Mexico border, and the 100 m and 2,000 m isobaths. Cetacean distribution and abundance were determined from seasonal aerial and shipboard visual surveys and shipboard acoustic surveys. In addition, hydrographic data were collected in situ and by satellite remote sensing to characterize cetacean habitat. Finally, tagging and tracking of sperm whales using satellite telemetry was attempted. This volume summarizes the results of the study. Cetaceans were observed throughout the study area during all four seasons. Nineteen species were identified, including two species (melon-headed whales and Fraser's dolphins) previously thought to be rare in the Gulf. Pantropical spotted dolphins, bottlenose dolphins, clymene dolphins, striped dolphins, Atlantic spotted dolphins, and melon-headed whales were the most common small cetaceans and the sperm whale was the most common large cetacean. The mean annual abundance for all cetaceans was estimated to be 19,198. Although the study area had complex and dynamic oceanography, bottom depth was the only environmental variable which correlated to cetacean distribution.

KEYWORDS:Endangered Species; Marine mammals; Cetaceans; Gulf of Mexico; Distribution; Abundance; Population density.

**175.**

Davis, R.W., G.S. Fargion, N. May, T.D. Leming, M. Baumgartner, W.E. Evans, L.J. Hansen, and K. Mullin. 1998. Physical habitat of cetaceans along the continental slope in the north-central and western Gulf of Mexico. Marine Mammal Science 14(3):490-507.

ABSTRACT: The physical habitat of cetaceans found along the continental slope in the north-central and western Gulf of Mexico was characterized from shipboard sighting data, simultaneous hydrographic measurements, and satellite remote sensing. The study area was encompassed by the longitude of the Florida-Alabama border (87.5 degree W), the southernmost latitude of the Texas-Mexico border (26.0 degree N), and the 100-m and 2,000-m isobaths. Shipboard surveys were conducted seasonally for two years from April 1992 to May 1994. A total of 21,350 km of transect was visually sampled in an area of 154,621 km super(2). Sighting localities of species in the study area were differentiated most clearly with bottom depth. Atlantic spotted dolphins (Stenella frontalis) were consistently found in the shallowest water on the continental shelf and along the shelf break. In addition, the bottom depth gradient (sea floor slope) was less for Atlantic spotted dolphins than for any other species. Bottlenose dolphins (Tursiops truncatus) were found most commonly along the upper slope in water significantly deeper than that for Atlantic spotted dolphins. All the other species and species categories were found over deeper bottom depths; these were Risso's dolphins (Grampus griseus), short-tinned pilot whales (Globicephala macrorhynchus), pygmy/dwarf sperm whales (Kogia spp.), rough-toothed dolphins (Steno bredanensis), spinner dolphins (Stenella longirostris), sperm whales (Physeter macrocephalus), striped dolphins (Stenella coeruleoalba), Mesoplodon spp., pantropical spotted dolphins (Stenella attenuata), Clymene dolphins (Stenella clymene) and unidentified beaked whales (Ziphiidae). Risso's dolphins and short-finned pilot whales occurred along the upper slope and, as a subgroup, were significantly different from striped dolphins, Mesoplodon spp., pantropical spotted dolphins, Clymene dolphins, and unidentified beaked whales, which occurred in the deepest water. Pygmy/dwarf sperm whales, rough-toothed dolphins, spinner dolphins, and sperm whales occurred at intermediate depths between these two subgroups and overlapped them.

KEYWORDS: Endangered Species; Continental slope; Water depth; Vertical distribution; Ecological distribution; Marine mammals; Continental shelves; Population ecology; Marine ecosystems; Gulf of Mexico; Cetaceans; Whales; Dolphins; Killer Whales; Pilot Whales; Habitat.

**176.**
DeLuca, M. 1999. Four quick discoveries boost outlook for US Gulf deepwater. Offshore Magazine 59(6).

ABSTRACT: None.

KEYWORDS: Technology.

**177.**
DeLuca, M. 1999. Product transportation becoming deciding issue in deepwater development. Offshore Magazine 59(11).

ABSTRACT: None.

KEYWORDS: Technology.

**178.**
DeLuca, M. 1999. Record 25 deepwater discoveries worldwide in 1999. Offshore Magazine 59(9).

ABSTRACT: None.

KEYWORDS: Technology.

**179.**
DeLuca, M. 1999. Twenty-six deepwater drilling units set for delivery by year-end 2000. Offshore Magazine 59(9).

ABSTRACT: None.

KEYWORDS: Technology.

**180.**

Diegel, F.A., J.F. Karlo, D.C. Schuster, R.C. Shoup, and Tauvers. R. 1995. Cenozoic structural evolution and tectono-stratigraphic framework of the northern Gulf Coast continental margin. The American Association of Petroleum Geologists Memoir 65:109-151.

ABSTRACT: The Cenozoic structural evolution of the northern Gulf of Mexico is controlled by progradation over deforming, largely allochthonous salt structures derived from an underlying autochthonous Jurassic salt. The wide variety of structural styles is due to a combination of (1) original distribution of Jurassic and Mesozoic salt structures, (2) differrent slope depositional environments during the Cenozoic, and (3) varying degrees of salt withdrawal from allochthonous salt sheets. Tectono-stratigraphic provinces descibe regions of contrasting structural styles and ages. Provinces include (1) a contractional foldbelt province, (2) a tabular salt-minibasin province, (3) a Pliocene-Pleistocene detachment province, (4) a salt dome-minibasin province, (5) an Oligocene-Miocene detachment province, (6) a lower Oligocene Vicksburg detachment province, (7) an upper Eocene detachment province, and (8) the Wilcox growth fault of Paleocene-Eocene age. Within several tectono-stratigraphic provinces, shale-based detachment systems, dominated by lateral extension, and allochtonous salt-based detachment systems, dominated by subsidence, can be distinguished by geometry, palinspastic reconstructions, and subsidence analysis. Many shale-based detachments are linked downdip to deeper salt-based detachments. Large extentions above detachments are typically balanced by salt withdrawal. Salt-withdrawal minibasins with flanking salt bodies occur as both isolated structural systems and components of salt-based detachment systems. During progradation, progressive salt withdrawal from tabular salt bodies on the slope formed salt-bounded minibasins which, on the shelf, evolved into minibasins bounded by arcuate growth faults and remnant salt bodies. Associated salt bodies above allochthonous salt evolved from pillows, ridges, and massifs to leaning domes and steep-sided stocks. Allochthonous salt tongues spread from inclined salt bodies that appear as feeder faults when collapsed. Coalesced salt tongues from multiple feeders formed canopies, which provided subsidence potential for further cycles of salt withdrawal. The Sigsbee escarpment is the bathymetric expression of salt flows that have overridden the abysal plain tens of kilometers since Paleogene. The distribution and palinspastic reconstruction of Oligocene-Miocene salt-based detachments and minibasins suggests that a Paleogene salt canopy covering large areas of the present onshore and shelf, may have extended as far as the Sigsbee salt mass.

KEYWORDS: Geology.

**181.**

Diegel, F. A. and R.W. Cook. 1990. Palinspastic reconstruction of salt-withdrawal growth-fault systems, northern Gulf of Mexico. Geological Society of America (Abstracts) 22(7):48.

ABSTRACT: Two dimensional palinspastic reconstructions of growth fault systems in the Gulf Coast indicate that salt withdrawal from autochthonous and allochthonous levels can create large extensional fault systems without producing significant contractional structures. Evacuation of salt from prograding depocenters allowed accumulation of the thick Eocene to Recent shallow water clastic sediments. Area balancing of salt is precluded by a complex salt budget involving regional basinward flow, lateral flow into out-of-the-plane structures, and dissolution. However, if section locations are chosen to avoid steep out-of-plane dips, major faults at a low angle to the section, and shallow salt bodies, 2-D reconstructions perpendicular to regional depositional strike can be used to restore the geometry of the overlying sediments and the top of salt. A modified one-dimensional backstripping technique, accounting for isostasy, paleobathymetry, compaction, faulting, thermal subsidence, and salt withdrawal is combined with two-dimensional geometric reconstructions to restore the base of salt though time. Reconstructed geometries of detachment-based fault systems in offshore western Louisiana suggest that salt withdrawal occurred from allochthonous salt within the Tertiary section even in many areas where shallow salt bodies and other direct evidence for salt withdrawal are rare or absent. Multiple feeder faults for these now evacuated sheets are observed beneath some Tertiary detachment surfaces. Reconstructions in South Texas indicate that large autochthonous salt walls, developed in Cretaceous time, were during Eocene time. The restored width of salt bodies once near the sea bottom is poorly constrained in two dimensions. End-member alternative reconstructions show the range of possible solutions between maximum salt width/minimum extension, and minimum salt width/maximum extension.

KEYWORDS: Geology.

**182.**
Dietrich, D.E. and C.A. Lin. 1994. Numerical studies of eddy shedding in the Gulf of Mexico. Journal of Geophysical Research 99(C4):7599-7615.

ABSTRACT: Models the eddy shedding phenomenon in the Gulf of Mexico using the Sandia Ocean Modeling System. Various observed features of the eddy shedding are simulated by the model. A boundary current which follows topographic contours is generated around the Gulf because of the splitting of the flows associated with the loop current and the shed eddy. This current is likely to be important in the dissipative stages of the eddies in the western Gulf. In addition, results suggest that higher-order baroclinic modes are important in the dissipation of loop current eddies. -from Authors.

KEYWORDS: Physical Oceanography; current rings; eddy shedding ; numerical modelling ; loop current; Gulf of Mexico.

**183.**
Dimego, G.J., L.F. Bosart, and G.W. Endersen. 1976. An examination of the frequency and mean conditions surrounding frontal incursions into the Gulf of Mexico and Caribbean Sea.
. Monthly Weather Review 104(6):709-718.

ABSTRACT: None.

KEYWORDS: Physical Oceanography; Meteorological Condition; Frequency; Atmospheric Front; Cold Front; Caribbean Sea; Tropical Environment; Gulf of Mexico.

**184.**
Ditty, J.G., G.G. Zieske, and R.F. Shaw. 1988. Seasonality and depth distribution of larval fishes in the northern Gulf of Mexico above latitude 26 degree 00'N. Fishery Bulletin 86(4):811-823.

ABSTRACT: None.

KEYWORDS: Water column biology; vertical distribution; Gulf of Mexico; fishery management; ichthyoplankton surveys; stock identification; fish larvae; seasonal variations; Gulf of Mexico; Pisces; Life Cycle; Larvae.

**185.**
Dodd, C.K. 1988. Biological Report-88,Synopsis of the Biological Data on the Loggerhead Sea Turtle *Caretta caretta* (Linnaeus 1758). U.S. Fish and Wildlife Service.

ABSTRACT:The report is the first to collate and synthesize the published data on the biology and management requirements of the loggerhead sea turtle. More than 850 literature references were covered. Topics discussed include taxonomy, morphology, life history, population biology, exploitation, protection, and management.

KEYWORDS:Endangered Species; Turtles; Marine biology; Management; Taxonomy; Morphology; Life cycles; Populations; Protection; Exploitation; Caretta Caretta; Loggerhead Sea Turtle.

**186.**

Douglas, B.C., R.E. Cheney, and R.W. Agreen. 1983. Eddy energy of the Northwest Atlantic and Gulf of Mexico determined from GEOS 3 altimetry. Journal of Geophysical Research 88(C14):9595-9603.

ABSTRACT: From May 1975 to October 1978 the GEOS 3 satellite altimeter made numerous repeated observations of sea surface topography in the Northwest Atlantic and Gulf of Mexico. By comparing members of about 1000 collinear pairs of altimeter profiles, mesoscale sea height variability and eddy kinetic energy in these ocean regions have been determined. Results agree qualitatively with estimates made from traditional oceanographic surveys, but significant quantitative differences exist in certain areas, especially in the Gulf Stream between Florida and Cape Hatteras where the altimetric results show less variability. The reason for this appears to be due to differences in spatial sampling. Historical oceanographic measurements are relatively sparse and must be aggregrated into small geographic boxes to compute variability statistics. Results therefore represent a combination of temporal and spatial variability. In contrast, repeated satellite altimeter tracks provide point measurements of changes of sea height and slope.

KEYWORDS: Physical Oceanography; oceanic eddies; ocean circulation; eddies; satellite altimetry; ANW; Geos 3; Gulf of Mexico.

**187.**

Doyle, E.H., M.J. Kaluza, and H.H. Roberts. 1992 . Use of manned submersibles to investigate slumps in deep water Gulf of Mexico. Proceedings of the International Conference on Civil Engineering in the Oceans V :770-782.

ABSTRACT: The Johnson-Sea-Link manned submersible was used to investigate surface slumps in the deep water Gulf of Mexico. High quality and specifically placed seafloor cores, video tapes, 35 mm pictures and manned observations were used to quantify the age and character of the slumps. Besides the two slumps investigated, cores were obtained in undisturbed areas to characterize ?in slump' geotechnical and geological characteristics with ?out-of-slump' characteristics. The slumps were initially identified through deep-tow, high-resolution side scan sonar and subbottom profiler records. A photographic mosaic of the slumps was created from the data to characterize the size and depth of the features. The slumps occur in clayey soils and are located in more 880 meters of water. Origin of the slumps was not identified in the study, but apparently occurred within the Recent epoch. For engineering purposes, the slumps are shown to have occurred long enough in the past that they will not be considered as a risk for future engineering development. (Author abstract) 5 Refs.

KEYWORDS: Geology; Underwater Soils; Submersibles; Core Samples; Characterization; Geology; Sonar; Underwater Cameras; Johnson Sea Link Manned Submersible; Gulf of Mexico; Slumps.

**188.**

Doyle L.J., Pilkey Jr O.H., and Woo C.C. 1979. Sedimentation on the eastern United States continental slope., pp 119-129. In: Doyle L.J., Pilkey Jr O.H., (Editors)Society of Economic Paleontologists and Mineralogists,

ABSTRACT: A major break in intercanyon continental slope sedimentation occurs at Cape Hatteras. N. of Cape Hatteras, slope sediments are dominantly silts which exhibit little change in grain size from upper slope to lower slope. Because of the Florida Current, S. of Cape Hatteras the upper slope has a greatly increased sand fraction and grain size decreases downslope. Intercanyon portions of the slope are active depocenters. N. of Hatteras, hemipelagic sedimentation is the dominant process with shelf spillover a secondary contributor. S. of the Cape, spillover is much more important. -from Authors.

KEYWORDS: Geology; Cape Hatteras; Sedimentation; Florida Current.

**189.**

Dutt, R.N., W.S. Rainey, T.K. Hamilton, J.H. Pelletier, Doyle, and E.H. 1997. Offshore Technology Conference, Annual Proceedings 1:OTC 8303.

ABSTRACT: The methods and the technology for deepwater geotechnical investigations in the Gulf of Mexico (GOM) have evolved over a number of years, and this evolution has been punctuated by several technological advancements. Deepwater geotechnical investigations are now pushing the limits of present capabilities, both in terms of drilling and in situ testing tools. More efficient and advanced tools are being developed to keep pace with the ever increasing water depth requirements and the related technological challenges. This paper describes some of the recently developed tools. Where existing tools have been modified, both the shortcomings and improvements are discussed. The tools described in the paper include the small-diameter piezoprobe, wireline hydraulic fracture tool, Halibut II remote vane shear system, and the long-stroke cone penetrometer system, which is still in the initial stages of development. Also described in the paper are the ongoing joint industry projects that are part of this tool development effort. Investment and continuous tool development will make it possible for the geotechnical community to meet the future challenges in 2000-m to 3000-m water depth.

KEYWORDS: Underwater drilling; Hydraulic fracturing; Probes Identifiers: Piezoprobe; Wireline hydraulic fracture tool; Remote vane shear system; Cone penetrometer.

**190.**

Ebbesmeyer, C.C., G.N. Williams, R.C. Hamilton, C.E. Abbott, B.G. Collipp, and C.F. McFarlane. 1982. Strong persistent currents observed at depth off the Mississippi River delta. Offshore Technology Conference :259-265.

ABSTRACT: Currents recorded off the Mississippi River delta at the Cognac and OTEC sites for 1.8 years show that mean speeds of 0.9-1.7 foot per second persist at depth (~ 300-600 ft) during discrete Events. Eleven Events lasted an average of 8 days, the longest of which persisted for 25 days; intervals between the Events varied between 676 days with a mean interval of 30 days; and the Events occurred in all seasons. During an Event the current direction was steady and oriented either eastward or westward along the bottom contours. The vertical structure of an Event can be complex with large changes in speed over short depth ranges. The structure of one Event showed an isolated core of maximum current centered near a depth of 600 ft. The events are apparently not related to the passage of cyclones or Mississippi River discharge. Most likely the Events are associated with effects of the Loop Current.

KEYWORDS: Physical Oceanography; Currents; Mississippi River Delta ; Cognac; Gulf of Mexico.

**191.**

Ebeniro, J.O. 1986. Structure and crustal type of the northwestern Gulf of Mexico derived from very large offset seismic data (ocean bottom, seismographs, seismometer). PhD. Dissertation. University Of Texas . Austin, TX.

ABSTRACT: Understanding the origin and geologic evolution of the Gulf of Mexico requires a good knowledge of the nature and type of the crust beneath the thick sedimentary cover. This thick sedimentary sequence and also numerous, shallow, high-velocity salt and carbonate features existing in the Gulf margins make it difficult, and often impossible, to probe the underlying crustal structures using conventional seismic refraction techniques or modern seismic reflection techniques. In 1983, the University of Texas Institute for Geophysics conducted a large-offset seismic experiment in the northwestern Gulf using large-capacity air guns and digital ocean-bottom seismographs to determine the structure and crustal type for this area. Five profiles were shot over an area extending from the shallow mid-shelf south of Galveston to the continental rise just south of the Sigsbee escarpment. These newly acquired data allowed combined use of near-vertical reflections, wide-angle reflections and refractions for interpretation. In addition to the conventional constant-velocity-layer analysis, several unconventional techniques were used to obtain complementary velocity-depth functions for this area. These techniques included: (1) determination of interval velocities from moveouts of the pre-critical reflections, (2) analysis of pre- and post-critical reflections in the tau-p domain to determine extremal depth bounds for constant-velocity layers, (3) forward modeling using two-dimensional (2-D) raytracing for 2-D velocity distributions, and finally (4) estimation of the thickness of the allochthonous salt from the relationship between the extent of salt refraction and the thickness of the salt. A 13 to 15 km thick sedimentary sequence lies beneath the northwestern Gulf. Various types of salt features exist within the sediments in the slope area, ranging from deeply buried layers and diapirs under the inner slope to shallow, thin, allochthonous bodies under the outer slope. In contrast to the sedimentary section, the crust shows considerable variation in thickness, from normal oceanic crust underneath the continental rise to nearly continental thickness underneath the shelf. The crustal transition under the slope, however, is not monotonous but includes nearly oceanic thickness under the mid-slope, which suggests a failed incipient rifting zone there.

KEYWORDS: Geology; Geophysics.

**192.**

El-Sayed, S.Z. 1972. Primary productivity and standing crop of phytoplankton., pp 8-13. In: Bushnell VC, (Editor). Chemistry, Primary Productivity, and Benthic Algae of the Gulf of Mexico. American Geographical Society, New York.

ABSTRACT: None.

KEYWORDS: Water column biology; phytoplankton; primary productivity.

**193.**

Elliott, B.A. 1982. Anticyclonic rings in the Gulf of Mexico. Journal of Physical Oceanography 12(11):1292-1309.

ABSTRACT: Using the historical data set, this study describes the anticyclonic rings that separated from the Loop Current in the eastern Gulf of Mexico. Six quasi-synoptic data sets are used to describe the evolving circulation of the Gulf of Mexico from October 1966 to September 1967, showing the separation and movement into the western Gulf of three anticyclonic rings. The historical data are used to determine that these rings typically translate to the west at a mean speed of 2.1 km day super(-1). Their length scale as defined by their rms radii is 183 km. An estimate of ring life-span, as defined by an e-folding time, is one year.

KEYWORDS: Physical Oceanography; current rings; wind stress; anticyclones; rings; Gulf of Mexico.

## 194.

Emmer, R.E., A. Rheams, and F. Wagner. 1992. Offshore Petroleum Development and the Comprehensive Planning Process,Final rept. Minerals Management Service, New Orleans, LA. Gulf of Mexico OCS Region.

ABSTRACT:Outer Continental Shelf petroleum activity began in 1947 when the first well was drilled in the Gulf of Mexico out of sight of land. Communities had the opportunity to plan for what would take place as a result of OCS activities and some did through the Section 701 program. But the Department of Public Works, the parishes, and the municipalities were operating with guidance from obsolete State laws. The State statute that defines the comprehensive plan was based on the Standard City Planning Enabling Act of 1928, which was known to be out of date by the end of World War II. In most instances medium and small communities could not afford full-time planners and did not keep abreast of the changing concepts in planning.

KEYWORDS:Socioeconomics; Louisiana; Offshore drilling; Regional planning; State government; Local government; Coastal regions; Law(Jurisprudence); Government policies; Decision making; Comprehensive Planning; Ocs(Outer Continental Shelf); Ntisdilmla.

## 195.

Ensminger, H.R. and J.E. Matthews. 1972. Origin of Salt Domes in Bay of Campeche, Gulf of Mexico. The American Association of Petroleum Geologists Bulletin 56(4):802-807.

ABSTRACT: A geophysical survey conducted in the Bay of Campeche, Gulf of Mexico, was completed by the USNS Kane in 1969. A magnetic map and a composite geophysical profile constructed from this information have yielded new significant data concerning the origin of salt domes in this region. Basement structures apparently are coincidental with the area in which salt diapirism has occurred in the Bay of Campeche, and could have been the mechanism by which formation of the diapirs was initiated and subsequently controlled.

KEYWORDS: Geology.

## 196.

Entzeroth, L.C. 1982. Particulate matter and organic sedimentation on the continental shelf and slope of the northwest Gulf of Mexico. Ph.D. Dissertation. University of Texas. Austin, TX.

ABSTRACT: A study of the source and rate of vertical transport of particulate organic matter on the shelf and slope of the Northwestern Gulf of Mexico was done. The study included zooplankton, total particulate organic matter, surface sediments and sediment cores. The organic matter was characterized with respect to percent carbon and nitrogen, (delta)('13)C and the chemical composition of the lipid fraction.^ Sediment trap studies on the South Texas shelf and upper slope indicated that approximately 60 to 80 percent of the organic carbon produced is recycled in the upper 100 meters of the water column. There is also a substantial loss of organic matter through oxidation, dissolution or resuspension at the sediment-water interface. Kerogen and humic fractions are the major particulate organic components below the euphotic zone. These fractions retain their isotopic identity as they are incorporated into the sediments. The flux of the lipid fraction decreased more rapidly than the total organic flux both in the water column and at the sediment surface and appears to undergo significant isotopic fractionation as it is incorporated into the sediments. Sedimentary fatty acid and hydrocarbon compositions showed significant quantities of terrestially derived lipid material across the shelf and upper slope. Profiles of sediment cores from the northwest slope of the Gulf of Mexico showed organic carbon (delta)('13)C values ranging from -19.2 to -27. ('o)/oo. Some cores showed distinctive shifts in (delta)('13)C with depth from values around -20 ('o)/oo to values around -25 ('o)/oo. C/N ratios of these sediment samples generally support the theory that the isotopic changes are due to a shift from interglacial marine-dominated organic matter to terrestially-dominated organic matter deposited during glacial periods of the Pleistocene.

KEYWORDS: Chemistry; Geo.

**197.**

Erdman, R.B., N.J. Blake, F.D. Lockhart, W.J. Lindberg, H.M. Perry, and R. Waller. 1991. Comparative reproduction of the deep-sea crabs Chaceon fenneri and C. quinquedens (Brachyura: Geryonidae) from the northeast Gulf of Mexico. Invertebrate Reproduction & Development 19(3):175-184.

ABSTRACT: Northeastern Gulf of Mexico populations of deep-sea golden crabs (Chaceon fenneri ) and red crabs (C. quinquedens ) were sampled quarterly from May 1987 through February 1988 to examine the timing of reproductive events. C. fenneri was most abundant at sample depths between 311 and 494 m while C. quinquedens showed a minimum depth of occurrence of 677 m. Both species exhibited an annual reproductive cycle with a distinct winter brooding period. However, oviposition in C. quinquedens began in May, approximately three months earlier than in C. fenneri ; consequently the single batch of eggs produced were brooded for nine months in C. quinquedens and six months in C. fenneri . Larvae of both species hatched during February and March of the following year. Differences in the duration of reproductive events may reflect the segregated bathymetric distribution of each species. The incidence of molting females and non-ovigerous females observed during the fall-winter brooding period suggests that although both species reproduce annually on the population level, individuals may reproduce biennially. This low frequency of reproduction may be a consequence of the reduced food supply characteristic of the continental slope environment.

KEYWORDS: comparative studies; deep waters; Gulf of Mexico; *Chaceon fenneri*; *Chaceon quinquedens*; Reproduction.

**198.**

Etter, P.C. 1975. A climatic heat budget study of the Gulf of Mexico. M.S. thesis. Texas A&M University. College Station, TX.

ABSTRACT: Monthly and annual mean heat budgets are calculated for four regions covering the Gulf of Mexico. The radiation balance at the sea surface ($Q_R$) is based on direct measurements of incoming solar radiation, as presented by Löf, Duffie and Smith (1965) [cited in de Jong (1973)]. The evaporation rate (E) is calculated by use of bulk-aero-dynamic formulae on the basis of meteorological data dating from 1858 to 1971, as available from the National Climatic Center; the annual mean for the Gulf of Mexico was found to be 204 centimeters per year, substantially higher than found in previous work. However, verification based on aerological data has been obtained from the evaporation-minus-precipitation (E-P) values of Cummings (1968) and good estimates of P. The sensible heat flux ($Q_H$) is calculated by use of Bowen's ratio. The rate of heat storage ($Q_T$) is calculated apparently for the first time directly by use of available bathythermograph (BT) data. Heat flux divergence due to currents ($Q_V$ ), calculated as a residual in the heat budget equation, is small. The monthly mean values of $Q_R$ and $Q_A$ obtained in this study are greater than those found by Hastenrath (1968) for the entire Gulf of Mexico. The best agreement, based on annual averages, was found with Budyko (1963) [cited in Budyko (1974)].

KEYWORDS: Physical Oceanography.

**199.**

Etter, P.C. 1983. Heat and freshwater budgets of the Gulf of Mexico. Journal of Physical Oceanography 13(11):2058-2069.

ABSTRACT: Monthly mean oceanic heat storage rates ($Q_T$ for the upper 200 meters of the Gulf of Mexico are calculated directly from multi-annual vertical temperature data. The annual march of $Q_T$ exhibits a minimum of -170 W $m^{-2}$ in January and a maximum of 170 W $m^{-2}$ in May. Spatial distributions of $Q_T$are contoured on maps for February, May, August and November. These maps elucidate climatic features of air-sea interactions occurring over the Loop Current and also near the shelf edges of the northern Gulf. Three previous climatic heat budget studies encompassing the Gulf of Mexico are examined to determine the surface heat exchange: Budyko's and Bunker's--supplemented with more detailed but unpublished monthly results; and studies by Hastenrath and Lamb. While Budyko's values provide a familiar basis for comparisons, the more recent unpublished results of Bunker and Hastenrath and Lamb are averaged together to define the monthly mean radiative ($Q_R$ and turbulent ($Q_A$ heat exchanges in the Gulf of Mexico.

KEYWORDS: Physical Oceanography; water budget; heat budget; heat exchange; Gulf of Mexico.

**200.**

Etter, P.C., W.F. Ulm, and J.D. Cochrane. 1985. The relationship of wind stress to heat flux divergence of Texas-Louisiana shelf waters. Continental Shelf Research 4(5):547-52.

ABSTRACT: Monthly, multi-annual mean heat budgets are calculated for waters overlying the Texas-Louisiana shelf. Heat storage rates are calculated on the basis of a volumetric temperature-salinity census; unpublished data from Bunker are consulted to determine surface heat exchanges. Monthly heat flux divergences, calculated as residuals in the heat budget equation, show divergence of heat during the months of June and July, the upwelling season for much of the Texas-Louisiana coast, and convergence of heat during the rest of the year when winds conducive to downwelling prevail.

KEYWORDS: Physical Oceanography; Oceanography; Continental Shelf; Ocean; Dynamics; Coast; Monthly; Heat Storage Rate; Wind Stress; Heat Flux Divergence; Texas-Louisiana Shelf Waters; Temperature-Salinity; Heat Budget; Upwelling; Downwelling; Gulf of Mexico.

**201.**

Ewing, J.I., N.T. Edgar, and J.W. Antoine. 1970. Structure of the Gulf of Mexico and Caribbean Sea, pp 321-358. In: Maxwell AE. The Sea, Ideas and Observations on Progress in the study of the seas. 4. John Wiley and Sons,

ABSTRACT: The Gulf of Mexico is a mediterranean sea with a maximum depth of approximately 3700 m. The deep basin is underlain by a quasi-oceanic crust that contains an exceptionally thick sequence of sediments. In general, its borders can be divided into two separate parts: the southeastern section, which is predominantly carbonate; and the northwestern section, which is predominantly clastic. Evidence from deep-sea cores and onshore drilling indicates that the margins of the deep basin have been subsiding at least since Early Cretaceous time. Indirect evidence from seismic refraction investigations suggest the basin itself also has been subsiding. The great thickness of sediment on the basin is documented by both seismic-reflection and refraction studies; these show that the major input of sediments was from the north and northwest. The influence of the river systems that delivered these sediments shifted toward the east during the Tertiary, that is, the great Eocene sedimentation came mainly from the Rio Grande, the mid-Tertiary depocenters were related to the more easterly rivers of Texas, and the Pleistocene and Recent sediments were related to the present-day Mississippi drainage system (Hardin, 1962). An interesting characteristic of this clastic province is the widespread occurrence of salt. Through much of the Texas, Louisiana, and Mississippi coastal plains, northern Mexico, and the saline basin of southern Mexico, the presence of salt is known from drilling. Geophysical evidence (gravity and seismic) suggests that the entire continental slope of the northern Gulf from Alabama to northern Mexico is underlain by salt, as are the shelf and slope of southern Mexico. Although the evidence is less conclusive, the possibility exists that at least the western portion of the deep basin and the western boundary of the Gulf are also underlain by salt. The association of the Sigsbee Knolls and Domes to the salt structures of the saline basin of Mexico (Worzel et. al., 1968) and the relationship of the exposed linear folds to the proposed salt anticlines of the northern Gulf (Bryant et al., 1968) make these suggestions tenable. Many hypotheses have been suggested for the origin and development of the Gulf of Mexico. These include: (a) the central portion of the basin was a land mass (llanoria) that was downfaulted along the existing scarps; (b) North America drifted toward the north opening a rift that is now the Gulf; (c) although an original basin was present with its eastern boundary adjacent to the African continent, it was moved to its present location by sea-floor spreading; a possible elevation of the basin is associated with the early spreading; and (d) the Gulf of Mexico represents an original oceanic basin that has received a great amount of sediment, which caused further subsidence of the crust and mantle.

KEYWORDS: Geology.

**202.**

Ewing, J. I., J. L. Worzel, and M. Ewing. 1962. Sediments and oceanic structural history of the Gulf of Mexico. Journal of Geophysical Research 67(6):2509-27.

ABSTRACT: A new technique for underway marine seismic reflection measurements was used in January 1961 to investigate the sediments in the deep basin of the Gulf of Mexico. Reflecting horizons, mapped to depths about 5 km below the ocean bottom or about 10 km below sea level, confirmed and added detail to the section published in 1960 on the basis of refraction data. The reflecting horizons were identified by comparison with seismic refraction and wide-angle reflection data. Measurements were made, in the area of the Sigsbee knolls, along two complete crossings of the deep basin, and along some shorter lines in mid-basin. It was found that: (1) During the present cycle of sedimentation (which extends back to Jurassic time, at least) a minimum of 5 km of sediment has been deposited in the Sigsbee basin. A gentle northerly dip is present throughout, except in the upper layers near the Sigsbee scarp, where the dip is reversed by thickening of some beds to the north. (2) Several reflectors exist within the sediment. The two principal ones and also the floor of the basin in which the sediments have been deposited are identified by refraction measurements. (3) The Sigsbee knolls, which rise a few hundred meters above the floor of the abyssal plain of the Sigsbee deep, in about 3.7 km of water, are found to be tops of tall vertical columns, apparently intrusive into the sediment. (4) Four additional knolls and 17 buried structures were discovered. All the structures are tentatively called salt domes. (5) Twenty-one of these domes were found by rough reconnaissance survey in an area 90 km wide by 200 km long, which trends north 60°E, is approximately median to the deep basin of the Gulf, and may extend to include the domes on the Isthmus of Tehuantepec. (6) Refraction profiles in this basin indicate that although the sediment is much thicker than that in a typical ocean basin, the crust beneath it is practically identical with that in the permanent ocean basins. Thus it is highly probable that this basin has never been land or shallow sea. (7) These facts suggest that the Louann salt beds, which supplied the domes in the Texas-Louisiana region, continue across the Sigsbee basin at a depth of about 8 km below sea level, and that they were deposited in water depths up to 5 or 6 km. (8) The region in which great thicknesses of sediments have accumulated, sometimes called the Gulf Coast, geosyncline, extends to the Campeche scarp. Isostatic adjustments have caused the faults and flexures along the Texas-Louisiana coast region and warping of the basin floor.

KEYWORDS: Geology.

**203.**

Ewing, M., D.B. Ericson, and B.C. Heezen. 1958. Sediments and topography of the Gulf of Mexico, pp 995-1053. In: Weeks LG, (Editor). Habitat of Oil . American Association of Petroleum Geologists ,

ABSTRACT: The topography of the floor of the Gulf of Mexico is dominated by the Mississippi Cone, the apex of which lies a few hundred feet below sea level at the Pleistocene mouth of the Mississippi River, and limits of which are formed by the scarps bounding the main basin. On the southwest the Mississippi Cone merges with the remarkably flat Sigsbee abyssal plain.

The sediments of the Cone and the closely related abyssal plain are all remarkably similar. The top 30-50 centimeters of each core from the abyssal plain and lower Mississippi Cone is largely composed of formaminiferal lutite. This bed reaches its maximum thickness of 4 meters on the upper cone and on the upper continental rise. The lower portion of each core is composed of gray silty clay which forms a layer so thick that, with one exception it has never been completely penetrated by a 30-foot coring tube. Micropaleontological correlation and radiocarbon dating have established the abrupt transition at the base of the ooze as the Pleistocene-Recent boundary (11,000 years B.P.). In sharp contrast cores from three low knolls rising from the abyssal plain contain no gray silts and represent pelagic deposition well back into the Pleistocene. The deposition of gray silts and clays on the cone and on the floor of the abyssal plain at the same time that the pelagic sediment was being deposited on the knolls proves that the gray silts were transported along the sea floor. Evidence from sediments and topography indicates that the Mississippi Cone was formed by the turbidity current transportation and deposition of silty sediments supplied in quantity by the Pleistocene Mississippi River.

KEYWORDS: Geology.

**204.**

Ewing, M. and J. Antoine. 1966. New seismic data concerning sediments and diapiric structures in Sigsbee Deep and upper continental slope, Gulf of Mexico. American Association of Petroleum Geologists Bulletin 50(3, Part 1):479-504.

ABSTRACT: An Electro-Sonic Profiler (ESP) and Precision Depth Recorder (PDR) survey was made from Galveston across Sigsbee Deep to Campeche Shelf and back. Campeche Shelf is a constructional continental-shelf terrace, involving both upbuilding and outbuilding, and its contribution of sediments toward the north is slight. Several new knolls and domes reported in Sigsbee Deep are believed to be diapirs. Numerous diapiric structures, found from Sigsbee Scarp northward toward the continental shelf, suggest continuity of the belt of diapirs from the U.S. Gulf Coast to Sigsbee Scarp. Sigsbee Scarp is interpreted as the front of a system of diapiric uplifts and ridges having salt cores. The ridges may have helped in building the continental border by trapping sediments. Sigsbee knolls and domes are not associated with continental-margin growth.

KEYWORDS: Geology; Atlantic Ocean; Campeche Shelf; Continental Shelf; Continental Shelf and Slope; Continental Slope; Diapirs; Galveston to Campeche Shelf; Geophysical Surveys; Gulf of Mexico; Marine Geology; North Atlantic; Salt Tectonics; Sediments and Diapirs; Seismic Data; Seismic Surveys; Structure; Structure and Sediments; Surveys; Tectonics.

**205.**

Farber, S. and D.B. Johnson. 1976. The Impact of Oil and Gas Exploration, Development, and Production on the Outer Continental Shelf on Louisiana: Background and Methodology,Louisiana State Dept. of Conservation. Baton Rouge, LA.

ABSTRACT:This report contains data on OCS development and some financial implications for the state. But the major portion of the study is concerned with alternative methodologies, and their related evaluations, which can be applied to measuring the impact of petroleum and gas mining activity on the Outer Continental Shelf (OCS) adjacent to Louisiana. For purposes of this report the OCS extends seaward from the outer 3 mile limit of the state's jurdisiction to the limit of the continental margin. Chapter 2 contains a survey of the literature. Because the impact methodology proposed is based heavily on the input-output technique, Chapter 3 presents a summary of input-output technology. Chapter 4 summarizes the production and processes of the OCS industry. Chapter 5 presents the methodology for estimating OCS related expenditures and their impact on Louisiana. Chapter 6 is concerned with the methodology of estimating the fiscal impact on Louisiana's governments and Chapter 7 briefly discusses the environmental impact and literature.

KEYWORDS:Socioeconomics; Energy source development; Offshore drilling; Continental shelves; Louisiana; Petroleum industry; Natural gas; Exploration; Economic analysis; Environmental impacts; Management planning; Government policies; Transportation; Storage; State government; Geophysical prospecting; Water pollution abatement; Coasts; Outer Continental Shelves.

**206.**

Feagin, J.R. 1990. Extractive regions in developed countries: a comparative analysis of the oil capitals, houston and aberdeen. Urban Affairs Quarterly 25(4):591-619.

ABSTRACT: The cities of Aberdeen, Scotland, & Houston, Tex, have been greatly shaped by investment decisions made by oil & gas executives in the world oil & gas system. In Houston, planners' attention has been given largely to the interests of the investors, rather than to community costs of development. In contrast, in Aberdeen, the primary focus of planning has been to safeguard community growth & infrastructure & to alleviate the social costs of large-scale development by the oil industry. These differences in focus are due in part to the differing nature of power & autonomy of action held by the planners. However, in spite of their emphasis on the protection of public interests, the planners of Aberdeen have remained prisoners of capitalism, dependent on the mechanism of profit maximization to produce jobs. 74 References. AA (Copyright 1991, Sociological Abstracts, Inc., all rights reserved.).

KEYWORDS: Socioeconomics; Houston, Texas; Scotland ; Petroleum Industry; Economic Development; Planners; City Planning; oil; gas development.

**207.**

Feeley, M.H. 1984. Seismic stratigraphic analysis of the Mississippi Fan. PhD. Dissertation. Texas A&M University. College Station, TX.

ABSTRACT: Examination of extensive multichannel and single-channel data across the Mississippi Fan, Gulf of Mexico reveals that at least eight seismic sequences comprise the Pliocene/Pleistocene section (sequences I-VIII, oldest to youngest). The sequence boundaries are basin-wide unconformities identified on the basis of truncation and reflector terminations. In general, each sequence is lens-shaped in cross-section, thinning laterally from an area of maximum thickness. Isopach and structure maps compiled for each of the sequences indicates a seaward and eastward migration in the fan depocenter during its development. Mapping of the orientation of the axis of maximum thickness for each sequence indicates a major eastward shift in the depocenter during the Late Pleistocene. This shift suggests a major influx of sediment from sources other than the Mississippi River Embayment, possibly from the DeSoto Canyon. Seven seismic facies have been identified within the fan unit, each with one or more facies types. A depositional mechanism has been proposed for each based on the reflection pattern, position within each sequence, and lateral facies relationships. Channel, overbank, mass transport, and turbidity flow deposits have been interpreted within each sequence. Each facies occupies a unique position in the evolution of each sequence, reflecting a succession of depositional regimes. This succession may be related to cycles of sea level fluctuations. Analyses of facies distributions and interpreted depositional mechanisms suggest that the development of an individual sequence can be described in four stages. (1) Initial deposition is characterized by thick, mounded chaotic units, probably the result of mass transport depositional processes. Initiation of canyon development may occur during this stage. Major deposition is possibly triggered by a fall in sea level, when rapid progradation of the shelf edge occurs with associated failure of unstable sediment. (2) Stage 1 deposits are capped by higher amplitude, moderate continuity reflectors which fill across the irregular upper surface of the mass transport deposits. The reflection patterns suggest deposition from predominantly turbidity flows, possibly associated with the middle to late stages of a fall in sea level. Canyon development continues. (3) "Classic" channelized lobe deposition occurs during this stage. The canyon controls deposition, channelizing the flow of the material reaching the fan. . . . (Author's abstract exceeds stipulated maximum length. Discontinued here with permission of author.) UMI.

KEYWORDS: Geology; Seismic Exploration.

**208.**

Feeley, M.H., R.T. Buffler, and W.R. Bryant. 1985. Depositional units and growth pattern of the Mississippi Fan, pp 253-257. Submarine fans and related turbidite systems. I. Springer-Verlag, New York.

ABSTRACT: Basin-wise unconformities within the Plio-Pleistocene section of the Mississippi Fan define eight major sequences. Isopach maps of the sequences reveal that fan depocenter has migrated both eastward and seaward through its development. Definition and interpretation of seismic facies suggest mass transport, with channelized/unchannelized turbidite deposition were the important depositional mechanisms during fan growth. Although each sequence has a unique history, certain characteristics, particularly the vertical and lateral succession of seismic facies, are common to the majority of sequences. This succession suggests a dominant controlling mechanism on fan development, possibly sea-level fluctuations, with secondary influences of salt tectonics and sediment supply.

KEYWORDS: Geology.

**209.**

Feely, R.A. 1975. Chemical characterization of the particulate matter in the near bottom nephloid layer of the Gulf of Mexico. PhD. Dissertation. Texas A&M University. College Station, TX.

ABSTRACT: During cruises 71-A-12 and 73-A-3 of the R/V Alaminos eighty-six samples of suspended matter at eleven near bottom stations in the Gulf of Mexico and northwestern Caribbean Sea were collected, and simultaneously, values for light scattering were measured. Selected samples of the suspended matter were analyzed for particulate aluminum, silicon, calcium, magnesium, organic carbon and inorganic carbon. The results indicate that a permanent but highly variable near bottom nepheloid layer exists in the Gulf of Mexico but not the northwestern Caribbean Sea. Average total suspended loads in the Gulf of Mexico nepheloid layer are two times higher than in the clear water above the nepheloid layer. Since there is a significant increase in the aluminosilicate fraction and a corresponding decrease in the organic fraction of the total suspended matter, it would appear that the sediments are the most probable source of the increased concentrations of suspended matter in the nepheloid layer. This hypothesis is supported by X-ray diffraction analyses on the nepheloid material collected at one station which show the same mineral assemblages as the underlying sediments. Time studies over periods of one week and one and one-half years showed large total suspended matter variations which indicate that non steady-state processes, primarily vertical eddy diffusion and possibly advection, are controlling the distribution of suspended matter in the nepheloid layer.

KEYWORDS: Chemistry; nepheloid layer.

**210.**

Feely, R.A., W.M. Sackett, and J.E. Harris. 1971. Distribution of Particulate Aluminum in the Gulf of Mexico. Journal of Geophysical Research 76(24):5893-5902.

ABSTRACT: Particulate aluminum, defined as the aluminum retained on 0.45-microgram pore-size membrane filters, was determined fluorimetrically for 21 surface samples and 51 depth samples in 8 profiles from the Gulf of Mexico. The average concentration was 2.0 micrograms Al/l. The ratio of particulate aluminum as aluminosilicate to total suspended material averaged 0.14 for the surface, decreased to 0.08 in the middle of the euphotic zone and then increased to 0.30 at depths down to 1000 meters. Most profiles showed an increase along the thermocline. Relatively low and similar values for inflow and outflow indicate that the Gulf of Mexico and its distributive province is a closed system with respect to aluminosilicate materal. Suspended matter in this study region is approximately 50% organic, 20% aluminosilicate, and 30% other inorganic material. (Author).

KEYWORDS: Chemistry; Gulf of Mexico; Sea Water; Aluminum Compounds; Silicates; Particles; Rock(Geology); Aging(Materials); Continenta L Shelves; Sampling; Concentration(); Thermoclines; Tables; Reprints.

## 211.

Ferebee, T.W.Jr. 1979. Sedimentation in Mississippi Trough, Gulf of Mexico. The American Association of Petroleum Geologists Bulletin 63(3):449+.

ABSTRACT: Interpretation of high-resolution seismic data indicates that the Mississippi Trough was eroded, and then partially filled, by submarine gravity flows. These flows occurred primarily during late Quaternary stages of lowered sea level. Present-day mass transport appears to be a combination of seafloor creep and low-velocity turbid-layer flow.
An acoustically chaotic seismic facies characterizes the deeper parts of the trough fill. Visible reflectors are discontinuous, wavy and subparallel: they commonly disappear into almost reflectorless, seismically homogeneous units. Sediments deposited lateral to the chaotic facies are commonly composed of continuous, parallel reflectors. These strong reflecting units were deposited as onlapping fill and ponded sediments, and many are confined to semienclosed depressions within the trough walls. These various seismic-facies units represent the "freezing-in" stage of submarine-canyon sedimentation, and may result from separate submarine debris flows. The deposits of the Mississippi Trough debris flows are fine-grained sediments generated by mass failures of oversteepened deposits which occurred at the mouth of the ancestral Mississippi River. High-energy gravity flows thoroughly mixed the depositional material, leaving little bedding to produce coherent seismic-reflector patterns. Debris flows generated lower velocity gravity flows, which moved independently and lateral to the main flows. The onlapping fill deposits and sediment ponding were deposited by lower velocity flows. Recent sediments, which were sampled by piston coring along the axis of the trough, are rapidly deposited, hemipelagic, olive-gray silty clays. Sedimentary structures are limited to scattered, very thin laminae and thin beds. Clay sedimentation has been continuous during the late Quaternary, as is revealed by the clays containing mixtures of indigenous planktonic Foraminifera, displaced shallow-water microfauna, and terrigenous mineral grains. Large diapirs controlled the position and flow direction of the main erosional channel. Small feeder channels were eroded into the walls of the trough. Trough-wall sediments cover a steep erosional escarpment; they have moved downslope by slump and creep failure. An isopach map of the canyon fill, above erosional surfaces, outlines a linear channel-fill deposit.

KEYWORDS: Geology.

## 212.

Ferrell, R.E., P.A. Flanagan, and S.B. Devine. 1971. Comparative mineralogy of Recent and Pleistocene sediments from the deep Gulf of Mexico,In: J.P. Morgan, R.E. Ferrell, (Editors). Quarternary geology of the Louisiana continental shelf. U.S. Geol. Survey Tech. Rep. No. 3. Louisiana State University, Baton Rouge, LA.

ABSTRACT: None.

KEYWORDS: Geology.

## 213.

Fertl, D., A.J. Schiro, S. Collier, and G.A.J. Worthy. 1997. Stranding of a Cuvier's beaked whale (Ziphius cavirostris) in southern Texas, with comments on stomach contents. Gulf of Mexico Science 2:92-93.

ABSTRACT: A stranded Cuvier's beaked whale (*Ziphius cavirostris*) was reported on 2 April 1994 on South Padre Island, Texas. After recovery the following day, the animal was examined and found to be an immature female. Partial stomach contents were collected from multiple stomach chambers and analyzed. The contents included squid beaks and eye lenses, Nematoda, a mango seed, a corncob, and unidentified, black material which was believed to be coal. One squid beak was identified from *Loligo peali*, which is found within continental shelf waters of the Gulf of Mexico. *L. peali* constitutes a new species to the list of known prey items of Cuvier's beaked whales.

KEYWORDS: Endangered Species; Cetacea; Gulf Of Mexico; Strandings.

**214.**

Finger, K. L. 1981. Faunal reference list for Gulf of Mexico deep-water foraminifers recorded by Pflum and Frerichs in 1976. Journal of Foraminiferal Research 11(3):241-51.

ABSTRACT: This faunal reference list supplements Pflum and Frerichs's 1976 report, "Gulf of Mexico Deep-Water Foraminifers" (Cushman Found. Foram. Res., Spec. Publ. 14), by emending the original species list (ibid., Appendix F) with overlooked species recorded in the traverses (Appendices C, D, and E), type-references, and clarification of ambiguities resulting from inconsistencies in their taxonomic nomenclature. This list will aid foraminiferalogists studying Pleistocene-Recent Gulf of Mexico slope faunas in evaluating parts of Pflum and Frerichs's study for possible incorporation into their paleontologic programs.

KEYWORDS: Biology.

**215.**

Firth, R.W. and W.E. Pequegnat. 1971. Deep-Sea Lobsters of the Families Polychelidae and Nephropidae (Crustacea, Decapoda) in the Gulf of Mexico and Caribbean Sea,Technical rept. Texas A&M University, Department of Oceanography. 700-15.

ABSTRACT:A preliminary report on the deep-sea lobsters of the families Polychelidae and Nephropidae with particular emphasis upon their occurrences in the Gulf of Mexico and central Caribbean Sea is presented. Taxonomic keys to species in both families are provided. Particularly in the case of the Polychelidae an evaluation is made of the relative importance of certain structural traits as taxonomical characters. Consideration is also given to the possibility of vertical breeding migrations in some species of Polycheles. The problem of 'hard' and 'soft' species of the genus Willemoesia is also examined. Some extensions of geographic and vertical range are noted. The maximum size ranges are also extended for several species. The problem of intergrades between Polycheles t. typhlops and Polycheles typhlops perarmatus is discussed thoroughly. The fact that no polychelid has been photographed by bottom cameras aboard the R/V Alaminos in areas where they are known to abound suggests something about their life habits. (Author).

KEYWORDS:Crustacea; Gulf of Mexico; Caribbean Sea; Distribution; Classification; Morphology; Lobsters; Polychelidae; Nephropidae.

**216.**

Fisher, C.R. 1993. Oxidation of Methane by Deep-Sea Mytilids in the Gulf of Mexico, pp 606-618. Biogeochemistry of global change: radiatively active trace gases: selected papers from the Tenth International Symposium on Environmental Biogeochemistry, San Francisco, August 19-24, 1991. Chapman & Hall, New York.

ABSTRACT: At least four different species of mytilids which harbor abundant bacterial symbionts in their gills have been discovered in three general areas of the Gulf of Mexico. Two of the species harbor methanotrophic symbionts, one harbors both methanotrophic and chemoautotrophic sulfur-oxidizing symbionts, and the fourth harbors only chemoautotrophic sulfur-oxidizing symbionts. Mytilids with methanotrophic symbionts can reach very high densities and dominate the habitats in which they occur. Estimates of methane oxidation by the most shallow of these mytilid communities (500-700 m) are made based on mussel population size structues and densities, measurements of live animal methane oxidation rates and requirements for methane, in situ levels of dissolved methane, and the empirically determined relation between shell size and tissue biomass. This estimation indicates that oxidation rates between 22.4 and 42.4 g $CH_4m^{-2}d^{-1}$ are occurring within beds of these mytilids.

KEYWORDS: Biology; Seeps.

**217.**
Fisher, C.R., J.J. Childress, R.S. Oremland, and R.R. Bidigare. 1987. The importance of methane and thiosulfate in the metabolism of the bacterial symbionts of two deep-sea mussels. Marine Biology 96(1):59-72.

ABSTRACT: Undescribed hydrocarbon-seep mussels were collected from the Louisiana Slope, Gulf of Mexico, during March 1986, and the ultrastructure of their gills was examined and compared to Bathymodiolus thermophilus, a mussel collected from the deep-sea hydrothermal vents on the Galapagos Rift in March 1985. These closely related mytilids both contain abundant symbiotic bacteria, in their gills. However, the bacteria from the two species are distinctly different in both morphology and biochemistry, and are housed differently within the gills of the two mussels. The symbionts from the seep mussel are larger than the symbionts from B. thermophilus and, unlike the latter, contain stacked intracytoplasmic membranes. In the seep mussel three or fewer symbionts appear to be contained in each host-cell vacuole, while in B. thermophilus there are often more than twenty bacteria visible in a single section through a vacuole. The methanotrophic nature of the seep-mussel symbionts was confirmed in 14C-methane uptake experiments by the appearance of label in both CO2 and acid-stable, non-volatile, organic compounds after a 3 h incubation of isolated gill tissue. Furthermore, methane consumption was correlated with methanol dehydrogenase activity in isolated gill tissue. Activity of ribulose-1,5-biphosphate (RuBP) carboxylase and 14CO2 assimilation studies indicate the presence of either a second type of symbiont or contaminating bacteria on the gills of freshly captured seep mussels. A reevaluation of the nutrition of the symbionts in B. thermophilus indicates that while the major symbiont is not a methanotroph, its status as a sulfur-oxidizing chemoautotroph, as has been suggested previously, is far from proven.

KEYWORDS: Bathymodiolus thermophilus; Gill Ultrastructure; Chemoautotroph; Enzyme Activity ; Gulf of Mexico.

**218.**
Fisher, C.R., I.A. Urcuyo, M.A. Simpkins, and E. Nix. 1997. Life in the slow lane: growth and longevity of cold-seep vestimentiferans. Marine Ecology 18(1):83-94.

ABSTRACT: Yearly, in situ growth of two species of cold-seep vestimentiferan tubeworms was measured using a combination of banding and video analysis. The most common species, lamellibrachia sp., grows very slowly (averaging 0.77 cm.a"SUP -1" ) and yet commonly reaches lengths over 2 m. It is concluded that individuals in mature aggregations are a minimum of 100 a old and are likely to be much older. Smaller numbers of a second species of vestimentiferan were also monitored over this period. Life history considerations combined with the extremely low measured growth rates of this species suggest it is also long-lived.

KEYWORDS: Vestimentifera ; Lamellibrachia ; Growth Longevity ; Deep Sea ; Cold Seep ; Cold Seep Organisms ; Growth ; Deep Sea ; Longevity.

**219.**
Fisk, H.N. 1956. Nearsurface sediments of the continental shelf off Louisiana. Proceedings 8th Texas Conference on Soil Mechanics and Foundation Engineering :1-36.

ABSTRACT: None.

KEYWORDS: Geology.

**220.**

Fisk, H.N. and E.Jr. McFarlan. 1955. Late quaternary deltaic deposits of the Mississippi River. Geological Society of America, Special Paper 62 :279-302.

ABSTRACT: The late Quaternary river-mouth deposits of the mIssissippi were laid down during the cycle of sea-level change that has occurred since the beginning of the Late Wisconsinglacial epoch. Well data from the coastal Louisiana marshlands and the adjacent continental shelf, together with cores and samples from the Gulf floor, permit generalizations as to the nature, distribution, depositional history, and volume of these deltaic deposits. Carbon-14 analyses of wood and shells provide dates for younger deposits of the cycle. More than 8000 cubic miles of sediments have been carried to the Gulf by the Mississippi during the late Quaternary cycle. This huge mass has been deposited within a 44,000-square-mile area, comprised of the deltaic plain and adjacent portions of the continental shelf and slope. The continental margin has subsided during deposition, forming a trough-like depression which is localized to the depositional area. This trough has been downwarped more than 350 feet near the present shoreline and more than 500 feet offshore on the continental shelf.

KEYWORDS: Geology; sediments; alluvial; depositional history.

**221.**

Fisk, H.N., E. McFarlanJr., C.R. Kolb, and L.J. WilbertJr. 1954. Sedimentary framework of the modern Mississippi Delta. Journal of Sedimentary Petrology 24:76-99.

ABSTRACT: The arrangement of sedimentary units in the birdfoot delta of the Mississippi River is comparable to the structure of a leaf. Present-day facies can be correlated with delta platform deposits obtained from borings. The shape and distribution of sedimentary units, as disclosed from these borings, are shown on maps and sections. Factors controlling delta growth are the load of the river, number of main distributaries of the river, depth of water into which the delta front advances, and subsidence. The rate of lengthening of Southwest Pass, as determined from hydrographic surveys, provides a basis for establishing the rate of bird-foot delta growth and the date when the delta started to form, approximately 1500 A.D. Since then, nearly 27 cubic miles of sediment have accumulated in the delta platform.

KEYWORDS: Geology.

**222.**

Forristall, G.Z., R.C. Hamilton, and V.J. Cardone. 1977. Continental shelf currents in Tropical Storm Delia: observations and theory. Journal of Physical Oceanography 7(4):532-46.

ABSTRACT: Storm currents are a significant part of the design hydrodynamic flow field in areas subject to tropical storms. In September 1973, Tropical Storm Delia passed over the instrumented Buccaneer platform located in 20 m of water 50 km south of Galveston, Texas. Current meter records from three depths show the storm produced currents on the order of 2 m s/sup -1/ which persisted to near the bottom. A mathematical model of wind-driven current generation was successful in hindcasting the observed current development after a linear slip condition bottom was incorporated in the model.

KEYWORDS: Physical Oceanography; Oceanography; Storms; Tropical Storm Delia; Mathematical Model; Continental Shelf Currents; Wind Driven Currents; Ocean; Gulf of Mexico.

## 223.

Forristall, G.Z., K.J. Schaudt, and J. Calman. 1990. Verification of geosat altimetry for operational use in the Gulf of Mexico. Journal of Geophysical Research 95(C3):2985-2989.

ABSTRACT: Geosat altimetry is well suited for locating large eddies shed by the Loop Current in the Gulf of Mexico. We have compared the altimeter data with in situ data obtained during a survey of Eddy Murphy in June 1988. Since there is no significant mean circulation in the central gulf, we used the mean sea surface from the first year of altimeter data as a geoid estimate. The dynamic height change due to the eddy closure matched the altimeter data, although the eddy moved about one third of a degree between the survey and the satellite pass. The motion of the eddy was confirmed by the track of an Argos buoy. -Authors.

KEYWORDS: Physical Oceanography; Geosat; Altimetry; Eddy; Gulf of Mexico.

## 224.

Forristall, G.Z., K.J. Schaudt, and C.K. Cooper. 1992. Evolution and kinematics of a loop current eddy in the Gulf of Mexico during 1985. Journal of Geophysical Research 97(C2):2173-2184.

ABSTRACT: The large eddy that broke off from the Loop Current in July 1985 was the most extensively studied eddy ever to appear in the Gulf of Mexico. Other investigators have described its early evolution based on Lagrangian drifters and its later evolution using moored current meters in the western gulf. This paper provides additional insight on the early evolution of the eddy using results from air dropped expendable bathythermographs and air dropped expendable current profilers in early May, a hydrographic ship survey in mid July, and a detailed ship survey in August using expendable bathythermographs and a current profiler. The May survey established a center of circulation at about 26 degree N but showed that the eddy had not separated from the Loop Current. A maximum velocity of 171 cm/s was observed near the northern edge of the feature. The evidence suggests that a large elongated eddy then separated from the Loop Current and later split into two smaller eddies.

KEYWORDS: Physical Oceanography; kinematics; oceanic eddies; Loop Current; models; ocean circulation; Gulf of Mexico.

## 225.

Forsyth, C.J. and D.K. Gauthier. 1991. Families of offshore oil workers: adaptations to cyclical father absence/presence. Sociological Spectrum 11(2):177-201.

ABSTRACT: Interview data are used to examine the familial structures of 147 families of offshore oil workers. Results identify 6 permanent familial structures: egalitarian, alternating authority, contingent authority, marginal father, replacement/kin, & conflict. It is argued that the conflict type can be further divided into 2 subgroups: terminal conflict, a response indicating inability to cope; & habitual conflict, a response of families who disagreed on familial strategies. 1 Table, 26 References. Adapted from the source document. (Copyright 1991, Sociological Abstracts, Inc., all rights reserved.).

KEYWORDS: Socioeconomics; Family Work Relationship; Family Structure; Family Relations; Conflict; Petroleum Industry; Workers; familial structure; offshore oil workers' families; interview data.

**226.**

Forsyth, C.J. and R. Gramling. 1987. feast or famine: alternative management techniques among periodic-father absence single career families. International Journal of Sociology of the Family 17(2):183-195.

ABSTRACT: A typology of adaptive responses to periodic absence of the father in single-residence, single-career families is developed using data from participant observation, secondary sources, & interviews with merchant seamen, offshore oil workers, & their families (N = approximately 155). Five types of management strategy are delineated & described in detail: replacement husband/father, contingent authority, alternate authority, conflict, & periodic guest. Implications for family therapy & the concept of the traditional nuclear family are discussed. 70 References. Modified HA (Copyright 1988, Sociological Abstracts, Inc., all rights reserved.).

KEYWORDS: Socioeconomics; Father Absence; Family Therapy; Family Life; periodic father absence; single-residence; -career families, management strategies; participant observation; interview; secondary data; merchant seamen; offshore oil workers; families.

**227.**

Foster Associates. 1997. Final Baseline Report (draft): Social and Economic Consequences of Onshore OCS-related Activities in Coastal Alabama, Economic Baseline of the Alabama Coastal Region, U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA MMS-96-3829.

ABSTRACT:None.

KEYWORDS:Socioeconomics; Alabama; Economic analysis.

**228.**

Franceschini, G.A. 1961. Hydrologic balance of the Gulf of Mexico. University of MassachusettsThe hydrologic cycle of the Gulf of Mexico is considered for the year 1 October 1958 to 30 September 1959. Both branches of the water cycle, atmospheric and surface, are treated separately on a monthly, seasonal and annual basis. Results of each treatment are combined to determine a consistent description of the water balance for the basin during the period.

Determinations of the separate components of the atmospheric branch were based on the continuity equation for water vapor. Values of horizontal water-vapor divergence and storage-water change were obtained for the volume of air overlying the Gulf. Computations were based on standard aerological data for ten stations around the perimeter of the Gulf. From these computed values the net vertical exchange of water between sea and air was obtained. An electronic computer, IBM-704, available on the campus was used for performing most of the calculations required. Evaluation of the surface water branch rested on continuity considerations of the water mass. Monthly values of river discharge into the Gulf were determined from standard measurements. Combination of discharge data and computed values of the net vertical exchange between sea and atmosphere yielded the net flow through the straits of Florida and Yucatan. An analysis of results is presented. Emphasis is placed on an evaluation of atmospheric water-vapor transports. Significant differences which occurred between the west and east sectors of the Gulf are described. Contributions to the water balance resulting from eddy fluctuations of wind and moisture are stressed. Associated variations in the difference between evaporation and precipitation are considered from the standpoint of their effects on the salt, as well as water, balance of the Gulf. During the period studied, the Gulf of Mexico acted as a source of water for the atmosphere. The net amount of water lost by the Gulf was approximately $14.3 \times 10^{11}$ $m^3$ or $3.8 \times 10^{14}$ gal. Eddy fluxes were responsible for 60 per cent of this net loss. Nearly 85 per cent of the total was contributed by the eastern sector. During the winter the western sector acted as a water sink with precipitation exceeding evaporation. As a consequence of the net loss of water by the Gulf to the atmosphere, the average salinity of waters leaving through the Straits of Florida was estimated higher than that for waters entering through Yucatan Strait. The foregoing conclusion was based on salt continuity considerations. It is further suggested that conditions during the year studied tended to produce lower values of surface salinity in the west than in the east sector of the Gulf.

KEYWORDS: Physical Oceanography.

**229.**
Franceschini, G.A. and S.Z. El-Sayed. 1968. Effect of hurricane Inez (1966) on the hydrography and productivity of the western Gulf of Mexico. Deutsche Hydrographische Zeitschrift :10p.

ABSTRACT: Hurricane Inez, a small intense storm, traversed the western Gulf of Mexico effecting changes in the physical, chemical and biological state of the water. Observations made before and immediately after the storm along a line normal to the hurricane path permitted diagnosis of local changes. A discussion of these changes is presented. In the light of recent numerical experiments, implications regarding induced water circulation is considered. (Author).

KEYWORDS: Physical Oceanography; Tropical Cyclones; Hydrology; Intensity; Sea Water; Ocean Currents; Marine Biology; Nutrition; Oceanographic Vessels; Production; Salinity; Interactions; Oxygen; Temperature; Reprints; Hurricane Inez(1966); Alaminos Vessel; Gulf of Mexico.

**230.**
Franz, R. 1997. Transportation., pp 209-220. In: Stallings EF, T. F. Reilly, R. B. Gramling , D. P. Manual. Outer Continental Shelf Impact, Morgan City, Louisiana. Louisiana Department of Transportation and Development., Baton Rouge, LA.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana.

**231.**
Fredericks, A.D. and W.M. Sackett. 1970. Organic carbon in the Gulf of Mexico. Journal of Geophysical Research 75(12):199-220.

ABSTRACT: A study of the dissolved and particulate organic carbon in the Gulf of Mexico showed that mean amounts of both forms were highest in shelf waters, lower in the surface of the open gulf, and lowest in the deep open gulf. An evaluation of the sources of dissolved organic carbon (DOC) in the Gulf of Mexico indicates approximately equal contributions from runoff, in situ generation in open gulf surface water, and a near- shore source that may result from human activities.

KEYWORDS: Chemistry; Oceanography; Geo_Carbon; Water Pollution.

**232.**
French, T.M. 1986. Oil and Gas Producing Industry in Louisiana: A Short History with Long Term Projections.,Department of Natural Resources, Energy Division. Baton Rouge, Louisiana.

ABSTRACT:None.

KEYWORDS:Socioeconomics; Louisiana.

**233.**
French, T.M. 1994. New dimensions for oil and gas in Louisiana and at the Department of Natural Resources,Department of Natural Resources. Baton Rouge, Louisiana.

ABSTRACT:None.

KEYWORDS:Socioeconomics; Louisiana.

**234.**

Freudenburg, W.R. and R. Gramling. 1993. Socioenvironmental factors and development policy: understanding opposition and support for offshore oil. Sociological Forum 8(3):341-364.

ABSTRACT: Explores difficulties in integrating environmental variables into sociological analyses via a study concerning attitudes toward a proposed industrial development - offshore oil drilling. Data obtained during interviews with key informants (including fishermen, politicians, environmentalists, & business leaders) in 4 areas (2 each in CA & LA) reveal marked differences across regions. These are explained in terms of the influence of biophysical & technological variables, as well as interregional social & historical differences. Implications for further research are discussed. 3 Tables, 1 Figure, 65 References. Adapted from the source document. (Copyright 1994, Sociological Abstracts, Inc., all rights reserved.).

KEYWORDS: Socioeconomics; Environmental Factors; Sociological Research ; Regional Differences; Petroleum Industry; Social Attitudes; Louisiana; Technological Change; Social Factors; California; offshore oil drilling; interregional attitudinal differences; interview data; key informants; Louisiana; California.

**235.**

Frickel, S. and W.R. Freudenburg. 1996. Mining the past: historical context and the changing implications of natural resource extraction. Social Problems 43(4):444-466.

ABSTRACT: To determine the conditions under which natural resource extraction leads to prosperity or poverty, more attention must be paid to patterns of historical change in the developmental dynamics of resource extraction & to specific causal factors. Four such factors are examined here: resource-extraction capacities, preexisting competition, linkage specialization, & transporation. For each of these, the overall pattern of historical change has been toward decreasing the likelihood that natural resource extraction will lead to local or regional development. To illustrate, three case studies of successful extraction-based development experiences are presented: coal mines of 17th-18th-century GB; lead mines in the 19th-century US Midwest; & 20th-century offshore oil extraction along the US Gulf Coast. 98 References. Adapted from the source document. (Copyright 1997, Sociological Abstracts, Inc., all rights reserved.).

KEYWORDS: Socioeconomics; Energy Development ; Regional Development ; Natural Resources; Historical Development; Economic Development; Mining Industry; Great Britain ; Seventeenth Century; Eighteenth Century; Nineteenth Century; Petroleum Industry; Coal; Petroleum ; Twentieth Century; United States of America; natural resource extraction; developmental dynamics; causal factors; historical examples; Gulf of Mexico.

**236.**

Fritts, T.H., W. Hoffman, and M.A. Mcgehee. 1984. The distribution and abundance of marine turtles in the Gulf of Mexico and nearby Atlantic waters. Journal of Herpetology 17(4 1):327-344.

ABSTRACT: Aerial surveys of marine waters up to 222 km from shore in the Gulf of Mexico and nearby Atlantic Ocean suggest that marine turtles are largely distributed in waters less than 100 m in depth. The loggerhead turtle (Caretta caretta) was observed nearly 50 times as often in waters off eastern and western Florida [USA] as in the western Gulf of Mexico. Loggerheads were present year-round but the frequency of sightings in the winter months was lower than at other seasons. Green turtles (Chelonia mydas) were infrequently observed but were most conspicuous in water off eastern Florida. Kemp's ridleys (Lepidochelys kempi) were most frequently sighted off southwestern Florida and rarely observed in the western Gulf of Mexico. Leatherback turtles (Dermochelys coriacea) were more conspicuous on the continental shelf than in adjacent deeper water. A concentration of leatherback and loggerhead turtles occurred west of the Gulf Stream Current in Aug. 1980, near Brevard County, Florida.

KEYWORDS: Endangered Species; Caretta caretta ; Chelonia-mydas; Lepidochelys-kempi; Dermochelys-coriacea ; season ; depth ; Florida.

## 237.

Fritts, T.H., A.B. Irvine, R.D. Jennings, L.A. Collum, and W. Hoffman. 1983. Turtles, Birds, and Mammals in the Northern Gulf of Mexico and Nearby Atlantic Waters: An Overview Based on Aerial Surveys of OCS (Outer Continental Shelf) Areas, with Emphasis on Oil and Gas Effects,U.S. Fish and Wildlife Service.

ABSTRACT:Aerial line transect surveys of marine turtles, birds, and mammals were conducted in four areas of the Gulf of Mexico and nearby Atlantic waters. Areas surveyed were 111 km by 222 km and located off Brownsville, Texas; Marsh Island, Louisiana; Naples, Florida; and Merritt Island, Florida. Data on distribution, abundance, seasonal occurrence, and habitat use are reported in accounts for each of the 88 species observed. Information on reproduction, behavior, and potential impacts of Outer Continental Shelf (OCS) development are also discussed.

KEYWORDS:Endangered Species; Offshore drilling; Animal ecology; Vertebrates; Water pollution; Gulf of Mexico; Surveys; Turtles; Birds; Whales; Dolphins(Mammals); Distribution(Proper ty); Abundance; Animal behavior; Environmental impacts; Vulnerability; Tables(Data); Maps; Graphs(Charts); Texas; Florida; Habitats; Outer Continental Shelves; Oil Spills.

## 238.

Frohlich, C. 1982. Seismicity of the central Gulf of Mexico. Geology 10:103-6.

ABSTRACT: The Gulf of Mexico is nearly aseismic; no earthquake of Richter magnitude larger than 5.0 has been reported there in historic time. An unusual earthquake with a magnitude of about 5.0 did occur on July 24, 1978, and for this event it has been possible to obtain a focal mechanism and a reliable location, including accurate depth of focus. The event occurred near the edge of the Mississippi Fan at a depth of 15 km, which is about the depth of the Moho. Its location and reverse-faulting focal mechanism suggest that it may be related to stresses associated with the downwarping of the lithosphere caused by the accumulation of sediments from the Mississippi River. A crude calculation confirms that the rate of accumulation of stress caused by downwarping is large enough to cause the observed seismicity. Other earthquakes that have occurred in the Gulf of Mexico are situated near the boundaries of distinct geologic regions, suggesting that these may represent areas of weakness in the crust.

KEYWORDS: Geology.

## 239.

Fry, B., R.K. Anderson, L. Entzeroth, J.L. Bird, and P.L. Parker. 1984. $^{13}C$ enrichment and oceanic food web structure in the northwestern Gulf of Mexico. Contributions in Marine Science 27:49-63.

ABSTRACT: The use of delta $^{13}C$ measurements to indicate trophic levels of offshore animals was tested by analyzing four components of food webs in the northwestern Gulf of Mexico. A progression of increasing $^{13}C$ contents (less negative delta $^{13}C$ values occurred from POC (x@u- = -21.7 ppt.) to zooplankton (x@u- = -20.2) to benthic crustacean gut contents (x@u- = -17.8 ppt.) to whole benthic crustaceans (x@u- = -16.9 ppt.), so that the degree of $^{13}C$ enrichment functioned as a crude indicator of trophic level. Six transects made off Texas and Louisiana from near shore to approximately 160 m during 1979 and 1980 showed that considerable seasonal and spatial variation occurred in this average pattern of $^{13}C$ enrichment, and that this variation was not linked to inputs of terrestrial carbon. Benthic crustaceans collected in the same trawl had very similar delta $^{13}C$ values (within 1.3 ppt.), regardless of species. Shipboard experiments showed that assimilation could account for the observed 0.9 ppt. $^{13}C$ enrichment in these animals vs. their diets. While considerable isotopic variation occurs offshore and complicates simple assessment of trophic level from $^{13}C$ enrichment data, reduced isotopic variation appears useful for identifying consumers at higher trophic levels.

KEYWORDS: Chemistry; Carbon Isotopes; Trophic Relationships; Food Webs; Diets; Particulate Organic Carbon; Zooplankton; Zoobenthos; Carbon-13; Gulf of Mexico; Marine Fauna; , Gulf of Mexico; Crustacea.

**240.**
Fu, B., P. Aharon, G.R. Byerly, and H.H. Roberts. 1994. Barite chimneys on the Gulf of Mexico slope: Initial report on their petrography and geochemistry. Geo-Marine Letters 14(2-3):81-87.

ABSTRACT: Barite chimneys associated with hydrocarbon-rich fluid venting were recently documented and sampled on the Gulf of Mexico slope offshore Louisiana at 510-520 m water depth. The chimneys are dominated by barite associated with minor amounts of pyrite, iron oxide, Mg calcite, and detrital silicates. The barite displays distinct string-like and dendritic-like morphologies assembled from rosette-shaped crystals that are typically 20-40 mu m in diameter. The chimneys exhibit macroscopic growth layers 1-5 mm thick, which alternate between dark gray and light yellow colors. The dark layers are dominated by string barites associated with disseminated pyrite, while the light layers are dominated by dendritic barites with little or no pyrite. The barites are anomalously enriched in Sr (average 15.5 mol% and maximum 30 mol%) and Ca (average 2.8 mol% and maximum 4.6 mol%), and exhibit rhythmic, paired, microscopic light and dark bands. The exact origin of the barites and their mode of deposition has not yet been elucidated, but they are likely to be related to the hydrocarbon-rich fluids venting on the seabed.

KEYWORDS: Chemistry; , Gulf of Mexico; Seepages; Hydrocarbons; Barite; Petrology; Geo; Pyrite; Mineral Ogy.

**241.**
Furlow, W. 1999. Is associated natural gas an asset or burden. Offshore Magazine 59(11).

ABSTRACT: None.

KEYWORDS: Technology.

**242.**
Furlow, W. 1999. Mini-TLP may join spar as workhorse in deepwater production. Offshore Magazine 59(7).

ABSTRACT: None.

KEYWORDS: Technology.

**243.**
Furlow, W. 1999. Record setting deep-draft caisson set for installation. Offshore Magazine 59(9).

ABSTRACT: None.

KEYWORDS: Technology.

**244.**
Furlow, W. 1999. Turret location, abandonment issues studied for US Gulf FPSO. Offshore Magazine 59(9).

ABSTRACT: None.

KEYWORDS: Technology.

**245.**
Furlow, W. 1999. What technologies will be required for 100-mile tiebacks. Offshore Magazine 59(7).

ABSTRACT: None.

KEYWORDS: Technology.

**246.**
Gaddy, D., G. Moritis, and W.R. True. 1998. Oil and Gas Journal 96(20):46-47.

ABSTRACT: A selected roundup of late technical presentations at the Offshore Technology Conference focused on advances in drilling, production, and pipeline technologies. Speakers provided snapshots of major developments in the Gulf of Mexico and Norwegian North Sea, new offshore floater concepts, an innovative subsea mudlift system, cutting-edge laser drilling techniques, and the use of 3D seismic to solve water flow problems in a Gulf of Mexico field.

KEYWORDS: Petroleum engineering; Offshore oil fields; Oil field development; Offshore drilling; Oil well drilling; Oil well production; Flowlines; Production platforms; Seismic prospecting; Offshore petroleum; prospecting.

**247.**
Gafford, W.T. 1996. 3-D seismic data for geohazards assessment. Sea Technology 37(10):4p.

ABSTRACT: Three-dimensional seismic data, acquired for oil and gas exploration purposes, are now being used to supplement or replace conventional high resolution geohazard surveys in the Gulf of Mexico. The use of this technology enables geohazard interpreters to apply new tools in geohazard analysis and improve the identification and understanding of some types of geohazards encountered during drilling operations. However, this approach will only produce accurate results when used in areas of stable near-seafloor conditions with few shallow faults.

KEYWORDS: Oil well drilling; Offshore drilling; Geophysics; Seismic prospecting; Accident prevention; Image analysis; Stratigraphy; Geohazard analysis; Drilling hazards.

**248.**
Gaille, S. 1969. A preliminary review of the potential deep-water fishery off Texas between 50 and 300 Fm. Commercial Fisheries Review 31(4):28-29.

ABSTRACT: None.

KEYWORDS: Fisheries.

**249.**
Gainer, T.H.Jr. 1966. A theoretical investigation of the M2 constituent of the tide in the Gulf of Mexico. M.S. Thesis. U.S. Naval Postgraduate School. Monterey, CA.

ABSTRACT: An ability to predict tides in the open sea is of value to oceanographers and coastal engineers. This study attempts to attain this goal of deep-sea tidal prediction by application of the hydodynamic equations to individual tidal constituents. Similar treatments by Hansen and Rossiter with less general application were very successful. Adaptation of the method to the digital computer contributes considerably to its usefulness and versatility. Specific solutions are sought in the Gulf of Mexico for the M2 tidal constituent in an attempt to explain abrupt shifts in tidal forms along the Gulf Coast. One hand calculation solution using relaxation techniques on a coarse grid was undertaken. Computer solutions were obtained for actual depths with a coarse grid and for constant depth with a much finer grid. Cotidal and corange analyses of the computer solutions both fit well with coastal data indicating that bathymetry is not as influential in the tidal form shifts as expected. The technique utilized is judged effective and its refinement and application to other basins is recommended.

KEYWORDS: Physical Oceanography.

**250.**

Gallaway, B.J. 1988. Northern Gulf of Mexico Continental Slope Study. Final Report (Year 4). Volume 2. Synthesis Report. Minerals Management Service, New Orleans, LA. Gulf of Mexico OCS Regional Office.

ABSTRACT:In 1983, the Minerals Management Service initiated a multi-year program to study the continental slope of the northern Gulf of Mexico as part of its outer continental shelf environmental studies program. Volume II of the 3 volume Year 4 report provides an environmental and biological background as a context for the study findings, and a summary of the overall methods and approaches used to meet program objectives; the findings describing the slope environment and habitats; the meiofaunal, macrofaunal, and the megafaunal communities that occur over soft bottom communities and project specific studies at the site known as Bush Hill; and a conceptual model of the slope ecosystem.

KEYWORDS:Continental shelves; Continental slopes; Gulf of Mexico; Marine biology; Habitat; Benthos; Ocean bottom; Sediments; Marine microorganisms; Hydrocarbons; Water pollution; Dissolved organic matter; Tables(Data); Graphs(Charts); Aquatic Ecosystems; Ntisdimms.

**251.**

Gallaway, B.J. 1988. Northern Gulf of Mexico Continental Slope Study. Final Report (Year 4). Volume 3. Appendices. Minerals Management Service, New Orleans, LA. Gulf of Mexico OCS Regional Office.

ABSTRACT:In 1983, the Minerals Management Service initiated a multi-year program to study the continental slope of the northern Gulf of Mexico as part of its outer continental shelf environmental studies program. The Year 4 report was prepared in three volumes. Volume III contains three massive appendices detailing the results of significant analysis of variance (ANOVA) and orthogonal contrasts comparing the abundance levels of abundant macrofauna species among stations sampled on each cruise; a correlation matrix for the 22 environmental variables considered of importance and the same abundant macrofauna; and figures showing the relative density of the same abundant macrofauna that exhibited significant differences in the ANOVA's on one or more cruises.

KEYWORDS:Continental shelves; Continental slopes; Gulf of Mexico; Hydrography; Marine biology; Marine geology; Sedimentation; Water pollution; Geochemistry; Biological productivity; Dissolved organic matter; Habitat; Statistical data; Sediments; Aquatic Ecosystems.

**252.**

Gallaway, B.J. 1988. Northern Gulf of Mexico Continental Slope Study. Final Report (Year 4),Volume 1. Executive Summary. Minerals Management Service, New Orleans, LA. Gulf of Mexico OCS Regional Office.

ABSTRACT:In 1983, the Minerals Management Service initiated a multi-year program to study the continental slope of the northern Gulf of Mexico as part of its outer continental shelf environmental studies program. This particular program, the Northern Gulf of Mexico Continental Slope Program, has three primary goals: (1) to determine the abundance, structure, and distribution of animal communities in the deep sea Gulf of Mexico; (2) to determine the hydrography and bottom conditions at selected sites within the study area and to relate these to faunal variations; and (3) to measure present levels of hydrocarbon contamination in deep-sea sediments and selected animals. Volume I provides an introduction of the study and summarizes field and laboratory methods; the environmental characterization of the area; meiofauna, macrofauna, megafauna; an overview of the chemosynthetic community; the Bush Hill chemosynthetic community, the general conceptual model; depth patterns of standing stocks; faunal assemblages and zonation; conclusions; sampling deficiencies and recommendations; and literature cited.

KEYWORDS:Continental shelves; Continental slopes; Gulf of Mexico; Marine biology; Benthos; Habitat; Marine geology; Water pollution; Sedimentation; Sediments; Geochemistry; Biological productivity; Hydrocarbons; Aquatic Ecosystems; Ntisdimms.

**253.**
Gallaway, B.J., L.R. Martin, and R.L. Howard. 1988. Northern Gulf of Mexico Continental Slope Study. Annual Report (Year 3), Volume 1. Executive Summary. Minerals Management Service, Metairie, LA. Gulf of Mexico OCS Regional Office.

ABSTRACT:In 1983, the Minerals Management Service initiated a multi-year program to study the continental slope of the northern Gulf of Mexico as part of its outer continental shelf environmental studies program. The particular program, the Northern Gulf of Mexico Continental Slope Program, has three primary goals: (1) to determine the abundance, structure, and distribution of animal communities in the deep sea Gulf of Mexico; (2) to determine the hydrography and bottom conditions at selected sites within the study area and to relate these to faunal variations; and (3) to measure present levels of hydrocarbon contamination in deep sea sediments and selected animals. Volume I is the Executive Summary.

KEYWORDS:Oceanographic data; Marine biology; Marine geology; Water pollution; Gulf of Mexico; Sampling; Hydrocarbons; Sediments; Ocean temperature; Salinity; Dissolved gases; Oxygen; Marine fishes; Invertebrates; Abundance; Nematoda; Offshore drilling; Leasing; Chemical analysis; Outer Continental Shelves.

**254.**
Gallaway, B.J., L.R. Martin, and R.L. Howard. 1988. Northern Gulf of Mexico Continental Slope Study. Annual Report (Year 3), Volume 2. Technical Report. Minerals Management Service, Metairie, LA. Gulf of Mexico OCS Regional Office.

ABSTRACT:In 1983, the Minerals Management Service initiated a multi-year program to study the continental slope of the northern Gulf of Mexico as part of its outer continental shelf environmental studies program. The particular program, the Northern Gulf of Mexico Continental Slope Program, has three primary goals: (1) to determine the abundance, structure, and distribution of animal communities in the deep sea Gulf of Mexico; (2) to determine the hydrography and bottom conditions at selected sites within the study area and to relate these to faunal variations; and (3) to measure present levels of hydrocarbon contamination in deep sea sediments and selected animals. Volume I is the annual technical report, and Volume III is the appendices, which summarizes all data collected over five cruises during the first two years of the study. Year 3 was dedicated to finishing the sample analyses and compiling data. The report provides (1) a detailed description of all field collection, laboratory analyses, and data management methods, and (2) a comprehensive summary of all the data collected that have been submitted to NODC in specified tape report. Volume III contains four massive appendices detailing all data collected.

KEYWORDS:Oceanographic data; Marine biology; Water pollution; Gulf of Mexico; Sampling; Ocean temperature; Oxygen; Dissolved gases; Nutrients; Sediments; Hydrocarbons; Marine fishes; Invertebrates; Abundance; Benthos; Seasonal variations; Tables(Data); Graphs(Charts); Offshore drilling; Leasing; Outer Continental Shelves; Species Diversity; Ntisdimms.

**255.**

Gallaway, B.J., L.R. Martin, and R.L. Howard. 1988. Northern Gulf of Mexico Continental Slope Study. Annual Report (Year 3), Volume 3. Appendices. Minerals Management Service, Metairie, LA. Gulf of Mexico OCS Regional Office.

ABSTRACT:In 1983, the Minerals Management Service initiated a multi-year program to study the continental slope of the northern Gulf of Mexico as part of its outer continental shelf environmental studies program. The particular program, the Northern Gulf of Mexico Continental Slope Program, has three primary goals; (1) to determine the abundance, structure, and distribution of animal communities in the deep-sea Gulf of Mexico; (2) to determine the hydrography and bottom conditions at selected sites within the study area and to relate these to faunal variations; and (3) to measure present levels of hydrocarbon contamination in deep-sea sediments and selected animals. Volume III contains appendices providing a detailed summary of all data collected, which was conducted over five cruises during the first two years of the study.

KEYWORDS:*Oceanographic data; Marine biology; Water pollution; Gulf of Mexico; Oceanographic surveys; Sampling; Sediments; Hydrocarbons; Ocean temperature; Salinity; Marine fishes; Invertebrates; Benthos; Abundance; Bioassay; Worms; Crustacae; Offshor e drilling; Tables(Data); Leasing; Outer Continental Shelves; Species Diversity; Ntisdimms.

**256.**

Garrison, L.E. 1976. The U.S.G.S. Delta Project: Studies of bottom stability. Marine Slope Stability ConferenceBaton Rouge, Louisiana. Louisiana State University.

ABSTRACT: In the early part of 1974, the USGS began a research project with the purpose of gaining a better understanding of the basic processes which lead to sediment failure in the marine environment. Because of the great variety of failure modes it offered, and because of its importance as an oil-producing region, the Mississippi Delta was selected for an initial study area. The complexity of bottom stability problems dictated an interdisciplinary approach to their solution, and from the outset the delta project has been managed as a cooperative effort between the Survey, several universities, and other government agencies. A close liaison with the offshore petroleum industry has also been sought. For more efficient management and simplification of research, the problem was broken down into several separate but overlapping and inter-related elements for study: 1) the role of biogenic methane, 2) storm wave pressures and triggering mechanisms for sediment failure, 3) the nature of sediment mass movement, 4) the geotechnical properties of fine-grained, saturated, and gassy sediments, and 5) the acoustic character of such sediments. Emphasis has been placed on field data acquisition rather than on theoretical development. Operation SEASWAB is only one element of the Project, but it best exemplifies this approach.

KEYWORDS: Geology.

257.

Garrison, L.E. and R.G. MartinJr. 1973. Geologic structures in the Gulf of Mexico basin. U.S. Geological SurveyGeological Survey Professional Paper 773.

ABSTRACT:In 1969, more than 25,000 kilometers of continuous seismic-reflection profiles were recorded during a joint U.S. Geological Survey and U.S. Naval Oceanographic Office geophysical-geological survey of the Gulf of Mexico conducted aboard the USNS *Elisha Kane*. This report presents a selection of 63 profile segments that exemplify the variety of structural and stratigraphic features that characterize the several geologic provinces of the gulf. The Gulf of Mexico is a relatively small mediterranean sea covering an area of more than 1.5 million $km^2$. Its opening to the Atlantic Ocean and Caribbean Sea is confined into two narrow passages, the Straits of Florida and the Yucatan Channel, by the Greater Antilles Ridge from which Cuba emerges. The gulf is underlain by oceanic crust which is depressed substantially below the levels of equivalent crustal layers in normal ocean basins. In contrast to the neighboring Caribbean Sea, whose margins have either been created or highly modified by plate-tectonic processes, the gulf appears to have drifted passively with North America, gaining its present form wholly from a combination of sedimentary and intrabasin tectonic processes. Present available evidence suggests that the gulf is a relatively old ocean basin, possibly in existence as early as Pennsylvanian time, although its size has been considerably diminished since the close of the Cretaceous by an overwhelming influx of terrigenous sediments in the northern sector. During the clastic deposition in the north, the carbonate platforms of Florida and Yucatan continued their upward growth in pace with subsidence and maintained their tops near sea level. The continental margin of the gulf has thus developed into two separate geological provinces, (1) a southeastern region of shallow carbonate banks and (2) a northwestern region of terrigenous embankments. The vast wedge of terrigenous which composes the northern continental margin is highly distorted by intrusions and massive uplifts of Louann Salt (Jurassic?). The diapiric salt features that dot the continental slope from the Mississippi Fan to northeast of Tampico end along the foot of the slope in massive salt fronts which produce the Sigsbee Escarpment in the northern part of the gulf and the Rio Grande escarpment in the northwestern part. These salt fronts are believed to be products of the seaward migration of salt from separate basins. A broad area of scarce, widely spaced domes in the northwest corner of the gulf separates the two areas of major slope diapirism. Its anomalous character may reflect the seaward extension of the San Marcos arch, a region of thin or absent salt which crosses the coastal plain of southern Texas. The continental margin of the western gulf, where the coastal plain is restricted by the flanking Sierra Madre Oriental, is the narrowest in the basin. The structural framework of the submerged margin follows closely the pattern of alternating arches and basin known in the coastal plain from the Rio Grande in the north to the Banco de Campeche in the south. Off northeastern Mexico, continental-slope structures are a continuation of the salt-controlled features of the Texas-Louisiana Slope. A similar province of salt structures deforms continental-margin sediments in the Golfo de Campeche and stretches northward into deep water from the salt anticlines of the Isthmian saline basin. Between these two provinces of salt diapirs are the Mexican Ridges, a region of linear anticlinal folds whose trends are essentially parallel to the strike of the coast. The folds have been attributed to initial deformation of salt under sedimentary load, but an alternative hypothesis is that they are the result of a decollement. Negative Bouguer anomalies associated with some of the folds indicate a low-density core and support a salt-origin hypothesis, but the lobate regional pattern of ridges suggests submarine landsliding. A morphologic grouping of diapiric forms in the Golfo de Campeche indicates that the Sigsbee Knolls, the continental slope diapirs, and the salt structures of the Isthmian saline basins stem from separate salt masses. This in turn suggests that they may have formed in a series of salt basins ringing the ancient Yucatan Peninsula but sheds no light on the question of whether the salt formed in place or migrated outward from beneath the limestone bank. The eastern and southern continental margins of the gulf are formed by the massive carbonate banks of Florida and Yucatan. They are bordered by impressive escarpments which impart to the eastern gulf a geometrically simple pattern of bold topographic elements. The West Florida Escarpment is formed by the seaward face of a Lower Cretaceous barrier reef which stretches discontinuously northward from the Straits of Florida to the terrigenous margin of the northeast gulf. The northeastern face of the Campeche Escarpment is likewise formed by a barrier reef which appears to be of limited extent and is not seen southward into the Yucatan Channel or westward around Banco de Campeche. Similar Lower Cretaceous reefs are known to encircle the northern and western coastal-plain regions and to form the Golden Lane atoll in Mexico and the smaller Jordan Knoll atoll in the southeastern gulf. In the northeastern gulf, the Cretaceous reef of the Florida Escarpment and the overlying beds of the upper slope are being progressively buried beneath an advancing wedge of upper Teritiary clastic rocks from the northwest. The junction of these disparate elements forms the De Soto valley and, at least in part, the De Soto Canyon. Diapiric features clustered in the vicinity of De Soto Canyon are believed to represent the easternmost occurrence of Louann Salt in the northern gulf. The principal features of the central region of the Gulf of Mexico are the continental rise, the broad, flat-floored Sigsbee Plain, and

the Mississippi Fan. The continental rise is at the foot of the Sigsbee Escarpment and stretches westward from the Mississippi Fan to northern Mexico. It is underlain by successive wedges of sediment deposited as gravitational flows and interbedded turbidites originating on the continental slope. The Sigsbee Plain is an almost featureless expanse of deep sea floor interrupted only by the Sigsbee Knolls in its central sector. It is underlain by more than 800 m of near-horizontal Pliocene-Holocene turbidites and pelagic oozes beneath which Miocene and older beds dip northwest toward the Sigbee Escarpment. The dominance of Quarternary deposition by the Mississippi River distributary system in the east-central gulf is manifested by the Mississippi Fan which covers more than 160,000 $km^2$ of gulf floor. Its axis is alined with the strike of the Mississippi Trough which is southwest of the delta front, from which fan deposits extend southeast more than 600 km to the deepwater approaches of the Straits of Florida and Yucatan Channel. In the central gulf the fan deposits merge with horizontally layered deposits of the plain. The southeasternmost sector of the gulf is an area of complex and little known geology in which the gulf opens to the Atlantic Ocean and Caribbean Sea through the relatively narrow Straits of Florida and Yucatan Channel. Across these openings occurs an abrupt structural transition from the relatively simple framework of the gulf to the complex Laramide tectonic front of Cuba. The exact nature of the gulf-Caribbean juncture is unknown, but it is believed to be a major fault zone of either normal or strike-slip displacement. The origin of the Straits of Florida is attributed to a combination of tectonic and sedimentary processes active since at least Jurassic time.

KEYWORDS:Geology.

**258.**

Garrison, L.E., T.E. Tatum, J.S. Booth, and S.M. Casby. 1977. Geologic hazards of the upper continental slope of the Gulf of Mexico. Proceedings Offshore Technology Conference I:51-58.

ABSTRACT: During 1975-76 the U.S. Geological Survey conducted a reconnaissance study of geologic hazards on the upper Continental Slope in the Gulf of Mexico. More than 14,000 miles (22,500 km) of high resolution seismic reflection profiles were made, large diameter piston cores taken from 37 locations, and smaller cores taken from 84 locations. Geological and geotechnical analyses were preformed. Our preliminary interpretation of these data indicates that many slump features are relict from late Pleistocene low sea levels but that some areas of present instability exist. Detailed examination of the slope area off the Mississippi Delta, for example, indicates active faulting, ancient slumps, and a large mudflow.

KEYWORDS: Geology.

**259.**

Gartner, J.V.J. 1991. Life histories of three species of lanternfishes (Pisces: Myctophidae) from the eastern Gulf of Mexico. 2. Age and growth patterns. Marine Biology 111(1):21-27.

ABSTRACT: Based on validated daily growth increments in sagittal otoliths, age and growth patterns were determined for three mesopelagic species of tropical-subtropical myctophids collected from September 1984 to May 1986 in the eastern Gulf of Mexico (27 degree N, 86 degree W). The life span of *Benthosema suborbitale* is less than 1 yr and that of *Lepidophanes guentheri* is annual, while Diaphus dumerilii attains a maximum age of about 2 yr. The mean larval periods were 40, 27, and 28 d, respectively. Maximum growth rates, which occurred in young juveniles, were calculated as 0.20 to 0.35 mm/d, whereas minimum rates were 0.10 to 0.19 mm/d. There were no significant differences in daily growth among collection periods or between sexes for any of the three species.

KEYWORDS: Water column biology; age composition; growth; larval development; otolith reading; Benthosema suborbitale; Diaphus dumerilii; Lepidophanes guentheri; Gulf of Mexico; life history; Myctophidae.

**260.**

Gartner, J.V.J. 1991. Life histories of three species of lanternfishes (Pisces: Myctophidae) from the eastern Gulf of Mexico. 1. Morphological and microstructural analysis of sagittal otoliths. Marine Biology 111(1):11-20.

ABSTRACT: Morphology and microstructure of the sagittal otoliths from three species of mesopelagic, tropical-subtropical myctophids (*Benthosema suborbitale, Diaphus dumerilii, Lepidophanes guentheri* ), collected from September 1984 to May 1986 in the eastern Gulf of Mexico (27 degree N, 86 degree W), were examined and described. Analysis of the microstructure revealed microincrements corresponding to the daily growth rings reported in many studies. Using marginal increment analysis, the deposition of microincrements was verified as occurring daily, the first validation of daily growth rings in the otoliths of mesopelagic fishes. In all three species, the clear central (larval growth) zone of the sagitta was sharply delimited by a dark check accompanied by a series of accessory primordia. Within the dark zone in the otoliths of *B. suborbitale* and *L. guentheri* , two different microincremental structures were observed.

KEYWORDS: Water column biology; life history; age determination; otolith reading; growth; *Benthosema suborbitale*; *Diaphus dumerilii*; *Lepidophanes guentheri*; Myctophidae; Gulf of Mexico; ultrastructure.

**261.**

Gartner, J.V.J. 1993. Patterns of reproduction in the dominant lanternfish species (Pisces: Myctophidae) of the eastern Gulf of Mexico, with a review of reproduction among tropical-subtropical Myctophidae. Bulletin of Marine Science 52(2):721-750.

ABSTRACT: Reproductive patterns were determined for the seven numerically dominant species of myctophids in the eastern Gulf of Mexico: *Benthosema suborbitale, Ceratoscopelus species* (cf. *warmingii* ), *Diaphus dumerilii, Lampanyctus alatus, Lepidophanes guentheri, Myctophum affine* , and *Notolychnus valdiviae.* Overall sex ratios differed significantly from parity only in *Ceratoscopelus species* (cf. *warmingii* ) because of size dimorphism among the largest individuals. Oocyte development was typically teleostean and did not differ among the seven species. In all species, maximum oocyte diameter at hydration was about 0.5 mm, which was smaller than has been reported for conspecifics from other parts of their range. Sizes at sexual maturity and maximum lengths were also smaller when compared to conspecifics outside the Gulf of Mexico. An increasing percentage of advanced stage (migratory nucleus and hydrated) oocytes with increasing length was observed among all species, which suggested that spawning frequency increased as the fishes grew larger. Among species for which data were available, spawning occurred only during the night at epipelagic depths with peak activity generally after midnight. Two basic reproductive patterns were noted: 1) a protracted spawning season of 4- to 6-months duration, with individuals spawning every 1 to 4 days (*Benthosema suborbitale, Lampanyctus alatus, Lepidophanes guentheri* , and *Notolychnus valdiviae* ); 2) more restricted spawning periods which primarily occurred once or twice a year (*Ceratoscopelus species* and probably *Diaphus dumerilii* ). *Diaphus dumerilii* , though present in great numbers in the eastern Gulf, was represented almost solely by juveniles and subadults. Available evidence indicated that upon reaching sexual maturity, *Diaphus dumerilii* shifted to a pseudoceanic or possibly benthopelagic lifestyle, with spawning activities restricted to waters overlying the shelf edge.

KEYWORDS: Water column biology; sexual reproduction; Gulf of Mexico; Myctophidae; sex ratio; body size; spawning seasons; sexual maturity; fecundity; reproduction; Gulf of Mexico.

**262.**

Gartner, J.V.J., T.L. Hopkins, R.C. Baird, and D.M. Milliken. 1987. The lanternfishes (Pisces: Myctophidae) of the eastern Gulf of Mexico. Fishery Bulletin 85(1):81-98.

ABSTRACT: Forty-nine species from 17 genera of Myctophidae were taken in midwater trawl samples from the eastern Gulf of Mexico during March through October between 1970 and 1977. Seven abundant species (*Ceratoscopelus warmingii, Notolychnus valdiviae, Lepidophanes guentheri, Lampanyctus alatus, Diaphus dumerilii, Myctophum affine,* and *Benthosema suborbitale* ) comprised 74.4% of the total number (13,369) of myctophids captured. Of the remainder, 10 species were common, 26 were uncommon, and 6 were rarely collected. Diel vertical profiles showed that all species except *Taaningichthys* vertically migrated. Daytime vertical ranges for the entire assemblage were between 300 and 900 m, while at night myctophids were most abundant between the surface and 150 m. A deep group remained below 600 m at night and was composed of mostly juvenile nonmigratory individuals of 19 species and *Taaningichthys bathyphilus*. Five daytime and five nighttime groups of associated species were defined based on vertical ranges, minimum depths of occurrence and zones of abundance. Species of tropical and tropical-subtropical zoogeographic affinities comprised the largest percentage of the total number of specimens and were about equal in their percentage contributions.

KEYWORDS: Water column biology; abundance; vertical distribution; Gulf of Mexico; check lists; biogeography; trawling; Gulf of Mexico; dominant species; mesopelagic zone; Myctophidae.

**263.**

Gasca R, Suarez E, and I. Castellanos. 1995. Zooplanktonic biomass in surface waters of the Gulf of Mexico during summer and winter of 1991. Caribbean Journal of Science 31:128-140.

ABSTRACT: Zooplanktic biomass (wet weight) of surface waters (0-50 m) was studied from samples taken during two oceanographic campaigns (CIRCAM I and II), carried out during winter and summer 1991 in the southern Gulf of Mexico. Summer mean biomass (270 mg/ml) was 23% higher than during winter (208 mg/ml). There was no difference between nocturnal and day samples. Mean neritic biomass values in winter and summer were 41 and 30% higher than values from oceanic zones, respectively. The highest biomass values (400-1300 $mg/m^{-3}$) were observed on the outermost portions of the Campeche shelf, known as a highly productive area. During both climatic regimes, biomass values were low ( lt 150 $mg/m^{-3}$) in the characteristically oligotrophic oceanic waters of the Gulf. Cyclonic, cold-core gyres (more productive) and anticyclonic, warm-core gyres (less productive) were detected in the area. Exceptionally, in some sites we noted the effect of a cyclonic gyre with biomass values up to three times higher than those of surrounding waters, at least one sampling station with relatively lower biomass could be related to an anticyclonic gyre. However, this condition did not influence the local surface biomass. Biomass values reported here are within the range previously known in adjacent neritic and oceanic waters.

KEYWORDS: Water column biology; Ecology (Environmental Sciences); Marine Ecology (Ecology; Environmental Sciences); Metabolism; animals; Seasonality.

**264.**

Gaul, R.D. 1967. Circulation over the continental margin of the northeastern Gulf of Mexico. Ph.D. Dissertation. Texas A&M University. College Station, TX.

ABSTRACT: The ocean circulation over the continental margin of the northeastern Gulf of Mexico has been delineated on the basis of three years of hydrographic and direct current observations. A wide range of measurement techniques was used at two fixed platforms in the nearshore region off Panama City, Florida, and from small vessels during periodic surveys conducted over a larger area. Evidence is presented for a close coupling between circulation over the continental margin and that in deeper water. The "loop" current, which transports water into the Gulf from the Yucatan Channel, is identified on the basis of water mass characteristics as far north as the edge of the northeast continental slope. Lateral mixing with waters over the continental margin is evidenced by smooth transitions of salinity-temperature relations characterizing offshore and nearshore waters. It is suggested that the loop current is the main driving influence for circulation over the continental margin, especially below the seasonal thermocline. Flow over the continental margin is modified markedly by ocean bottom topography. De Soto Canyon, the most prominent single bathymetric feature, appears to have a dominant influence on replenishment of water in the lower layer over the shelf. A zone of horizontal transition in hydrography and currents has been noted along the break between shelf and slope, especially during the spring months when stratification over the shelf is incipient. A close relationship is noted between vertical stratification of density and horizontal currents in the northeastern Gulf. A net onshore transport of water below the thermocline maintains a sharp density stratification during the spring and summer over the entire shelf. The stratification gradually diminishes during the fall and gives way to a typical winter situation of a nearly homogeneous water mass overlying the entire shelf. Outside the shelf the seasonal thermocline is depressed downward as much as 50 meters below its normal summer depth. The circulation exhibits seasonal changes which are related to the hydrography but which are obscured by both longer and shorter term fluctuations of comparable magnitude. Eddies have been observed over the continental slope that are 50 to 100 kilometers across and extend to depths of 500 meters or more. Well defined gyres of comparable scale have not been detected over the shelf or outside the continental slope by either direct observation of inference from dynamic topography. Two remarkable aspects of these vortices are that they were found intermittently and that both cyclonic and anticyclonic rotation have been observed. It remains unknown as to whether or not the eddies build up and decay locally or are part of a system of vortices (that might be generated by lateral shear between inshore and offshore mesoscale motion) that travel along the continental slope. Over the continental shelf, internal tide current speeds were comparable to those of the quasi-steady circulation only when the water was sharply stratified. Currents in the surface layer, which commonly exhibited a uniform rate of clockwise rotation in rhythm with the diurnal tide, could be influenced significantly by inertia circle rotation. Currents in the lower layer tended to be smaller in magnitude and lag the clockwise rotation of the surface currents suggesting marked modification by friction at the bottom and between the two layers. Tidal currents over the continental slope, which were several times smaller than steady currents, were mainly barotropic indicating that the internal tide is negligible in deep water.

KEYWORDS: Physical Oceanography.

**265.**

Gauthier, D.K., C.J. Forsyth, and W.B. Bankston. 1993. The effects of wife's occupation on the structure of decision-making authority in the offshore oilworker's family. International Journal of Sociology of the Family 23(2):87-98.

ABSTRACT: In an extension of earlier research by Craig J. Forsyth & DeAnn K. Gauthier (see SA 39:4/91X9465), interview data are drawn on to investigate the influence of wives' occupation on the structure of decision-making authority in 161 families of offshore oil workers across the US. Results suggest that a professional/managerial occupation on the part of the wife is associated with a lower probability of the presence of a father-centered (male-dominated) structure. However, contrary to expectations, this occupational status of the wife did not promote the emergence of either a mother-centered or egalitarian pattern. Rather, wife's occupational status was more likely to engender persistent conflict situations regarding the nature of authority in the family. 5 Tables, 24 References. Adapted from the source document. (Copyright 1994, Sociological Abstracts, Inc., all rights reserved.).

KEYWORDS: Socioeconomics; Decision Making ; Family Relations; United States of America; Petroleum Industry; Working Mothers; Family Roles ; Power; Authority; Wives; Occupational Status; family decision-making authority; offshore oilworkers; wife's occupation; interviews.

**266.**

Gauthier, D.K., C.J. Forsyth, and W.B. Bankston. 1996. Women's employment and structures of familial authority among families of offshore oilworkers. Free Inquiry in Creative Sociology 24(1):37-42.

ABSTRACT: Interview data from 161 offshore oil worker families from southwestern LA & east TX were used to examine the impact of female employment (FE) on familial authority. Results indicate that while FE does not increase female power disproportionately (ie, mother-centered authority structures do not typically emerge), FE-generated family resources raises female prestige, which affects the familial power structure. Findings suggest that unequal employment status leads to conflict, while relative job-status equality contributes to an egalitarian marriage. It is concluded that FE is not the sole determinant of marriage gender quality, & suggestions for future research are outlined. 4 Tables, 26 References. Adapted from the source document. (Copyright 1997, Sociological Abstracts, Inc., all rights reserved.).

KEYWORDS: Socioeconomics; Petroleum Industry ; Family Power; Working Mothers; Family Work Relationship; Egalitarianism; Authority ; Dual Career Family; Working Hours; Occupational Status; Texas ; Louisiana; Family Structure ; familial authority, female employment impact; offshore oil worker families; interview data; southwestern Louisiana; east Texas.

**267.**
Gealy, E.L. 1955. Topography of the continental slope in northwest Gulf of Mexico. Geological Society of America Bulletin 66(2):203-227.

ABSTRACT: Topographic charts of the continental slope in the northwest Gulf of Mexico were constructed largely from soundings from unpublished hydrographic surveys of the U.S. Coast and Geodetic Survey. The configuration of the slope and the nature of its sediments suggest a genetic interpretation for its varied topography and high relief. Twenty-one profiles show that the break in slope at the edge of the continental shelf is marked only by a gradual steepening. A hummocky zone on the upper part of the slope shows features resembling landslide scars and deposits, sediment-flow scars, and surface expressions of faults. These features indicate that the upper part of the slope is underlain by a mass of relatively unstable sediments, probably deposited during the Pleistocene when sea level was near the present 75-fathom curve. Steep slopes and a lack of hummocks on the lower part of the slope indicate that most of the underlying sediments are relatively stable. Many steep-sided troughs cut this portion of the slope. Their position and configuration suggest a history which may involve (1) subaerial erosion, (2) submergence and tilting, (3) masking of the upper part of the slope by Pleistocene sediments, and (4) extensive modification by the failure of sediment under the stress of gravity. The Sigsbee Scarp, at the base of the slope, is at least 340 miles long and as high as 4800 feet. It may represent one of a series of large faults surrounding the Gulf of Mexico and downthrown toward the Sigsbee Deep. The Sigsbee Deep is a basin of gentle slopes and subdued relief extending from the base of the Sigsbee Scarp, at 1700 fathoms, to a maximum depth of about 2200 fathoms. Although salt domes may underlie a number of features of low relief on and near the edge of the continental shelf, there is no evidence which indicates they have been an important geomorphic factor on the continental slope. The topography and sediments suggest that in the northwest Gulf of Mexico there is a large mass of sediment under the stress of gravity and failing by landslides, faults, creep, sediment flows, and intermediate types of failure.

KEYWORDS: Geology.

**268.**
George, J.E., W.J. Parker, and D.J. Cranswick. 1999. FPSO Environmental Impact Statement: What is Happening? Proc. 31th Annual Offshore Technology Conference (OTC Paper 10705).

ABSTRACT: This paper explores the regulatory issues around the use of floating production, storage, and offloading systems (FPSOs) and shuttle tankers in the Gulf of Mexico (GOM), the increasing interest in the use of FPSOs in the GOM, and how DeepStar came to be involved in the FPSO Environmental Impact Statement (EIS). It also covers the interaction between DeepStar, the Minerals Management Service (MMS), and the U.S. Coast Guard (USCG), the progress made in selecting a contractor to conduct the EIS, and the schedule for completion of the EIS.

KEYWORDS: Technology.

**269.**
Geyer, R.A.andC. P. Giammona. 1980. Naturally occurring hydrocarbons in the Gulf of Mexico and Caribbean Sea, pp 37-106. In: Geyer RA, (Editor). Marine Environmental Pollution, 1 Hydrocarbons. Elsevier Scientific Publishing Company, New York, NY.

ABSTRACT: None.

KEYWORDS: Chemistry.

**270.**

Gilbert, R.M. and E.G.Ward. 2000. Planned Approach for Comparative Risk Analysis of Deepwater Production Systems in the Gulf of Mexico. Proceedings of OMAE 2000, 19th International Conference on Offshore Mechanics and Arctic Engineering .

ABSTRACT: This paper will describe the approach that is being used to compare the risks of Floating Production Storage and Offloading Systems, which have been used in the Gulf of Mexico, with the risks for existing deepwater production systems in the Gulf of Mexico. This motivation for this study is the Deep Water Operating Plan for the Gulf of Mexico, which requires proposed systems with new technologies to be at least as reliable as existing systems. The planned approach for the comparative risk analysis has been developed to provide information for a consistent and objective comparison of risk, to provide a level of detail necessary to compare and understand system risks for typical systems, and to incorporate industry data, experience and expertise into the risk analysis. This approach will use the following as measures of risk : total fatalities, cumulative volume of oil released, maximum volume of oil released in a single incident and total duration of unplanned interruptions to production in the operational life. Information for the risk analysis will be elicited from teams of industry experts in a series of workshops for each production system. Risks will be calculated and presented as expected values for each risk measure in the operational life.

KEYWORDS: Technology.

**271.**

Glenn, S.M. and C.C. Ebbesmeyer. 1993. Drifting buoy observations of a loop current anticyclonic eddy. Journal of Geophysical Research 98(C11):20.

ABSTRACT: The Loop Current penetrated deep into the Gulf of Mexico in early 1989. After several eddy formation and reattachment cycles, a southwestward propagating anticyclonic eddy was formed during the summer. The Loop Current and subsequent eddy produced strong currents over widespread areas on the Louisiana continental slope, prompting a series of current measurement programs. Because of the lack of satellite infrared coverage in the Gulf of Mexico during the summer, the trajectories of 53 ARGOS tracked drifting buoys deployed in the Gulf of Mexico in 1989 were assembled to determine the synoptic history of the Loop Current and anticyclonic eddy during this event. Ten of the most critical summertime buoy trajectories are discussed here.

KEYWORDS: Physical Oceanography; Loop Current; drifting data buoys; oceanic eddies; current meandering; satellite sensing; Gulf of Mexico.

272.

Gonzalez-Rodas, G.E. 1999. Physical forcing of primary productivity in the northwestern Gulf of Mexico. Texas A&M University.

ABSTRACT: From 1992 to 1994, Texas A&M University carried out 3 hydrographic survey cruises per year to support the Louisiana-Texas Shelf Physical Oceanography Program (LATEX). These surveys provided fine scale physical and chemical data which when combined with biological data have allowed an ecological characterization of the waters in the region. Measurements of phytoplankton primary production, standing crop, and species composition were made in an effort to relate them quantitatively to the physical and chemical forcings. Because of the frequent occurrence of Loop Current Eddies (LCEs) in the western Gulf of Mexico, an attempt was made to assess the impact of these mesoscale, high kinetic energy environments in the seasonal and spatial distribution of phytoplankton biomass and primary productivity. This study describes the primary productivity of the Louisiana-Texas continental shelf on a systematic, multi-season, and interannual basis. Primary productivity was found to be greatly enhanced in the vicinity of the major river deltas over the inner shelf during the spring of 1993. However, there was no increase in productivity of the inner shelf in spring of 1994, when the nutrient flux to the shelf was much lower. Statistical modeling of the data collected revealed that nutrients and light limitation control productivity of the inner shelf, while nutrients seem to be the factor limiting productivity of the outer shelf. When LCEs enhance the eastward flow of the currents at the continental slope, they induce upwelling at the outer shelf. The shoaling of the nutricline and the resultant increased nutrient flux at the base of the thermocline directly increase primary productivity. Such divergences, however, amount to only about 10% of the riverine nutrient flux from the Mississippi-Atchafalaya River (MAR). Since the nutrient flux from the MAR seems to be highly dependent on man's agricultural and industrial practices in the river watersheds, it could be argued that these anthropogenic activities now have a controlling influence on primary productivity of the inner shelf, especially near the rivers' deltas. On the other hand, the productivity of the outer shelf is largely determined by wind-driven currents, as well as by the presence of LCEs and their influence on water movement. It would seem, therefore, that anthropogenic practices and hydrodynamic forcing (i.e. winds and currents) are the two main factors that govern the magnitude and distribution of primary productivity in the northwestern Gulf of Mexico.

KEYWORDS: Biology.

273.

Govoni, J.J., D.E. Hoss, and D.R. Colby. 1989. The spatial distribution of larval fishes about the Mississippi River plume. Limnology and Oceanography 34(1):178-187.

ABSTRACT: The distribution of larval fishes is shaped by the Mississippi River plume at both coarse (kilometers) and fine (tens to hundreds of meters) spatial scales. Density estimates of larval fishes No. $m^{-3}$, based upon ichthyoplankton samples collected about the Mississippi River plume in February 1982, December 1982, and November 1983, were often greater by a factor of 10, and sometimes by several orders of magnitude, at the plume front than they were inside (within) or outside of the plume. Greater densities at the plume front were most apparent for larval *Brevoortia patronus* (a clupeid) and unidentified clupeid larvae. Frontal convergence apparently affects the accumulation of larval fishes at the frontal interface, but high densities were not evident everywhere along the front.

KEYWORDS: Water column biology; geographical distribution; Gulf of Mexico; Mississippi R. Plume; fish larvae; ichthyoplankton surveys.

**274.**

Gramling, R. and Freudenburg, W.R. 1995. Crude, coppertone(r), and the coast - developmental channelization and constraint of alternative development opportunities. Society & Natural Resources 9(N5):483-506.

ABSTRACT: Southern Louisiana and southern Florida are characterized by the two most extensive coastal wetlands in the continental United States. These immense, seemingly hostile, and similar environments have experienced two very different directions of regional development. Louisiana developed much earlier, focusing initially on the extraction of renewable resources from the coastal marsh. Later, by the 1920s, the discovery of oil and gas led to the rapid development of an offshore, nonrenewable extractive system that is literally unparalleled on the planet. In contrast, at the time of early settlement, southern Florida had fewer recognized renewable or nonrenewable resources; its development began later, centered around amenity use rather than consumptive use of resources. In spite of potentially massive economic benefits, Florida has bitterly fought recent attempts at offshore ail or gas exploitation, and coastal tourism in Louisiana seems as unlikely as offshore development in Florida. At the same time, however, there are significant challenges to the continued vitality of both the oil-based economy of southern Louisiana and the tourism-based economy of southern Florida. The two contrasting cases provide examples of developmental channelization. On the one hand, once an area or region takes a given developmental direction, both the process of specialization in a given primary activity and the investment of human and economic capital in the capture of linkages tied to that primary activity can set in motion a process that may effectively preclude other developmental options. On the other hand, a given course of development can also be pursued so intensively as to bring about its demise.

KEYWORDS: Socioeconomics; Economic development; Florida; Louisiana; Offshore Oil; Tourism; Environmental Sociology; Dependency.

**275.**

Gramling, R. and S. Laska. 1993. Social Science Research Agenda for the Minerals Management Service in the Gulf of Mexico,Final rept. Minerals Management Service, New Orleans, LA. Gulf of Mexico OCS Region.

ABSTRACT:On September 9-12, 1992, at a workshop in New Orleans funded by Minerals Management Service (MMS) through the Louisiana Universities Marine Consortium (LUMCON), a group of social scientists from all over the U.S., Canada, and Norway met with representatives of MMS and LUMCON, to design a social science research agenda for MMS in the Gulf of Mexico. The report describes the process by which the workshop was organized and conducted, and presents the descriptions of the recommended projects to implement that agenda.

KEYWORDS:Socioeconomics; Social sciences; Research management; Research and development; Research projects; Mexico Gulf; Offshore drilling; Environmental issues.

**276.**

[Anonymous]. 1980. East St. Mary Parish, Economic Growth and Stabilization Strategies.,Louisiana Department of Natural Resources. Baton Rouge, LA.

ABSTRACT:None.

KEYWORDS:Socioeconomics; Louisiana.

**277.**

Gramling, R.B. 1980. Labor Survey of East St. Mary Parish, pp 80-108. In: Gramling RB, (Editor). East St. Mary Parish, Economic Growth and Stabilization Strategies. Louisiana Department of Natural Resources, Baton Rouge, LA.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana.

**278.**
Gramling, R.B. 1980. Population Growth in East St. Mary Parish, pp 65-75. In: Gramling RB, (Editor). East St. Mary Parish, Economic Growth and Stabilization Strategies. Louisiana Department of Natural Resources,

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana.

**279.**
Gramling, R.B. 1980. Population Shifts, Employment, and the Quality of Life in East St. Mary Parish, pp 405-410. In: Gramling RB, (Editor). East St. Mary Parish, Economic Growth and Stabilazation Strategies. Louisiana Department of Natural Resources, Baton Rouge, LA.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana.

**280.**
Gramling, R.B. 1983. A Social History of Lafayette Parish, pp 8-52. In: Manuel DP, (Editor). Energy and Economic Growth in Lafayette, LA 1965-1980. University of Southwestern Louisiana, Lafayette, LA.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana.

**281.**
Gramling, R.B. 1984. Conclusions and Recommendations, pp 217-224. In: Gramling RB, S. Brabant. The Role of Outer Continental Shelf Oil and Gas Activities in the Growth and Modification of Louisiana's Coastal Zone. U.S. Department of Commerce, National Oceanic and Atmospheric Administration; Louisiana Department of Natural Resources, Lafayette, Louisiana.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana.

**282.**
Gramling, R.B. 1984. East St. Mary Parish: a Case Study, pp 171-198. In: Gramling RB, S. Brabant. The Role of Outer Continental Shelf Oil and Gas Activities in the Growth and Modification of Louisiana's Coastal Zone. U.S. Department of Commerce, National Oceanic and Atmospheric Administration; Louisiana Department of Natural Resources, Lafayette, Louisiana.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana.

**283.**
Gramling, R.B. 1984. Housing in the Coastal Zone Parishes., pp 127-134 . In: Gramling RB, S. Brabant. The Role of Outer Continental Shelf Oil and Gas Activities in the Growth and Modification of Louisiana's Coastal Zone. U.S. Department of Commerce, National Oceanic and Atmospheric Administration; Louisiana Department of Natural Resources, Lafayette, Louisiana.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana.

**284.**
Gramling, R.B. 1984. OCS activities and their Relationship to Occupational Shifts in the Coastal Zone Parishes,In: Gramling RB, S. Brabant, (Editor). The Role of Outer Continental Shelf Oil and Gas Activities in the Growth and Modification of Louisiana's Coastal Zone. U.S. Department of Commerce, National Oceanic and Atmospheric Administration; Louisiana Department of Natural Resources, Lafayette, Louisiana. Lafayette, Louisiana.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana.

**285.**
Gramling, R.B. 1984. Other Impacts of OCS Production in the Louisiana Coastal Zone., pp 165-170. In: Gramling RB, S. Brabant. The Role of Outer Continental Shelf Oil and Gas Activities in the Growth and Modification of Louisiana's Coastal Zone. U.S. Department of Commerce, National Oceanic and Atmospheric Administration; Louisiana Department of Natural Resources, Lafayette, Louisiana.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana.

**286.**
Gramling, R.B. 1984. Population Growth in the Coastal Zone, pp 41-52 . In: Gramling RB, S. Brabant, (Editors). The Role of Outer Continental Shelf Oil and Gas Activities in the Growth and Modification of Louisiana's Coastal Zone. U.S. Department of Commerce, National Oceanic and Atmospheric Administration; Louisiana Department of Natural Resources, Lafayette, L. A.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana.

**287.**
Gramling, R.B. 1989. Concentrated Work Scheduling: Enabling and Constraining Aspects. Sociological Perspectives 32:47-64.

ABSTRACT: None.

KEYWORDS: Socioeconomics.

**288.**
Gramling, R.B. 1991. The Concerns of the State of Louisiana, Involving the Socioeconomic Impacts of Outer Continental Shelf Activities. Proceedings of the Twelfth Annual Gulf of Mexico Information Transfer Meeting. Minerals Management Service, Gulf of Mexico OCS Region.

ABSTRACT: None.

KEYWORDS: Socioeconomics.

**289.**

Gramling, R.B. 1995. Oil in the gulf: past development, future prospects. University research initiative,Final Report. Minerals Management Service, Gulf of Mexico OCS Region. MMS 95-0032.

ABSTRACT:The report discusses the history and consequent development of the oil and gas industry on the Outer Continental Shelf in the Gulf of Mexico. The report traces the events and technological development that preceded and allowed that development, as well as the national and international events that shaped and limited offshore development in the Gulf of Mexico. The impacts of that development in general and of the Federal Outer Continental Shelf leasing program, initiated in 1954, in particular are also discussed.

KEYWORDS:Socioeconomics; Mexico Gulf; Petroleum industry; Natural gas industry; Energy source development; Historical aspects; Oil production; Gas production; Offshore drilling; Offshore operations; Environmental effects; Socioeconomic impacts; International factors; Cartels; Technology innovation; Outer continental shelf; Minearal leases; NTISDILMLA.

**290.**

Gramling RB. 1996. Oil on the Edge: Offshore Development, Conflict, Gridlock. State University of New York Press Albany, New York

ABSTRACT: None.

KEYWORDS: Socioeconomics; Gulf of Mexico; Offshore oil industry.

**291.**

Gramling, R.B., S. Brabant, C. Forsyth, and C.E. Palmer. 1995. Outer Continental Shelf Issues: Central Gulf of Mexico,Final rept. Minerals Management Service, New Orleans, LA. Gulf of Mexico OCS Region.

ABSTRACT:This report summarizes the research effort and findings of an investigation of the issues associated with Outer Continental Shelf (OCS) oil and gas activities in the Central Gulf of Mexico. Stakeholders assessed for the delineation of the issues associated with OCS oil and gas activities ranged across the offshore oil and gas industry; the offshore support sector; other direct and indirect coastal users; stakeholders that benefited from economic growth in general; concerned citizen groups; and public and governmental organizations.

KEYWORDS:Socioeconomics; Mexico Gulf; Offshore operations; Environmental issues; Petroleum industry; Natural gas industry; Energy source development; Resource management; Economic impact; Environmental impacts; Social impact; Esthetics; Regional analysis; Louisana; Alabama; Mississippi; Outer Continental Shelf; Mineral Leases.

**292.**

Gramling, R.B.andE. Joubert. 1977. The Impact of Outer Continental Shelf Petroleum Activity on Social and Cultural Characteristics of Morgan City, Louisiana, pp 106-143. In: Stallings EF, T. F. Reilly, R. B. Gramling , D. P. Manual. Outer Continental Shelf Impact, Morgan City, Louisiana. Louisiana Department of Transportation and Development, Baton Rouge, LA.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana; Offshore oil industry.

**293.**
Gramling, R.B. and S. Brabant. 1984. The Role of Outer Continental Shelf Activities in the Growth and Modification of Louisiana's Coastal Zone. U.S. Department of Commerce, National Oceanic and Atmospheric Administration; Louisiana Department of Natural Resources. Lafayette, LA.

ABSTRACT:None.

KEYWORDS:Socioeconomics.

**294.**
Gramling, R.B. and S.Brabant. 1986. Boom towns and Offshore Energy Impact Assessment:: The Development of a Comprehensive Model. Sociological Perspectives 29:177-201.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Gulf of Mexico.

**295.**
Gramling, R.B.andT. F.Reilly. 1980. Education in East St. Mary Parish, pp 109-116. In: Gramling RB. East St. Mary Parish, Economic Growth and Stabilization Strategies. Louisiana Department of Natural Resources, Baton Rouge, LA.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana.

**296.**
Gramling, R.B. and W.R. Freudenberg. 1990. A Closer Look at Local Control: Communities, Commodities, and the Collapse of the Coast. Rural Sociology 55: 541-558.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Gulf of Mexico.

**297.**
Gramling, R. 1992. Employment data and social impact assessment. Evaluation and Program Planning 15(3):219-225.

ABSTRACT: Although the community impact model has traditionally used population figures to assess social impacts, it is suggested that employment data also provide a useful & flexible metric. After reviewing advantages & problems surrounding the use of population statistics & employment data, examples of the use of both in a community setting are provided. 1 Figure, 26 References. Adapted from the source document. (Copyright 1993, Sociological Abstracts, Inc., all rights reserved.).

KEYWORDS: Socioeconomics; Social Impact Assessment; Statistics; Methodology ; Employment; Population; social impact assessment; population statistics' vs employment data's utility; illustrative example; community setting.

**298.**

Gramling, R. and C. Forsyth. 1987. work scheduling and family interaction: a theoretical perspective. Journal of Family Issues 8(2):163-175.

ABSTRACT: An expansion of the construction of reality paradigm proposed by Peter Berger & Mansfried Kellner ("Marriage and the Constructions of Reality", Diogenes, 1964, 46, summer, 1-23) as an appropriate theoretical perspective for the examination of the link between work scheduling & family interaction. Not only does this perspective allow an examination across a continuum of family member absences, but it is applicable across the family life cycle, & to increasingly evident nontraditional family structures. 49 References. HA (Copyright 1988, Sociological Abstracts, Inc., all rights reserved.).

KEYWORDS: Socioeconomics; Working Hours; Family Life; Social Determination of Meaning; work scheduling; family interaction relationship; construction of reality paradigm.

**299.**

Gramling, R. and W.R. Freudenburg. 1992. opportunity-threat, development, and adaptation: toward a comprehensive framework for social impact assessment. Rural Sociology 57(2):216-234.

ABSTRACT: The traditional focus of social impact assessment has been on the impacts taking place during the most intensive phases of developmental activity. These narrowly focused approaches miss a number of predictable, significant impacts that take place both before & after the periods of most intense activity. Here, a conceptual framework is offered that deals with impacts both across time & across potentially affected systems of the human environment, which will improve the comprehensiveness of social impact assessment. 1 Table, 54 References. Adapted from the source document. (Copyright 1993, Sociological Abstracts, Inc., all rights reserved.).

KEYWORDS: Socioeconomics; Social Impact Assessment; Methodology ; Theoretical Problems; social impact assessment; broadened conceptual framework.

**300.**

Gramling, R.B. 1980. The Economic History of East St. Mary's Parish., pp 4-16. In: Gramling RB, (Editor). East St. Mary's Parish Economic Growth and Stabilization Strategies. Louisiana Department of Natural Resources, Baton Rouge.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana.

**301.**

Greenman, N.N. and R.J. LeBlanc. 1956. Recent marine sediments and environments of northwest Gulf of Mexico. Bulletin of the American Association of Petroleum Geologists 40(5):813-847.

ABSTRACT: This paper presents the results of a megascopic study of eighty-five sediment cores, ranging in length from 3 to 10 feet and averaging 7 feet, taken by the Woods Hole Oceanographic Institution in the northwest Gulf of Mexico. The study has led to the following conclusions.

1. Recent sediments in this region are accumulating in five major marine environments, each with its characteristics sedimentary facies. These are: (a) The continental shelf, extending seaward to a depth of about 600 feet, with a coarse-textured facies consisting of sand, silty clay, and shell clay; (b) the rises, a group of isolated topographic highs at the outer edge of the shelf and upper parts of the slope, with a coarse-textured facies consisting of sandy and silty glauconitic foraminiferal ooze, calcareous biotromal deposits, and other deposits similar to those of the facies; (c) the upper slope, from depths of 600 to 3,000 feet in the central and western parts of the region but extending to 8,000 feet in the eastern part, with a green-gray to brown-gray homogeneous clay facies; (d) the lower slope-western Sigsbee Deep, from depths of 3,000 to 12,000 feet in the central and western parts of the region, with a light yellow-brown mottled clay facies; and (e) the eastern Sigsbee Deep, from depths of 8,000 to more than 11,000 feet in the eastern part of the region, with a foraminiferal ooze facies.
2. Most of the continental slope and Sigsbee Deep cores show a three-fold zonation. The intermediate zone is reddish brown and/or dark olive-gray clay in slope cores and red or red-streaked clay in Sigsbee Deep cores. Because changes from warm- to cold-water faunas generally occur at the stratigraphic level of this zone, the base of the reddish brown, red, or red-streaked clay is taken to be the contact between the Recent and the last glacial stage of the Pleistocene. There is no evidence of the Recent-Pleistocene contact in shelf cores or, with one possible exception, in rise cores.
3. The sedimentary facies distribution pattern is the result of two factors: (a) the great volumes of sediment carried into the Gulf by a system of several major and many minor rivers with a large combined drainage area and (b) the transport of the sediment by the counter-clockwise prevailing current. Because of factor (a), most of the northwest Gulf is an area of clastic deposition. Because of factor (b), the non-clastic ooze facies, an extension of the large eastern Gulf calcareous area, terminates southwest, rather than directly south, of the Mississippi Delta.
4. The thickness of the Recent, as shown by the isopach pattern, appears to be controlled by the same two factors. Though variable, it decreases on the average from slope to deep and from west to east within the dee Averages for the upper slope, lower slope, western deep, and eastern deep are 56, 42, 37, and 20 inches, respectively. The corresponding average sedimentation rates are 360, 480, 540, and 1,000 years per inch, on the assumption that the Recent epoch began 20,000 years ago.
5. On the slope and in the deep, the good to excellent core-to-core correlation and the absence of graded bedding indicate that turbidity current activity has been non-existent, or at most of minor importance, during the time represented by the cored strata.
6. Coarse-textured deposits similar to those of the shelf are found in the Pleistocene sections of Sigsbee Deep cores. Evidence for turbidity origin, such as graded bedding, is lacking. It is postulated either that they accumulated in a shelf environment and were downfaulted to their present depth late Pleistocene or early Recent time, or that they are products of the coarser loads contributed to the Gulf by the rejuvenated streams of the last glacial stage.

KEYWORDS: Geology.

**302.**

Grey, M. 1956. New records of deep-sea fishes, including a new species, *Oneirodes bradburyae,* from the Gulf of Mexico. Copeia :242-246.

ABSTRACT: Deepwater trawl collections made by the U.S. Fish and Wildlife Service vessel OREGON in the Gulf of Mexico produced several new records and one new species of deepwater fish. New records for the gulf included *Microstomus microstoma, Valenciennellus tripunctulatus, Argyropelecus gigas, Melanomus unipennis, Diretmus argenteus,* and *Hollardia hollardia.* A new species of deep-sea angler was collected in 780 fathoms. This species was named *Oneirodes bradburyae.*

KEYWORDS: Mesopelagic fishes; Bathypelagic fishes.

**303.**

Grimes, C.B. and J.H. Finucane. 1991. Spatial distribution and abundance of larval and juvenile fish, chlorophyll and macrozooplankton around the Mississippi River discharge plume, and the role of the plume in fish recruitment. Marine Ecology Progress Series 75(2-3):109-119.

ABSTRACT: In September 1986, we collected neuston (1 x 2 m, 0.947 mm mesh) and surface chlorophyll a samples and hydrographic data at 46 stations around the discharge plume of the Mississippi River. Transects were positioned so that the 3 water masses in the plume area - plume water, Gulf of Mexico shelf water and frontal water (a mixture of the former 2) - were sampled. The plume was represented by a shallow lens of water < 34% salinity and < 29 degree C resting atop warmer (> 29 degree C) and more saline (> 34%) Gulf of Mexico shelf water. Strong turbidity fronts with a scale of 50 to 100 m form, relax and reform approximately at tidal frequencies within the frontal region that has a larger scale of 6 to 8 km. Total ichthyoplankton catch per tow, individual surface chlorophyll a values and macrozooplankton displacement volumes were all significantly greater in frontal water than adjacent Gulf of Mexico shelf or plume waters.

KEYWORDS: Water column biology; fish larvae; juveniles; recruitment; organism aggregations; river plumes; Gulf of Mexico; Mississippi River; abundance; Teleostei; River Discharge.

**304.**

Grimes, C.B., J.H. Finucane, L.A. Collins, and D.A. DeVries. 1990. Young king mackerel, *Scomberomorus cavalla* , in the Gulf of Mexico, a summary of the distribution and occurrence of larvae and juveniles, and spawning dates for Mexican juveniles. Bulletin of Marine Science 46(3):640-654.

ABSTRACT: To further our understanding of recruitment, spawning areas and times and stock structure we summarized all available published and unpublished information on early life stages of king mackerel. New data, 248 larvae and small juveniles ( less than or equal to 50 mm SL) from 676 neuston samples (1 x 2 m 0.947 mm and 0.760 mm mesh net) collected between 1983 and 1986 from west Florida (83 degree W long.) and the U.S. Mexican border (26 degree N lat.), are included. Previously unreported data (mostly large juveniles > 50 mm SL) were collected during over 105,000 h of trawling between 1952 and 1985, and from an almadraba (pound net) and shrimp trawls in Mexico in 1985, 1986 and 1987. Sampling effort appropriate for collecting early life stages of king mackerel has been extensive (> 7,200 collections), but heavily concentrated in U.S. waters during warm months (Apr to Oct). Seasonal occurrences of young stages clearly delineate the spawning season in U.S. waters as May to Oct, with a peak in Sep.

KEYWORDS: Water column biology; spawning seasons; ichthyoplankton surveys; spawning grounds; Scombridae; Gulf of Mexico; spatial distribution; spawning; juveniles; *Scomberomorus cavalla*; Fish Larvae; Geographical Distribution; Larvae.

**305.**

Grimmer, P. 1999. GTL: Perspectives of an Oil Company as a Technology Developer. Proceedings of the 31th Annual Offshore Technology Conference ( OTC paper 10760).

ABSTRACT: Conoco has been developing Gas-To-Liquids technologies since early 1997 and has a perspective shared by few companies as both an integrated company and a technology developer. This presentation will address the challenges producers face in commercializing "stranded gas", offering a different perspective from the enthusiastic views espoused by many in the last 3 years. GTL potential is enormous but so are the remaining hurdles to commercialization.

KEYWORDS: Technology.

**306.**

Gulf of Mexico Fishery Management Council. 1996. Amendment 8 to the Shrimp Fishery of the Gulf of Mexico U.S. Waters.,Gulf of Mexico Fishery Management Council. Tampa, FL.

ABSTRACT:This amendment provides for a total allowable catch (TAC) and optimum yield (OY) of royal red shrimp (*Pleoticus robustus*) of up to 130 percent of maximum sustainable yield (MSY) for no more than two years in order to obtain scientific data for a better determination of MSY. It redefines overfishing as fishing in excess of OY. The fishery occurs in the Gulf of Mexico only in the EEZ (Exclusive Economic Zone).

KEYWORDS:Fisheries; commercial species; management; royal red shrimp.

**307.**

Hagerty, R.M. 1970. Clay mineralogy of the southwestern Gulf of Mexico and adjacent rivers outlets. Texas A&M University. College Station, TX.

ABSTRACT: This study of the clay mineralogy of the surface sediments in the southwestern Gulf of Mexico and its adjacent river outlets is based primarily on X-ray diffractograms of the less than 2u size fraction of 184 samples. Montmorillonite, mica (illite), kaolinite and chlorite, as well as metahalloysite, tabular halloysite and attapulgite occur in the study area. The clay mineral suites found at the mouth of ten river systems in Mexico fall into four natural geographical groups. The controlling influence for this grouping is the lithologies of the parent rocks found in the drainage basins. The most distinctive province is one containing large quantities of volcanics. The clay suites in the rivers do not reflect climatic differences between their drainage basins. Very similar suites are present in the Rio Grande River, which drains an arid to semiarid region, and the Rio Grijalva River which drains a tropical rain forest. Within the southwestern Gulf of Mexico the clay mineral suite is remarkably homogenous in the northern and western portions because of mixing by the current system. Montmorillonite is the predominent clay mineral and varies between 40% and 45%. Mica is the next most abundant averaging about 35%. Kaolinite and chlorite average about 12% and 8% respectively. In the Bay of Campeche and adjacent shelves the areal distribution of the clay minerals is more variable in which case they reflect their source rivers. A cyclonic current system in this region tends to shift the clay minerals counterclockwise away from their sources. Halloysite as measured by a "halloysite index" is a minor but distinctive mineral in this area. No evidence of significant diagenesis or differential transport is found in the clay minerals in the southwestern Gulf. The results of this study places serious restrictions on the ability of clay minerals in ancient sediments to provide information on concerning their source or depositional environment.

KEYWORDS: Geology.

**308.**

Halbouty MF. 1979. Salt domes, gulf region, United States and Mexico. Gulf Publishing Company Houston, TX

ABSTRACT: None.

KEYWORDS: Geology.

**309.**

Hall, C.S. 1969. An investigation of the water balance of the basin of the Gulf of Mexico. M.S. Thesis. Texas A&M University. College Station, TX.

ABSTRACT: Streamflow data for rivers flowing into the Gulf of Mexico were studied to determine the average monthly, annual, and seasonal rates of discharge into that body during the three year period, 1 October 1962 through 30 September 1965. River discharge computations were combined with results from a previous study of the atmospheric branch of the hydrologic cycle to yield an approximation to the difference in flow though the Yucatan Channel and the Straits of Florida, as well as an estimate of the salt balance. The average rate at which water was contributed by river discharge during the period studied was $23.8 \times 10^6$ kgm $sec^{-1}$, which was 75 percent of the long-term mean. The maximum seasonal values of discharge occurred in the winter and spring months. The 1965 water year had the greatest rate of river discharge, $29.0 \times 10^6$ kgm $sec^{-1}$, while the 1963 and 1964 water years had rates of $19.8 \times 10^6$ kgm $sec^{-1}$ and $22.5 \times 10^6$ kgm $sec^{-1}$, respectively. The primary contributor of water to the Gulf of Mexico was the Mississippi River which, on the average, furnished 59 percent of this total. During the period of study, the inflow through the Yucatan Channel exceeded the outflow through the Straits of Florida by $33 \times 10^6$ kgm $sec^{-1}$. The average salinity of waters leaving through the Straits of Florida was estimated to be 0.13 percent higher than that for waters entering through the Yucatan Channel. A conclusion of this study is that river discharge does not compensate for the net water loss caused by the excess evaporation over precipitation in the Gulf of Mexico. This is in agreement with results of a similar study conducted by Franceschini (1961).

KEYWORDS: Physical Oceanography.

**310.**

Halper, F.B. 1984. The effects of storms on sediment resuspension and transport on the outer continental shelf, northwest Gulf of Mexico. PhD. Dissertation. Texas A&M University. College Station, TX.

ABSTRACT: Time series measurements of current velocity, transmissivity and water temperature, along with meteorological data obtained during the winter of 1980-81 and the spring/summer of 1980 were analyzed in order to determine the effect of winter storms and hurricanes on suspended sediment concentration on the outer continental shelf (average water depth 100 meters) of the northwest Gulf of Mexico. During the winter deployment, seven northers and Hurricane Jeanne passed over the study area. The time series data indicate that the passage of these storms disrupted the strong easterly flow (at 50 meters depth) present for much of the year in this area and caused the entire water column to oscillate north/south across the shelf edge. The passage of the storms did not cause an increase in current speed. Transmissivity data obtained from 2 levels above the bottom (four and eleven meters above the bottom) during the winter deployment showed that, in general, the passage of storms did not directly cause an increase in suspended sediment concentration. Regression analyses indicated that increases in current speeds were not linearly correlated with increases in suspended sediment concentration at this height above the bottom. Visual examination of the records indicates that suspended sediment is being advected into the area from onshore. Spectral analyses performed on the current meter data from both the winter and spring deployments indicated the presence of: (1) oscillations at the inertial/diurnal period, (2) shelf waves with periods of two days, and (3) a 28-30 hour natural mode for the Gulf. In addition, during the winter, a three day oscillation was observed in the spectra. Analysis of the wind and current meter data indicates that strong wind events which occur in winter may either directly or indirectly be forcing this oscillation. Coherence square estimates computed between the suspended particulate matter and the current meter records indicate that, during the winter, the v (north/south) component of the current and the suspended particulate matter concentration are coherent at periods of 28-30 hours, 2 days, and 3 days. Phase relationships suggest that when the flow is to the south (offshelf) the suspended particulate matter concentration increases, implying that sediment is advected into the area. When the flow is to the north (onshore) warm, clear water from off the shelf is brought into the area and the suspended particulate matter concentration begins to decrease. This advection of suspended sediment over the shelf edge may be an effective mechanism for the removal of sediment from the shelf.

KEYWORDS: Physical Oceanography; Gulf of Mexico.

**311.**
Halper, F.B. and D.W. McGrail. 1988. Long-term measurements of near-bottom currents and suspended sediment concentration on the outer Texas-Louisiana continental shelf. Continental Shelf Research 8(1):23-36.

ABSTRACT: Long-term measurements of near-bottom current velocity, water temperature and transmissivity were collected on the outer Texas-Louisiana shelf, near the shelf-edge, during the spring-summer of 1980 and the winter of 1980-1981. The sediments on this part of the shelf consist primarily of silt and clay and a bottom nepheloid layer is well developed. The winter deployment coincided with the passage of 7 northers and Hurricane Jeanne. The spring-summer deployment was relatively quiet in comparison. The observations show that current direction is strongly related to changes in suspended sediment concentration. Flow to the south corresponds to increases in suspended matter concentration, flow to the north corresponds to decreases in suspended sediment concentration, suggesting that suspended sediment concentration is modulated primarily by advective processes. The passage of the northers did not cause an increase in current speed or suspended sediment concentration.

KEYWORDS: Physical Oceanography; bottom currents; resuspended sediments; current velocity; continental shelves; long-term records; Texas; Louisiana; Gulf of Mexico.

**312.**
Hamilton, P. 1990. Deep currents in the Gulf of Mexico. Journal of Physical Oceanography 20(7):1087-1104.

ABSTRACT: Direct current measurements using moored arrays have been made below 1000 m in the eastern, central and western Gulf of Mexico basin. The major low frequency velocity fluctuations in the lower 1000 to 2000 m of the water column in the three regions have the characteristics of topographic Rossby waves (TRWs). Spectral peaks are observed at periods of about 25 days and 40 to 100 days. Motions are highly coherent with depth. Variances increase toward the bottom despite the very weak stratification of the deep waters of the Gulf. Wavelengths are about 150-250 km and phase propagation is offshore with energy propagation westward.

KEYWORDS: Physical Oceanography; current measurement; fluid flow; current velocity; deep currents; Deep Water; Gulf of Mexico.

**313.**
Hamilton, P. 1992. Lower continental slope cyclonic eddies in the central Gulf of Mexico. Journal of Geophysical Research 97(C2):2185-2200.

ABSTRACT: Current meters, an inverted echo sounder, hydrography, drifters, and satellite imagery are used to characterize relatively small (100- to 150-km diameter) cold cyclonic eddies in the central basin and on the lower Louisiana slope of the Gulf of Mexico. These cyclones are shown to be long-lived (6 months or more), have limited movements when compared with Loop Current anticyclones, and be fairly vigorous, with upper layer currents of 30-50 cm/s. They usually have only small temperature differences with surrounding water masses in the upper 50 to 100 m of the water column and are therefore not readily apparent in satellite thermal imagery. The largest isotherm displacements occur over depths of 200-800 m. In one case, a cyclone was traced from the deep basin near 92 degree W to the northern slope as a major anticyclone propagated southwestward through the gulf. The presence of cyclones and anticyclones on the Louisiana slope is consistent with observed current meter measurements in the upper half of the water column that have long (several months) periods and approximately equal variances in the cross-slope and along-slope directions.

KEYWORDS: Physical Oceanography; oceanic eddies; cyclonic motion; continental slope; low temperature; ocean circulation; ocean currents; water motion; Gulf of Mexico.

**314.**

Hansen, D.V. and R.L. Molinari. 1979. Deep currents in the Yucatan Strait. Journal of Geophysical Research 84(C1):359.

ABSTRACT: Current meter and hydrographic data were collected in the Yucatan Channel during a month in the autumn of 1970. Currents 15 m above the bottom are characterized by diurnal modulation and oscillations of 4- to 5-day periods. The observed tidal currents are in phase with their counterpart in the Straits of Florida but of insufficient amplitude for consistency with the amplitude of diurnal tide observed in the Gulf of Mexico. The average current observed over the month was 3.9 cm/s toward SSW. Geostrophic current circulation and dissolved oxygen observations indicate a generally southward flow below about 1000-m depth and at all depths in the eastern side of the channel during the latter part of the observation.

KEYWORDS: Physical Oceanography; subsurface currents; tidal currents; diurnal tides; Yucatan Strait; Geostrophic Currents; Dissolved Oxygen; Gulf of Mexico.

**315.**

Happ, G., V.R. Bennett, W.W. Burke, W.H. Conner, and N.J. Craig. 1976. Impacts of Outer Continental Shelf Activities: Lafourche Parish, La,Final rept. Louisiana State Univ., Baton Rouge. Center for Wetlands Resources.

ABSTRACT:Three categories of activity studied in relation to Outer Continental Shelf (OCS) development are mineral extraction, navigation and transportation. Environmental impacts of OCS activities are described in terms of hydrocarbon discharge, altered drainage patterns, eutrophication, subsidence, erosion, direct land loss, changes in salinity and turbidity, and disruption of flora and fauna. The major environmental impacts of OCS activities are OCS employment-derived population increases, OCS use of pipeline ditches and navigational canals, and potential oil spills. OCS-use of oil and gas pipeline canals, and dredging of landfill, along with muck disposal, spoil banks, are other sources of environmental impact upon Lafourche Parish. Direct land loss resulting in loss of primary production of marshes and swamps has a direct impact on the economy of the area. On the basis of preliminary data guidelines for OCS-related activities are suggested.

KEYWORDS:Socioeconomics; Continental shelves; Environmental impacts; Natural resources; Louisiana; Oil pollution; Water pollution; Mineral deposits; Marine transportation; Dredging; Navigation; Employment; Drainage; Turbidity; Hydroc arbons; Pipelines; Land use; Marshes; Swamps; Erosion; Tables(Data); Outer Continental Shelf; Oil Spills; Eutrophication; Lafourche Parish(Louisiana); Ntiscomnoa.

**316.**

Hardin, G.C.Jr. 1962. Notes on the cenozoic sedimentation in the gulf coast geosyncline, pp 1-15. In: Rainwater EHIJr, (Editor). Geology of the Gulf Coast and central Texas, and guidebook of excursions. Houston Geological Society,

ABSTRACT: The Gulf Coast geosyncline extends from Alabama southwestward to the northeastern part of Mexico, and contains Mesozoic and Cenozoic sediments on the order of 60,000 feet thick. Cenozoic clastics ranging from 10,000 to 50,000 feet or more thick cover an area of approximately 250,000 square miles. Two stable arches and three embayments are aligned transverse to the axis of the geosyncline, and largely determine the shape of its northwestern limb. These features reflect Paleozoic and pre-Cambrian structures and alignments. The greatest thickness of sediments known for each Cenozoic stratigraphic unit is found in one of the embayments. During the Cenozoic, rate of sedimentation was never uniform throughout the geosyncline. At some places, deposits accumulated in depocenters or along depoaxes to much greater thickness than elsewhere. Area of maximum sedimentation for Eocene was in southwestern Texas, but gradually shifted northeastward until area of maximum sedimentation for Miocene and younger was in southern Louisiana. The gentle southeastward dip of most Cenozoic stratigraphic units is modified by zones called "flexures," downdip from which the rate of dip and thickening of beds is accentuated. Most flexures are accentuated by contemporaneous normal faults of regional extent. Each succeeding younger "flexure" is located seaward, or downdip, from the preceding older one. This results in the cross sectional shape of the geosyncline being asymetrical, with its axial plane dipping landward at an angle of approximately four degrees.

KEYWORDS: Geology; sediments.

**317.**

Haring, R.E. and J.C. Heideman. 1980. Gulf of Mexico rare wave return periods. Journal of Petroleum Technology 32(1):35-47.

ABSTRACT: Estimates of rare wave heights and crest heights in the Gulf of Mexico were derived from hindcasts of 22 severe hurricanes since 1900. Results vary little between the sectors investigated. Wave height results are not influenced strongly be the statistical method used, but crest heights are. Results provide a basis for evaluation of platform design wave criteria in the Gulf of Mexico.

KEYWORDS: Physical Oceanography; wave climate; wave hindcasting; wave height; storms; hurricanes; Design Wave; Gulf of Mexico.

**318.**

Harlan, R.W. 1966. A clay mineral study of recent and Pleistocene sediments from the Sigsbee deep, Gulf of Mexico. Ph.D Dissertation. Texas A&M University. College Station, TX.

ABSTRACT: The less than $2\mu$ fraction of 96 samples from five deep-sea cores from the Sigsbee Deep and Campeche Bank, Gulf of Mexico, were analyzed by X-ray diffraction methods in order to evaluate the mineralogical content and the changes of the relative abundance of montmorillonite, chlorite, illite, and kaolinite through the stratigraphic section and between different topographic occurrences. Two of the cores studied were collected from the tops of knolls which rise about 600 feet above the flat floor of the Sigsbee Deep abyssal plain. These cores penetrated three warm- and two cold-water faunal facies. It was found that the relative abundances of illite and chlorite are greatest in the sediments deposited during the inferred cold-water glacial ages and are least in the sediments deposited during the warm-water interglacial ages. Similarly, kaolinite and montmorillonite are most abundant in the sediments deposited during the warm-water interglacial ages and are least abundant in the sediments deposited during the inferred cold-water glacial ages. This observed distribution of the relative abundance of the various clay minerals is believed to be directly related to changes in the weathering environment of the source area which was supplying sediments to the Sigsbee Deep during the Late Pleistocene. Two of the cores studied were collected from the abyssal plain, and one core was collected from the northwest corner of the Campeche Bank. It was found that the relative abundance of montmorillonite and illite was higher while the relative abundance of kaolinite and chlorite was lower in the dark-gray silts and clays which characterize the abyssal plain sediments, compared to the light-colored, highly-calcareous sediments that occur interbedded with the dark-gray silts and clays. The relative abundance of the minerals from the light-colored sediments compared very favorably with those observed in the core from the Campeche Bank. It was concluded that the dark-gray silts and clays were derived primarily from the ancient Mississippi River drainage basin and the light colored sediment originated from the relatively nearby Campeche Bank area. The observed increase in the relative abundance of kaolinite in the various warm-water faunal facies strongly suggests that kaolinite does not undergo any structural change after introduction into a marine environment.

KEYWORDS: Geology.

**319.**

Harris, J.E. 1972. Characterization of suspended matter in the Gulf of Mexico. I. Spatial distribution of suspended matter. Deep-Sea Research 19(10):719-726.

ABSTRACT: The mass distribution of total suspended matter was determined at 45 stations in the Gulf of Mexico using 0.45 mu m membrane filters. In surface water, total suspended matter ranged from 600 mu g/I. in the open Gulf to 2.4 mg/l. in near-shore waters. In water deeper than 100 m the range was 20 to 640 mu g/l. A bimodal distribution was found which can not be completely explained; however, it appears that seasonal variations in primary productivity are important. The average value of total suspended matter for deep water was 166 mu g/l., almost three times higher than the previously reported average.

KEYWORDS: Physical Oceanography; Oceanography; Seawater; Suspensions; Suspended Matter; Mass Distribution; Gulf of Mexico.

**320.**

Havran, K.J. and K. M. Collins. 1980. Outer Continental Shelf Oil and Gas Activities in the Gulf of Mexico and Their Onshore Impacts: a Summary Report, September 1980. U. S. Department of Interior, Geological Survey, Outer Continental Shelf Oil and Gas Information Program, U.S. Bureau of Land Management, Council on Environmental Quality. Philadelphia, Pa.USGS open file report 80-864.

ABSTRACT:None.

KEYWORDS:Socioeconomics; Gulf of Mexico.

**321.**

Hays, P.R. 1996. Steel catenary risers for semisubmersible based floating production systems. Offshore Technology Conference, Annual Proceedings 4:845-859.

ABSTRACT: The DeepStar production riser committee has investigated the feasibility of using steel catenary risers (SCR's) in water depths of 3000-6000 ft. Using Sonat's George Richardson as the base semisubmersible, DeepStaR has examined both extreme event response and fatigue life of an SCR made of pipe sections welded end-to-end. Concepts using alternative materials were investigated. This included steel, steel with titanium and titanium catenary risers. The pros and cons of frequency domain versus time domain analysis were investigated with a commercially available analysis package. A second study outlined a definitive analysis procedure which optimized the analysis time requirements. Analyses showed that steel catenary risers are feasible for semisubmersible based floating production systems. For the DeepStax Gulf of Mexico design criteria, alternative materials are not required. The greatest fatigue damage occurs in the touchdown region of the riser. Mild sea states contribute most to fatigue damage near riser touchdown. Wave drift and wind forces provide a significant contribution to touchdown area fatigue damage. Estimated fatigue lives are acceptable. Although the rotations of the upper end of the riser are large relative to an SCR attached to a TLP, the rotation required can probably be accommodated with existing technology. For the case of product export, steel catenary risers provide very cost effective and readily installable deep water riser alternatives.

KEYWORDS: Marine risers; Production platforms; Steel pipe; Fatigue of materials; Optimization; Frequency domain analysis; Time domain analysis; Computer software; Computer aided analysis; Cost effectiveness; Steel catenary risers (SCR); Floating production systems.

**322.**

Hecker, B. 1985. Fauna from a cold sulfur-seep in the Gulf of Mexico: comparison with hydrothermal vent communities and evolutionary implications. Biological Society of Washington Bulletin 6:465-73.

ABSTRACT: Dense populations of large epifaunal organisms associated with a hypersaline, cold-water, sulfur seep were found at 3270 meters at the base of the Florida Escarpment. The taxonomic composition of this seep community is strikingly similar to that of epifaunal communities surrounding the eastern Pacific hydrothermal vents. At least five of the taxa found at the seep site are congeners of hydrothermal vent organisms, while several other taxa belong to the same families found at the vents. This notable taxonomic similarity points to a common origin and subsequent evolutionary history for seep and hydrothermal vent communities. The discovery of this seep community, as well as several more recent finds, indicate that geothermal vents are but one mechanism by which energy sources appropriate for the support of deep-sea chemosynthesis extend up to the sea floor. The prospective longevity of a seep site, in relation to the proposed short life span of individual hydrothermal vents, makes seep sites a more likely habitat in which the ancestors of these communities may have originally adapted to the toxic sulfide environment.

KEYWORDS: Geology.

**323.**

Heerema, E.P. 1998. Major deepwater pipelay vessel starts work in North Sea. Oil and Gas Journal 96:78, 82, 84, 86-88.

ABSTRACT: : Industry's deepwater pipelaying capability has received a boost with the entry into the world's fleet of Solitaire, a dynamically positioned pipelay vessel of about 350 m including stinger. The converted bulk carrier, formerly the Trentwood, arrived on station in the North Sea and begun laying pipe on Statoil's Europipe II project, a 600-km, 42-in. OD gas pipeline from Norway to Germany. The vessel will install pipe for the Exxon U.S.A.'s Gulf of Mexico South Diana development in a water depth 1,643 and for Mobil Oil Canada as part of the Sable Island Offshore and Energy Project offshore Nova Scotia. Using the S-lay mode, Solitaire is well suited for laying large lines including deepwater projects.

KEYWORDS: Pipe laying barges; Pipeline laying; Submarine pipelines; Shipbuilding; Welding machines; Cost effectiveness; Dynamic positioning.

**324.**

Heffernan, J.J. and T.L. Hopkins. 1981. Vertical distribution and feeding of the shrimp genera *Gennadas* and *Bentheogennema* (Decapoda: Penaeidea) in the eastern Gulf of Mexico. Journal of Crustacean Biology 1(4): 461-473.

ABSTRACT: Five species of *Gennadas* and one species of the closely related genus *Bentheogennema* are found in the eastern Gulf of Mexico. *Gennadas* undergoes diel migration with most of the population concentrating at 650-850 m in the day and at 150-400 m during the night. Bentheogennema intermedia remains below 900 m. *Gennadas* valens is the most abundant species and constitutes 63% of the Gennadas catch. Maximum density for the genus was 6/1,000 m super(3) and the number under a square meter of sea surface was estimated at 2 individuals. Populations have been underestimated, however, as juveniles escape through the trawl meshes. The diets of *Gennadas*) and *Bentheogennema* are diverse and consist of a wide variety of primarily small, 1-5 mm plankton, (mostly copepods) and greenish brown detritus containing fragments of epipelagic microplankton. Little difference exists in the diets of the six species considered.

KEYWORDS: Water column biology; vertical distribution; diurnal rhythms; feeding behavior; Gulf of Mexico; *Gennadas*; *Bentheogennema*.

**325.**

Henry, W. K. 1979. Some aspects of the fate of cold fronts in the Gulf of Mexico. Monthly Weather Review 107(8):1078-82.

ABSTRACT: This is a summary of the frontal activity in the Gulf of Mexico and the Caribbean Sea based on the fronts rather than on the more standard climatological summary of frequency in latitude-longitude squares. The orientation of the entering front is a function of the origin of the front. The duration and final departure of the front is discussed along with the extent of the penetration southward and the development of frontal waves.

KEYWORDS: Physical Oceanography.

**326.**

Hewitt, J.E., J.P. Brooke, and J.H. Knipmeyer. 1984. Estimated oil and gas reserves Gulf of Mexico outer continental shelf and continental slope
1983. Minerals Management Service, New Orleans, LA, Gulf of Mexico Region. MMS 84-0020.

ABSTRACT:Remaining recoverable reserves of oil and gas in the Gulf of Mexico Outer Continental Shelf and Continental Slope have been estimated to be about 3.41 billion barrels of oil and 43.7 trillion cubic feet of gas, as of December 31, 1983. These reserves are recoverable from 505 studied fields under the Federal submerged lands off the coasts of Louisiana and Texas. An additional 51 fields, discovered since December 31, 1981, have not been sufficiently developed to permit a reasonably accurate estimate of reserves. Original recoverable reserves are estimated to have been 9.31 billion barrels of oil and 106.2 trillion cubic feet of gas from 521 fields in same geographic area. Included in this number are 16 fields that are depleted and were abandoned; not included are the 51 insufficiently developed fields. Estimates were made for individual reservoirs in 399 fields on a fieldwide basis for the other 122 fields.

KEYWORDS:Geology; oil and gas; offshore oil and gas; energy industry.

**327.**

Hill, A.W. 1996. Use of exploration 3D data in geohazard assessment: Where does the future lie? Offshore Technology Conference, Annual Proceedings 1:113-117.

ABSTRACT: Increasing use is being made of exploration 3D datasets in geohazards evaluations. This new attitude towards the use of exploration data has occurred whilst operators have been revising all their oilfield working practices. The streamlined approaches to exploration through to development have required site investigation practices to be refined to allow business plans to maintain the speed and momentum of their projects whilst ensuring safety. Using explorers's 3D data to screen potential well or platform locations or even pipeline routes the Site Investigation Specialist can ensure that inappropriate locations or routes are not surveyed whilst minimizing survey costs. (Author abstract) 8 Refs.

KEYWORDS: Geology; Seismic Prospecting; Data Processing; Risk Assessment; Oil Field Development; Petroleum Prospecting; Accident Prevention; Three Dimensional Seismic Exploration; Geohazard Assessment.

**328.**

Hinga, K.R., J.M. Sieburth, and G.R. Heath. 1979. The supply and use of organic material at the deep-sea floor. Journal of Marine Research 37(3):557-579.

ABSTRACT: Sediment traps and benthic respirometers have been used to measure the supply of particulate materials to, and the use of organic material by the North Atlantic deep-sea benthos. The area of the sea floor less than 2 km deep is relatively small but accounts for 85% of the total oceanic benthic oxygen consumption which reflects the primary productivity of the surface waters. In situ measurements of nutrient fluxes across the sediment-water interface differ markedly from the Redfield ratios. Sediment traps at three locations in the western North Atlantic yielded fluxes of 205 to 280 mg/$m^{-2}$ /day of total particulate material, 33 to 150 mg/m SUP-2 /day of carbonate, 14 to 30 mg/$m^{-2}$ /day of organic carbon, and 0.3 to 1.2 mg/$m^{-2}$ /day of nitrogen. Vertical fluxes of identifiable particulates included 2,000-11,000/$m^{-2}$ /day of foraminifera, 2,000-6,000/$m^{-2}$ /day of Radiolaria, 760-1200/$m^{-2}$ /day of pine pollen, 6-560/$m^{-2}$ /day of metal spheres and 30,000-700,000/$m^{-2}$ /day of diatoms. Comparison of the sediment trap fluxes with the benthic oxygen consumptions indicates that the vertical flux of particulate organic carbon is adequate to fuel the deep (3500 m) benthos, but that an additional input is required at shallower (600 m, 1300 m) depths. The transport of organic matter by vertically migrating organisms is suggested as the dominant additional input at the shallower depths.

KEYWORDS: nutrient cycles; benthos; organic suspended matter; Abyssal Zone; Oxygen Consumption.

**329.**

Hirth, H.F. 1997. Biological Report -97,Synopsis of the Biological Data on the Green Turtle *Chelonia mydas* (Linnaeus 1758).

ABSTRACT:This document reviews the salient and current literature on the biology of the green turtle, Chelonia mydas (Linnaeus, 1758) including taxonomy, distribution, physiology, morphology, ecology, demography, exploitation and conservation. Fifteen figures and 17 tables supplement the text. In general, green turtles are large sea turtles well adapted to marine life. They are circumglobal, commonly occurring in warm, tropical seas. They occur in offshore waters or on the nesting beaches of at least 139 countries and territories. Most nesting sites are located between 30 deg N and 30 deg S latitudes. The green turtle is a morphospecies, made-up of several distinct populations and metapopulations. The total range of a population--encompassing the nesting beach, epipelagic habitat, feeding grounds and migrations--can be very extensive.

KEYWORDS:Endangered Species; Turtles; Amphibians; Distribution; Bionomics; Life history; Populations; Exploitation; Protection; Management; Mariculture; Green Turtles; Chelonia Mydas.

**330.**
Hodel DP, Deitz R. 1993. Crisis in the oil patch: how america's energy industry is being destroyed and what must be done to save it. Regnery Publishing, Inc. Washington, D.C.

ABSTRACT: Examines exploration, production, refining, and marketing; focus on how government policies force dependence on petroleum imports through taxation and environmental regulation; recommendations.^Published by Regnery Publishing. Social, political, and economic costs.

KEYWORDS: Socioeconomics; Petroleum industry ; Tax aspects; Environmental policy.

**331.**
Hofmann, E.E. and S.J. Worley. 1986. An investigation of the circulation of the Gulf of Mexico. Journal of Geophysical Research 91(C12):14221-14242.

ABSTRACT: None.

KEYWORDS: Physical Oceanography; Ocean Circulation; Gulf of Mexico.

**332.**
Holing D. 1990. Coastal Alert: Energy, Ecosystems, and Offshore Oil Drilling. Island Press Washington, D.C.

ABSTRACT: This book explains how citizens can protect coastal resources from the damaging effects of offshore oil drilling.

KEYWORDS: Socioeconomics; Offshore drilling; Coastal zone management; Marine ecosystems; Offshore platforms; Petroleum industry; Energy source development; Coastal waters; Environmental impacts; Environmental protection; Citizen participation.

**333.**
Holmes, C.W. and E. A. Martin. 1978. $^{226}$Radium chronology of Gulf of Mexico slope sediments,U.S. Geological Survey. Open-file Report 78-701.

ABSTRACT:None.

KEYWORDS:Geology.

**334.**
Holmes, C.W. 1973. Distribution of selected elements in surficial marine sediments of the northern Gulf of Mexico continental shelf and slope. U. S. Geological Survey Professional Paper ( USGS PP0814):1-7.

ABSTRACT: Analyses for 30 elements, 1304 sediment samples.

KEYWORDS: Chemistry; Atlantic Ocean; Chemical Composition; Composition; Geo; Gulf of Mexico; Maps; Marine Geology; North Atlantic; Oceanography; Sediments; Usgs.

**335.**

Hooper, J.R. and W.A. Dunlap. 1989. Modeling soil properties on the continental slope, Gulf of Mexico. 21st Annual Offshore Technology Conference 1:677-688.

ABSTRACT: Models of engineering properties of soil on the continental slope in the Gulf of Mexico can be developed using relationships to geologic processes. Examples are given for known slope phenomena such as very weak and very strong clays, sand and rocks. Unusual foundation problems include sensitive clays, calcareous ooze and gas hydrates. Modeling thermal soil properties for foundation analysis is also considered. The method may be used to anticipate problems with in situ strength measurements caused by lateral compression and extension stresses in the slope.

KEYWORDS: Geology.

**336.**

Hoose, J.W., D.R. Schneider, and E.L. Cook. 1996. Rocky Flowline project - the Gulf of Mexico's first reeled pipe-in-pipe. Offshore Technology Conference, Annual Proceedings 3: 145-153.

ABSTRACT: The paper reviews the Rocky Flowline project from preliminary design through detail design, testing, fabrication, and installation. The emphasis of the paper is on the issues involved with deep water insulated flowlines, with special emphasis on fabricating and reeling insulated pipe-in-pipe flowlines. The paper highlights the design and installation of 21,000 ft of dual insulated 3-inch inside 6-inch flowlines in water depths up to 1785 feet. The paper and project is of significance to those in the industry involved in deep water oil development and the transportation of waxy crudes.

KEYWORDS: : Submarine pipelines; Flowlines; Offshore oil wells; Deep oil well drilling.

**337.**

Hopkins, T.L. 1982. The vertical distribution of zooplankton in the eastern Gulf of Mexico. Deep-Sea Research 29(9A):1069-1083.

ABSTRACT: The zooplankton community in the eastern Gulf of Mexico was investigated to determine the quantity and taxonomic composition of forage available to higher trophic levels and to provide a data base for future trophodynamic modelling. Standing stock (1.2 g $m^{-2}$, dw) in the upper 1000 m is in the range for oligotrophic low-latitude boundary currents but is greater than in central gyre areas. Abundance decreases exponentially with depth, over half the biomass occurring in the upper 200 m. Diel variations are apparent. Copepods were dominant, contributing over 80% of the number and half the net-caught biomass. Zooplankton biomass available as forage for higher trophic levels is most concentrated in the upper 50 m, whereas, paradoxically, the zooplanktivorous micronekton, the myctophid fishes in particular, are centered deeper, primarily between 50 and 150 m.

KEYWORDS: Water column biology; zooplankton; vertical distribution; circadian rhythms; community composition; biomass; Gulf of Mexico.

**338.**

Hopkins, T.L. and R.C. Baird. 1985. Feeding ecology of four hatchetfishes (Sternoptychidae) in the eastern Gulf of Mexico. Bulletin of Marine Science 36(2):260-277.

ABSTRACT: Vertical distribution and trophic ecology of hatchetfishes were investigated in the eastern Gulf of Mexico. The four principal species, *Argyropelecus aculeatus*, *A. hemigymnus*, *Sternoptyx diaphana* and *S. pseudobscura*, ranged in abundance from 21-53 x 10 $km^{-2}$ in the upper 1,000 m. There is strong evidence for time-space and food resource partitioning among these species. Depth of habitat and diet characteristics are reflected in cryptic adaptations and functional morphology of the two genera. *A. aculeatus* appeared to feed in the epipelagic zone (<200 m) early at night. Ostracods and copepods were the most important (biomass) food for smaller size classes, and pteropods, euphausiids and fish for larger individuals. *A. hemigymnus* apparently foraged in late afternoon in the 300-500-m zone. Ostracods and copepods were the principal food of all size classes. Cyclic feeding was not evident in either species of *Sternoptyx*, *S. diaphana*, which occurred primarily at 500-800 m, fed largely on copepods, ostracods and amphipods as juveniles and on amphipods and euphausiids at maturer sizes. S. pseudobscura which occurred mostly below 800 m, ingested primarily copepods, polychaetes and euphausiids as juveniles and took proportionately more amphipods and fish as adults. Non-random food choice was apparent, the Argyropelecus species selectively feeding on ostracods and S. diaphana on ostracods and amphipods. Much of the food of *S. pseudobscura*, inexplicably, was epipelagic in origin. Diet, depth and morphological characteristics of these hatchetfish species support the case for reduction of intraspecific competition through evolution. (DBO).

KEYWORDS: Water column biology; Gulf of Mexico; Sternoptychidae; *Argyropelecus aculeatus*; *Argyropelecus hemigymnus*; *Sternoptyx diaphana*; *Sternoptyx pseudobscura*; trophic relationships; vertical distribution; feeding behavior; competition; niches; intraspecific relationships; marine fish; selective feeding.

**339.**

Hopkins T.L., Flock M.E., J.V. Gartner Jr, and J.J. Torres. 1994. Structure and trophic ecology of a low latitude midwater decapod and mysid assemblage. Marine Ecology Progress Series 109:143-156.

ABSTRACT: Examined the micronektonic crustacean assemblage in the E Gulf of Mexico. Species showed highly varying diel distribution patterns ranging from a strong vertical migration to the epipelagic zone to absence of any migration resulting in a permanent residence deep in the mesopelagic zone. Decapod species with variegated pigment patterns centered above 650 m during the day, whereas "all-red' species centered below this depth. Standing stocks were 0.18 g dry wt $m^{-2}$ and 3 ind. $m^{-2}$ and 3 ind. $m^{-2}$ in the upper 1000 m. Crustaceans dominate as the main food biomass of sergestids (eg. copepods, ostracods, euphausiids) while aristeids (Gennadas spp.) and carideans feed heavily on both fish and crustaceans. Among mysids, Gnathophausia ingens ingests mostly fish while eucopiids are primarily copepod feeders. Other common diet items of the micronektonic crustacean assemblage are chaetognaths, molluscs (pteropods, heteropods) and large phaeodarian radiolarians. Olive-green debris containing phytoplankton and protists was encountered in the diets of all but two caridean species and the mysids. A likely source of this material is "marine snow'. The predation impact of the decapod and mysid population on zooplankton is estimated at 1% of standing stocks and 18% of biomass production $d^{-1}$. Cluster analyses of vertical distribution (space and time niche dimension and diet (food niche dimension) characteristics indicate that resource partitioning among the shrimp assemblage occurs at the between-species level.

KEYWORDS: decapod; mysid; trophic interaction; chaetognath; pteropod; heteropod; marine snow; resource partitioning; Radiolaria; Gulf of Mexico; Water column biology.

**340.**

Hopkins, T.L. and J.V.Jr. Gartner. 1992. Resource-partitioning and predation impact of a low-latitude myctophid community. Marine Biology 114(2):185-197.

ABSTRACT: This study, based on data collected during summer 1985 in the eastern Gulf of Mexico, examined the degree of overlap in two prime niche parameters, space and food in 17 of the most abundant myctophid species which inhabit the epipelagic zone at night. Cluster-analyses of vertical distribution information and diet characteristics revealed that while large groups of species overlapped (> 60%) in either vertical distributions or diet, when both niche parameters were considered together, little interspecific or intraspecific (size class) overlap occurred. Our data suggest that for myctophids, trophic competition is reduced through resource-partitioning, although with considerable overlap at niche boundaries. Niche separation presumably is the result of competition during the evolution of the ecosystem and is maintained presently as "diffuse competition": the effect on a species of the combined competition from all other species at that trophic level.

KEYWORDS: Water column biology; nutritional requirements; food availability; feed composition; vertical distribution; diets; abundance; check lists; habitat; epipelagic zone; physical properties; primary production; statistical analysis; predation; community composition; Myctophidae; *Diaphus lucidus*; Pleuromamma; Ostracoda; Euphausiacea; Gulf of Mexico.

**341.**

Hopkins, T.L., J.V.J. Gartner, and M.E. Flock. 1989. The caridean shrimp (Decapoda: Natantia) assemblage in the mesopelagic zone of the eastern Gulf of Mexico. Bulletin of Marine Science 45(1):p. 1-14.

ABSTRACT: Twenty two species of caridean shrimps were caught (338 midwater trawls) in the upper 1,000 m of the eastern Gulf of Mexico at 27 degree N 86 degree W. The assemblage has close affinities to that of the North Atlantic and is similar to caridean faunas world wide at tropical-subtropical latitudes. *Systellaspis debilis*, *Parapandalus richardi* and *Acanthephyra purpurea* , in that order, were the most abundant species and comprised 86% of the catch. The three species are strong diel vertical migrators with *S. debilis* and *P. richardi* having abundance maxima in the epipelagic zone at night and the A. purpurea maximum occurring deeper at 300 to 400 m. Twelve of the remaining 19 species appear to be weak or non-migrators found deep in the mesopelagic zone and with distribution extending into the bathypelagic zone. Several types of reproduction are apparent.

KEYWORDS: Water column biology; pelagic environment; Gulf of Mexico; Natantia; Check Lists.

**342.**

Hopkins, T.L. and T.M. Lancraft. 1984. The composition and standing stock of mesopelagic micronekton at 27 degree N 86 degree W in the eastern Gulf of Mexico. Contributions in Marine Science 27:143-158.

ABSTRACT: A series of oblique 0-1000m tows were used to determine the standing stock of micronekton in the eastern Gulf of Mexico in June and September, 1981. The principal groups were semaeostome scyphomedusae, fishes, and crustaceans. Semaeostome scyphomedusae were uncommon and occurred in only five tows. *Cyclothone* spp. fishes were the numerically dominant taxa and averaged 34.1% of the total micronekton numbers. Faunal diversity was high with 148 fish and crustacean species being identified. Diel vertical migration was apparent: 45% of the numbers and 53% of the biomass of micronekton migrated into the upper 40m at night.

KEYWORDS: Water column biology; standing stock; zooplankton; Gulf of Mexico; population number; check lists; Gulf of Mexico; Species Composition.

**343.**

Hopkins, T.L. and T.T. Sutton. 1998. Midwater fishes and shrimps as competitors and resource partitioning in low latitude oligotrophic ecosystems. Marine Ecology Progress Series 164:37-45.

ABSTRACT: Oligotrophic tropical-subtropical oceanic regimes constitute the largest and most ancient ecosystem on earth, with these enormous areas being characterized by high faunal diversity. The stability and age of the ecosystem have enabled the evolution of many similar species niches where there is considerable overlap in niche parameters such as food and space, resulting in high species packing, especially in the epi- and mesopelagic zones. Competition for limited resources undoubtedly exists and has been described by MacArthur (1972; Geographical ecology, Harper and Row, New York) as diffuse competition where each species is impacted by many other species sharing the environment. Most studies of resource partitioning in the oceanic pelagial have been restricted to specific taxonomic groups, such as copepods, fishes, shrimps, or cephalopods, and intergroup relationships have not been examined. The 2 dominant (numbers and biomass) components of low latitude midwater micronekton communities, based on trawl catches, are fishes and shrimps, and the present study reveals that species from each of these 2 assemblages occur in the same feeding guilds and hence potentially compete for food resources. However, as additional niche parameters are included in the analysis, such as food size and predator vertical distribution, groups of species with matching niche characteristics become increasingly smaller. Results of this study suggest that as additional information on individual life histories is obtained, such as data on seasonality of reproduction and population dynamics, the same pattern will emerge as we have found for fishes and shrimps considered separately, i.e. that resource partitioning occurs at the species level despite the pressures of diffuse intra- and intergroup competition. This minimizes competitive exclusion and enables the maintenance of a high-diversity fauna in resource-poor low latitude ecosystems.

KEYWORDS: Water column biology; Competition; Food webs; Vertical distribution; Predation; Check lists; Species diversity; Prey selection; Body size; Diurnal variations; Food organisms; Decapoda; Myctophidae; Gulf of Mexico.

**344.**

Hopkins, T.L., T.T. Sutton, and T.M. Lancraft. 1996. The trophic structure and predation impact of a low latitude midwater fish assemblage. Progress in Oceanography 38(3):205-239.

ABSTRACT: The trophic ecology of a midwater fish assemblage was investigated in the eastern Gulf of Mexico, a regime exhibiting the principal physical-biological characteristics of oligotrophic low latitude ecosystems. In all, the diets of 164 species of midwater fishes were examined, with data for 121 being sufficient for analytical comparisons. Cluster analysis grouped the assemblage into 15 feeding guilds, with these falling into two major groups, those including zooplanktivores with largely crustacean diets, and those including predators on large prey, most of which were piscivores. Daily consumption of the entire assemblage is estimated at 2.5-4.3 kg C $km^{-2}$ in the upper 1000 m. Four fifths of this is zooplankton while the balance is large prey, mostly fishes. The ingestion rate accounts for only 5-10% of the daily production of zooplankton, but 95% of fish daily production. While the latter is obviously an overestimate it does suggest a tighter nutritional coupling of the midwater fish assemblage with the upper trophic levels of the ecosystem than with zooplankton. Midwater fishes and shrimps, the two dominant groups of micronekton, together account for only 25% of zooplankton daily production consumed in the eastern Gulf and it remains unresolved as to which midwater ecosystem components are responsible for most of the utilization of zooplankton food resources.

KEYWORDS: Water column biology; predation; trophic structure; community composition; diets; marine fish; Gulf of Mexico; Pisces.

**345.**

Houde, E.D., J.C. Leak, C.E. Dowd, S.A. Berkeley, and W.J. Richards. 1979. Ichthyoplankton Abundance and Diversity in the Eastern Gulf of Mexico,Final report. National Marine Fisheries Service, Miami, FL. Southeast Fisheries Center.

ABSTRACT:An ichthyoplankton survey in the eastern Gulf of Mexico was carried out from 1971-1974. Objectives of the survey were to determine the kinds and abundances of larval fishes, their distribution and diversity, and the relationship of their occurrence to environmental factors. The surveys succeeded in providing important baseline data on the early life stages of fishes in the Gulf of Mexico. Effects of environmental factors on ichthyoplankton abundances were not clearly demonstrated but the modes and ranges of surface temperature, surface salinities and station depths where common species occurred were clearly defined. Positive affinities of some species with water of Loop Current origin, when it intruded into coastal areas, were demonstrated for several species.

KEYWORDS:Water column biology; *Plankton; *Marine fishes; *Water pollution; *Gulf of Mexico; Oceanographic surveys; Abundance; Distribution(Property); Environmental impacts; Ocean temperature; Salinity; Depth; Loop Current; Coasts; Biomass; *Outer Continental Shelves; Baseline Studies; Species Diversity.

**346.**

Huang, E., Y. Luo, and J. Zou. 1999. Concept Evaluation of Deepwater Surface Tree Floating Systems. Proceedings of the 8th SNAME Offshore Symposium .

ABSTRACT: There is a growing interest in using the surface tree option for deepwater floating production systems. The most popular platform concepts are the SPAR and the Tension Leg Platform (TLP). The saving gained in the operation cost from such systems often offsets the high initial capital cost. Compared with other floating system concepts that utilize subsea trees, the surface tree concept possesses superior global performance characteristics not only in the 100 year design environmental conditions but also most importantly in normal dayto-day operating conditions. This paper first reviews various concepts of the surface tree systems such as the cylindrical SPAR, truss SPAR, fourcolumn, three-column and single-column TLP's; their advantages and limitations; and suitability for applications in various offshore environments. The paper aims at illustrating the general trends of the preferred systems based on a few key design requirements. The present study focuses on the Gulf of Mexico application and investigates the influences of topsides payload and water depth. The approach adopted in the study is to utilize the past experience of field developments and conceptual studies to systematically evaluate different platform concepts. The concepts are evaluated according to (i) the efficiency in carrying the payload and (ii) the development cost. Based on the defined assumptions, the preferred concept(s) are highlighted. The present study uses an in-house field development database to provide a consistent basis of evaluation.

KEYWORDS: Technology.

**347.**

Huang, T.C. and H.G. Goodell. 1970. Sediments and sedimentary processes of eastern Mississippi cone, Gulf of Mexico. The American Association of Petroleum Geologists Bulletin 54(11):2070-2100.

ABSTRACT: The upper 6-7 m of sediment of the eastern Mississippi cone consists of a repetitious vertical succession of gray silt and silty clay intercalated with a few layers of fine sand and topped by 20 50 cm layer of yellowish-brown foraminiferal clay. Disequilibrium age determinations indicate that the lower silty layers, representing the deposits of latest low sea-level stand, were deposited more rapidly than the upper foraminiferal clay. These sedimentation rates, which depend primarily on the rate of the detrital influx and sea-level change, average about 30 cm / 1,000 years. Sedimentary processes on the deep-sea fan are interpreted from sedimentary structures, textures, and compositions, as well as from bathymetry, bottom photographs, and continuous seismic profiles. The more than 20 varieties of minor sedimentary structures recognized from X-ray radiographs are grouped into five varieties that correlate closely with sediment type. None of the structures is typical of vertical "turbidity sequence." On the contrary, the evidence suggests that the primary mechanisms of sediment transport are differential pelagic settling and low-flow-regime bottom currents, with mass movements by sliding or slumping common in channel and slope areas. Statistical evaluation of the occurrence and distribution of minor structures indicates that (1) most of the structures associated with coarser materials are analogous to structures formed by traction transport or by ripple migration in shallow water, and (2) the distribution of both bottom-current intensity and internal waves that create small-scale ripple is local. Photographs of the present bottom support this conclusion. The importance of diagenetic solution of carbonate, mostly planktonic foraminifers and pteropods, as verified by laboratory experimentation, is related to the degradation of organic matter in the sediments. The most active solution occurs near the boundary between the upper foraminiferal clay and the lower silty layers and is partly responsible for (1) the abrupt decrease of carbonate downward in the cores, (2) the rearrangement of clay particles into secondary thin laminae, and (3) the shortening of the distance between noncarbonate silt and sand layers or laminae. These results, combined with compaction, accentuate the uniformity of layering. The upper cone is indented by digitate leveed valleys and canyons cut by transverse ridges, whereas the lower section is characteristically smooth. The bathymetry of the cone reflects its underlying structure. Continuous seismic profiles show that the cone is composed of relatively uniform flat-lying beds, representing at least five major depositional cycles since Plio-Miocene time and as many as 14 since Late Cretaceous time. In contrast, the upper cone has many internal irregularities, probably caused by gravity sliding, folding, and slumping contemporaneous with deposition, and by diapiric salt intrusion. The cone's depocenter has shifted continuously basinward as the Mississippi delta has prograded gulfward since Late Cretaceous time.

KEYWORDS: Geology.

**348.**

Hubertz, J.M. 1967. A study of the loop current in the eastern Gulf of Mexico. Texas A&M UniversityA physical oceanographic survey was made in June 1966 using and instrument which measures salinity and temperature as continuous functions of depth. Data was also gathered using Nansen casts, bathythermographs, and the geomagnetic electrokinetograph.

The Loop Current was found to extend to 27°30'N with a smaller secondary loop at its northern tip. Average speeds in the current were 2 knots with associated transports of 45 x $10^6$ $m^3$/sec around the major loop within the Gulf. The Loop Current bounded a water mass, the Eastern Gulf Loop Water, distinct from that found elsewhere in the Gulf of Mexico. The average circulation pattern was found to be less complex than those presented previous to 1967.

KEYWORDS: Physical Oceanography.

**349.**

Hubertz, J.M., R.O. Reid, and A. Garcia. 1969. Objective analysis of oceanic surface currents., pp 139. In: L.R.A. Capurro. Contributions on the Physical Oceanography of the Gulf of Mexico. Volume 2 Gulf Publishers, Houston, TX.

ABSTRACT: Physical oceanographic surveys of the eastern Gulf of Mexico were made in June, 1966, and June, 1967, with the R/V *Alaminos*. Hourly surface GEK measurements were made during both cruises. Treating measurements from each cruise as synoptic, these results are used to appropriate the nondivergent part of the surface velocity field, which is displayed in terms of stream function. The method used to obtain the stream function is a numerical relaxation of a form of Poisson's equation. Solutions were obtained for two types of boundary conditions. The gradient of the stream function normal to the boundary was specified in one instance (Neumann-type). In the second case the value of the stream function itself was specified along the boundary in such a way that the net flow through the boundaries was zero (Dirichlet-type). The data from 1967 are used in an extension of the method which considers the transports within a near-surface layer bounded above by the sea surface and below by a surface of constant potential density.

KEYWORDS: Physical Oceanography.

**350.**

Hughes, R.M. 1967. Balance of atmospheric water vapor over the Gulf of Mexico. Texas A&M UniversityAerological data for ten stations around the perimeter of the Gulf of Mexico for the period 1 October 1959 through 30 September 1960 were used to investigate precipitable water, water-vapor transport, and the atmospheric water balance. Computations for the flux of water vapor were preformed by an electronic computer, IBM-7094, at each 50-mb level and integrated vertically from the surface to 200 mb for each month. Changes in water storage and the net divergence of water vapor were computed for the atmosphere above the Gulf on a monthly basis. These values were used to determine the vertical exchange between sea and atmosphere, i.e., evaporation minus precipitation. Results are shown on annual and seasonal maps and vertical cross sections for the area. Finally, a comparison was made between the results obtained in this study with those obtained by Dr. Guy A. Franceschini for the previous water-year, 1959. Very good agreement was found for all parameters considered. During the period studied, the Gulf of Mexico acted as a source of water for the atmosphere.

KEYWORDS: Physical Oceanography.

**351.**

Huh, O.K., L.J. Rouse Jr, and N.D. Walker. 1984. Cold air outbreaks over the northwest Florida continental shelf: heat flux processes and hydrographic changes. Journal of Geophysical Research 89(C1):717-726.

ABSTRACT: An experimental study of the meteorology and oceanography of the cold air outbreak cycle was conducted during the fall of 1978 off Panama City, Florida. The cycle has three phases recognizable in the measurements: the prefrontal, frontal passage, and cold air outbreak/high-pressure phases. Observations indicate the extreme time variability of heat flux processes and the hazards of extrapolating to daily rates from spot measurements or very short time series.-from Authors.

KEYWORDS: Physical Oceanography; Gulf of Mexico.

**352.**

Huh, O.K., W.J. Wiseman, and L. Rouse. 1978. Winter cycle of sea surface thermal patterns, northeastern Gulf of Mexico. Journal of Geophysical Research 83(C9):4523-4529.

ABSTRACT: None.

KEYWORDS: Physical Oceanography; Geophysical Oceanology; Dynamic Properties of Sea Water; Gulf of Mexico.

**353.**
Huh, O.K., W.J.J. Wiseman, and L.J.J. Rouse. 1981. Intrusion of Loop Current Waters onto the West Florida Continental Shelf. Journal of Geophysical Research 86(C5):4186-4192.

ABSTRACT: An intrusion of loop current water up DeSoto Canyon and onto the West Florida continental shelf to within 8 km of the shore occurred in February 1977. Boat, aircraft, and satellite data collected in the area for another purpose were used to estimate the space and time scales of the intrusion and the ultimate fate of the intruded waters. The duration of the event was 18 days. Oceanic waters advanced across the shelf at speeds of 20 cm s super(-1). At maximum intrusion, 6650 km super(2) of shelf were affected. Approximately half the intruded water receded off the shelf, and half appears to have been modified in situ.

KEYWORDS: Physical Oceanography; intrusion; shelf dynamics; current meandering; Loop Current; DeSoto Canyon; Texas; Gulf of Mexico.

**354.**
Humphris, C. C.Jr. 1979. Salt movement on Continental Slope, Northern Gulf of Mexico. The American Association of Petroleum Geologists Bulletin 63(5):782-98.

ABSTRACT: Regional sparker lines across the continental slope of the northern Gulf of Mexico demonstrate the close relation between salt movement and sediment deposition. Salt features on the outer slope are not as well developed as those near the shelf because sedimentation has been much less on the slope. Salt-generated structures in the eastern part of the gulf are more mature than those in the western gulf because of higher rates of sedimentation. The youngest salt features on the outer slope are much larger than domes on the shelf. Seismic data from the outer slope suggest that salt dome growth in this area was initiated by southward salt flowage caused by sediment loading updip. The Sigsbee Escarpment appears to be a salt scarp (formed by this gulfward salt flowage) that has extruded over younger sediments for a considerable distance. Areas of salt diapirs in the Gulf of Mexico, with the exception of diapirs on much of the lower continental slope, are considered to be areas of original thick salt deposition. It is suggested that these areas of thick salt were deposited in one central rift in Jurrasic time, and have moved to their present position by seafloor spreading. The present Red Sea is a model for the Gulf of Mexico at the time of Mesozoic breakup.

KEYWORDS: Geology.

**355.**
Hurlburt, H.E. and J.D. Thompson. 1980. Numerical Study of Loop Current Intrusions and Eddy Shedding. Journal of Physical Oceanography 10(10):1611-1651.

ABSTRACT: The dynamics of the eddy shedding by the Loop Current in the Gulf of Mexico have been investigated using three nonlinear numerical models: two-layer, barotropic and reduced gravity. The barotropic and reduced gravity models demonstrate the individual behavior of the external and internal modes, and provide insight into how they interact in the two-layer model. Because of the economy of the semi-implicit free surface models, it was possible to perform over 100 experiments to investigate the stability properties of the Loop Current. Typically, the models were integrated 3-5 years to statistical equilibrium on a 1600 km x 900 km rectangular domain with a resolution of 20 km x 18.75 km. Prescribed inflow through the model Yucatan Channel was compensated by outflow through the Florida Straits.

KEYWORDS: Physical Oceanography; Numerical analysis; Hydrodynamic models; Eddies; Currents; Yucatan Channel; Straits of Florida; Eddy Shedding; Loop Current; 2-Layer Models; Barotropic Models; Reduced Gravity Models; Gulf of Mexico.

**356.**

Hurlburt, H.E.andJ.D. Thompson. 1982. The dynamics of the Loop Current and shed eddies in a numerical model of the Gulf of Mexico, pp 243-297. In: Nihone JCS, (Editor). Hydrodynamics Of Semi-Enclosed Seas. Proceedings Of The 13th International Liege Colloquium On Ocean Hydrodynamics. Elsevier Scientific, Amsterdam.

ABSTRACT: Some basic dynamic ideas and numerical results are presented concerning the behavior of the Loop Current eddy system. Dynamic topics discussed include: 1) the nature of the instability associated with the eddy shedding; 2) the external and/or internal factors which determine the eddy shedding period; 3) the trajectory dynamics of the Loop Current and how they affect the penetration of the Loop Current into the Gulf, the eddy shedding and the diameter of the eddy; 4) the existence of different regimes for the Loop Current; 5) two important roles of topography in the dynamics; and 6) the distinctive signatures of barotropic and baroclinic instability in the flow and in the energetics.

KEYWORDS: Physical Oceanography; hydrodynamics; ocean circulation; mathematical models; eddies; Loop Current; Gulf of Mexico.

**357.**

Ichiye, T. 1962. Circulation and water mass distribution in the Gulf of Mexico. Geofaisica Internacional: Revista De La Uniaon Geofaisica Mexicana Auspicr El Instituto De Geofaisica De La Universidad Nacional Autaonoma De Maexico 2(3):4746.

ABSTRACT: Oceanographic data collected by the "Alaska" and the "Jakulla" in the Gulf of Mexico from 1951 to 1955 are analyzed. The circulation of the upper layer is greatly influenced by the wind drift, as seen in the location of the low salinity water. According to seasonal change of the temperature and salinity, the water mass in the upper layer is classified into five types: three coastal and two off-shore. The statistical T-S oxygen-density and phosphate-density correlations show little difference between the western and eastern parts in the layer deeper than 1,000 m. In the intermediate layer, however, the difference between two parts becomes more distinct due to the water flowing in the eastern part through Yucatan Channel. Semi-permanent anticyclonic gyres are found in the eastern part on dynamic topography, sigma-t surfaces and isotherm patterns at 200m depth. These vortices seem to be in contact with the flow through Yucatan Channel occasionally. Comparison with the Japan Sea suggests that vertical convection is more intense in that sea, where the water mass of uniform nature spreads widely in the intermediate and deep layer. Three dynamic problems are discussed in the appendices. Firstly, the wind drift in a circular basin with a shelf is derived and applied to the Gulf of Mexico. The results indicate a good agreement with observed seasonal change of the circulation in the upper layer of the Gulf of Mexico manifested by patterns of isohalines. Secondly, the vertical profiles of the temperature and salinity in the upper layer are explained by solutions of the equation of eddy diffusion and advection of heat and water mass. Thirdly, meandering of the Yucatan Current, and horizontal stability of gyres and discussed.

KEYWORDS: Physical Oceanography.

**358.**
Ichiye, T.C. 1969. Circulation changes caused by hurricanes, pp 229. In: L.R.A. Capurro. Contributions on the Physical Oceanography of the Gulf of Mexico. Volume 2 Gulf Publishing, Houston, Texas.

ABSTRACT: Observations in the Gulf of Mexico of temperature and salinity changes due to passing hurricanes are reviewed. Observations for Hurricane Carla (1961) and for Hurricane Inez (1966) were made on the continental slope in the northwestern and the western Gulf, respectively. The data from the latter case indicate upward displacement and deepening of the thermocline near to and to the left hand side of the hurricane center, respectively. The data from Hurricane Hilda (1964) were obtained on several transects across the track in the central Gulf and are the most comprehensive. Comparison of hydrographic data with those of the undisturbed state indicate upward and downward displacement of the thermocline at and outside the track of the eye, respectively. Theoretical models are also reviewed. These include steady state circulation induced in a homogeneous ocean by a circular storm, perturbation currents (both horizontal and vertical) in a homogeneous ocean due to a moving wind system of arbitrary space distributions, the response of a two-layer ocean with the motionless lower layer to a stationary circular storm starting suddenly or to a storm moving with a constant velocity and the effects of a shelf or a coast on the response of the two-layer ocean to a storm with arbitrary space and time distributions.

KEYWORDS: Physical Oceanography.

**359.**
Iliffe, T.M. and J.A. Calder. 1974. Dissolved hydrocarbons in the eastern Gulf of Mexico Loop Current and the Caribbean Sea. Deep-Sea Research 21(6):481-488.

ABSTRACT: Concentrations of dissolved non-polar hydrocarbons extracted from waters taken at several stations and depths in the Gulf of Mexico and Caribbean Sea ranged from traces to 75 mu g $l^{-1}$, with the highest occurring in the Florida Strait. In all cases except in the Florida Strait, this fraction was characterized by relatively large amounts of n-alkanes having between 15 and 20 carbon atoms and relatively small amounts of n-alkanes with more than 20 carbon atoms. In the Florida Strait there were much larger concentrations of n-alkanes above $C_{20}$. There was an unresolved envelope in the gas chromatograms of all the samples that extended approximately from the $C_{15}$ to the $C_{30}$ position, with the maximum between the $C_{20}$ and $C_{23}$ positions.

KEYWORDS: Chemistry; Oceanography; Organic Compounds; Seawater; C Atoms; Dissolved Hydrocarbons; Eastern Gulf of Mexico Loop Current; Caribbean Sea; Florida Strait; N-Alkanes.

**360.**
Ishizuka, T., V. Ittekkot, E.T. Degens, and H. Kawahata. 1986. Preliminary data on dissolved organic carbon and sugar in interstitial water from the Mississippi Fan and Orca and Pigmy basins, Deep Sea Drilling Project Leg 96., pp 729-732. In: Bouma AH, Coleman JM, et al. Initial reports DSDP, Leg 96, Ft. Lauderdale to Galveston, Texas, 1983.

ABSTRACT: At Site 618 in Orca Basin, the DOC content of the interstitial water peaks in the hypersaline sulfate reduction zone. The sugar content reaches a maximum and the DOC content begins to decrease at the depth of methane gas generation. Below that depth, the sugar and DOC contents are about constant. At Site 619 in Pigmy Basin, the DOC content increases slightly with depth in the sulfate reduction and the methane fermentation zones. The sugar content is lower in the sulfate reduction zone than in the methane fermentation zone; sugar concentration increases and fluctuates with methane gas percentages within the methane fermentation zone. At Site 623 in the lower fan region of the Mississippi Fan, there is no sulfate reduction zone. The DOC and sugar contents of the interstitial water are almost constant with depth. -from Authors.

KEYWORDS: Chemistry.

**361.**
Ishizuka, T., H. Kawahata, and S. Aoki. 1986. Interstitial water geochemistry and clay mineralogy of the Mississippi Fan and Orca and Pigmy basins, Deep Sea Drilling Project Leg 96., pp 711-728. In: Bouma AH, Coleman JM, et al. Initial reports DSDP, Leg 96, Ft. Lauderdale to Galveston, Texas, 1983.

ABSTRACT: Concentration ratios of salinity to chlorinity and to sodium in interstitial waters are similar to those of Orca Basin bottom water, suggesting that the chemistry of interstitial water is affected by the dissolution of buried salt. -from Authors.

KEYWORDS: Chemistry.

**362.**
Iverson, R.L., T.L. Hopkins, and D.K. Atwood. 1981. A Summary of Knowledge of Plankton Production in the Gulf of Mexico: Recent Phytoplankton and Zooplankton Research. Proceedings of a symposium on environmental research needs in the Gulf of Mexico (GOMEX) Key Biscayne, Florida.

ABSTRACT: Some new information on phytoplankton productivity and standing crop has been obtained in several coastal areas since 1973. Several investigations of large-scale physical features of the eastern Gulf of Mexico have included observations of phytoplankton distribution patterns. This review summarizes productivity patterns and factors which appear to affect the patterns in different regions of the Gulf of Mexico. In addition this report summarizes the principal work done in shelf, slope, and open-Gulf regions subsequent to reviews on zooplankton research in Gulf of Mexico waters by Bjornberg (1971) and Hopkins (1973). Most of the material remains in the form of unpublished theses and data reports to Government agencies.

KEYWORDS: plankton/ production/ Gulf of Mexico/ Water column biology.

**363.**
Iwamoto, T. 1965. Summary of tuna observations in the Gulf of Mexico on cruises of the exploratory fishing vessel Oregon, 1950-63. Commercial Fisheries Review 27(1):7-14.

ABSTRACT: A resume of work done on tuna aboard the exploratory fishing vessel OREGON during 14 years of exploratory fishing in the Gulf of Mexico is given. Prospects for commercial exploitation of tuna in the Gulf are discussed. Surface observations of tuna logged on the OREGON are summarized. Blackfin and skipkjack tuna are the tuna most frequently found at the surface in the Gulf, their abundance indicates a commercial potential.

KEYWORDS: Fisheries; commercial species; exploratory fishing; longlining; pelagic fishes; Gulf of Mexico.

**364.**
J. Antoine, W. Bryant, and B. Jones. 1967. Structural features of continental shelf, slope, and scarp, northeastern Gulf of Mexico. The American Association of Petroleum Geologists Bulletin 51(2):257-262.

ABSTRACT: None.

KEYWORDS: Geology.

**365.**
Jackson, M.P.A. and W.E. Galloway. 1984. Structural and depositional styles of Gulf Coast Tertiary continental margins; application to hydrocarbon exploration. AAPG Continuing Education Course Note Series 25:1-226.

ABSTRACT: None.

KEYWORDS: Geology; Cenozoic; Continental Margin; Economic Geology; Energy Sources; Exploration; Faults; Gulf Coastal Plain; Salt Tectonics; Sedimentation; Structural Geology; Tectonics; Tertiary; Textbooks; Traps.

**366.**
Jackson, M.P.A. and C.J. Talbot. 1986. External shapes, strain rates, and dynamics of salt structures. Geological Society of America Bulletin 97(3):305-323.

ABSTRACT: Salt structures continue to attract attention as petroleum traps and as storage vessels for wastes or fuels. Drawing on field studies, experiment, and theory, we examine the megascopic structure and large-scale dynamics of salt structures. Salt tectonics is classified here on the basis of change of gravity potential energy that promotes or retards salt flow. Halokinetic movements can be initiated, succeeded, retarded, or accelerated by regional tangential forces that stretch, wrench, or compress sedimentary basins. -from Authors.

KEYWORDS: Geology.

**367.**
James, B.M. 1972. Systematics and biology of deep-water *Palaeotaxodonta* (Mullosca: Bivalvia) from the Gulf of Mexico. Texas A&M UniversityThis study is based on samples of palaeotaxodont bivalves obtained from the deeper aspects of the Gulf of Mexico by the Texas A&M University Research Vessel ALAMINOS during the years 1964-1969. Approximately 300 live specimens and 2,800 valves were collected from a total of 91 stations of which 46 were located between 183 and 1,999 meters and 45 were at depths between 2,000 and 3,800 meters. The collection comprises 34 species representing 11 genera. Ten of these species are considered to be new to science. Of the 24 previously described species, 10 are reported in the Gulf for the first time, horizontal ranges of eight are extended over 2,000 nautical miles, and five are illustrated for the first time. Predation and food are discussed for some species, while systematic notes and photographic illustrations are given for each species. Revisional notes are given for some of the deep-sea palaeotaxodont species collected by previous investigation. A comparison of pertinent type specimens has revealed the following three sets of subjective synonyms: *Nucula pernambucensis* Smith, 1885 and *N. cymella* Dall, 1886; *Tindaria amabilis* (Dall, 1889) and T. *lata* Verrill & Bush, 1898; *Nuculana semen* (Smith, 1885) and *N. aspecta* (Dall, 1927). The vertical distributions of specimens are examined with the main emphasis on benthic zonation. The distributions of live and dead specimens are separately examined. Some probable displaced valves are noted and possible causative agents are discussed. Data on the distribution of live specimens show a distinct faunal change at around 2,000 meters. Most of the previously described species found living below a depth of 2,000 meters in the Gulf have been considered abyssal species outside the Gulf. Thus it is concluded that the Gulf has an abyssal zone.

KEYWORDS: Biology.

**368.**

Jefferis, R.G., K.A. Digre, and J.P. Haney. 1999. Ursa Team Based Project Management - Overcoming Adversity in 4000 ft. of Water. Proceedings of the 31th Annual Offshore Technology Conference (OTC paper 10754.).

ABSTRACT: The Ursa field is an oil field with significant volumes of gas located 6 miles east of the Mars field, in water depths ranging from 3800 to 4100 feet. The preferred Production System for developing the field utilizes a 24 slot TLP located in MC block 810 developing reserves in MC blocks 809, 810, 853 and 854. The TLP facilities have processing capability for 150MBOPD, 400MMCFD and 25 MBWPD. The base development plan called for 14 production wells on the TLP. The plan includes batch setting 21 TLP well positions and pre-drilling of the 6 of the TLP wells. The TLP was designed for flexibility including: 2840 tons of spare payload, one spare export riser support, several subsea flow line riser supports, 7 spare well slots, processing facilities to accommodate early production rates of 175MBOPD and 550MMCFD and structural strength to accommodate these flexibility items. Installation was planned to commence in June 1998 with first oil targeted for April 1999. In late 1997 significant shallow flow occurred at the batch set site during the final batch operations such that it became unusable for foundation support. Development plans were modified to batch set 12 production wells and proceed with 1 - 2 pre-drills. The installation site was moved to an area with still significant but smaller shallow flow risk in MC block 809, in 3800 feet of water. Due to the drilling concerns and risk, the planned installation commencement was changed from June 1998 to October 1998. The Ursa Project Team responded with significant modifications to their plans completely changing the original installation procedure and enabling the team to proceed with a plan which had a chance of still meeting the April 1999 target first oil date.

KEYWORDS: Technology.

**369.**

Jefferson, T.A. 1995. Distribution, abundance, and some aspects of the biology of cetaceans in the offshore Gulf of Mexico. PhD. Dissertation. Texas A&M UniversityThe cetaceans of the offshore waters of the Gulf of Mexico are poorly known. Much additional information on population biology and life history is needed for most species.^All available historical records of offshore cetaceans in the Gulf of Mexico were assembled and analyzed. An attempt was made to confirm species identification for each of the records. Twenty-seven offshore species of cetaceans have been confirmed to occur in the Gulf of Mexico. All of the baleen whales, with the possible exception of the Bryde's whale, are extralimital in the Gulf. The sperm whale is the most common great whale. All previous records of common dolphins in the Gulf are rejected. The Atlantic spotted dolphin and the bottlenose dolphin are the only species that regularly occur over the continental shelf. The pantropical spotted dolphin is the most common species of small cetacean in oceanic waters.^Seven vessel-based surveys were conducted in outer continental shelf and continental slope waters of the Gulf of Mexico, from 1992-1993. Estimates of abundance were made using line transect methods: sperm whales, 442; continental shelf bottlenose dolphins, 451; continental slope bottlenose dolphins, 520; pantropical spotted dolphins, 5,876; and Clymene dolphins, 2,285. The validity of line transect assumptions and potential biases are discussed.^There are year-round records of the Clymene dolphin in the northern Gulf of Mexico. Strandings in Texas, Louisiana, and Florida have provided information on the natural history of this poorly known species. Males reach greater total lengths and weights than females. Care must be taken to distinguish Clymene dolphin skulls from those of young striped dolphins. The shortest sexually mature male Clymene dolphin in this study was 176 cm long and the shortest female was 171 cm. Herd composition is not well-known, but herds in two mass strandings were composed predominantly of one sex or the other.^Using a "pro-active" approach to cetacean management, intensive research on population biology and life history would begin, even though no major population threats have so far been identified. This would help to diffuse the polarization of user conflicts that usually develops when population threats become widely known.

KEYWORDS: Endangered Species; Biology; Zoology ; Biology; Oceanography ; Biology; Ecology.

**370.**

Jefferson, T.A. 1996. Estimates of abundance of cetaceans in offshore waters of the northwestern Gulf of Mexico, 1992-1993. Southwestern Naturalist 41:279-287.

ABSTRACT: In order to estimate cetacean abundance, seven vessel-based surveys were conducted in outer continental shelf and continental slope waters of the northwestern Gulf of Mexico from 1992 to 1993. Sixteen species were identified, and estimates of abundance were made using line transect methods for the most commonly seen species: sperm whales (Physeter macrocephalus), 442 (CV = 35.7%); bottlenose dolphins (Tursiops truncatus), 451 (CV = 36.5%) over the continental shelf, and 520 (CV = 56.3%) over the continental slope; pantropical spotted dolphins (Stenella attenuata), 5,876 (CV = 42.3%); and Clymene dolphins (Stenella clymene), 2,285 (CV = 60.8%). Most line transect assumptions were satisfied, or were dealt with in the analyses. The major remaining bias is the probable underestimation of sperm whale abundance, due to missed animals on and near the transect line.

KEYWORDS: Endangered Species; Delphinidae; Physeteridae; Cetacea ; Mammalia ; Vertebrata ; sperm whale (Physeteridae); Physeter macrocephalus; (Physeteridae); Stenella attenuata (Delphinidae); Stenella clymene (Delphinidae); Tursiops truncatus (Delphinidae); North West Atlantic ; Bottlenose Dolphin; Clymene Dolphin; Gulf Of Mexico; Marine Ecology; Spotted Dolphin Bottlenose Dolphin; Clymene Dolphin; Marine Ecology; Spotted Dolphin.

**371.**

Jefferson, T.A., D.K. Odell, and K.T. Prunier. 1995. Notes on the biology of the Clymene dolphin (*Stenella clymene*) in the northern Gulf of Mexico. Marine Mammal Science 11(4):564-573.

ABSTRACT: The Clymene dolphin (*Stenella clymene*) is one of the most poorly known of all the delphinid dolphins. This paper describes information on the biology of this species based on the examination of specimens stranded in the Gulf of Mexico. The following list of items were examined and reported from stranded individuals: length and weight; skull dimensions and details; external color patterns and morphology; external and internal parasites, and probable causes of death or stranding; evidence of trauma from injuries; stomach contents; dimensions and maturity of reproductive tracts; and fetuses. Verified records of Clymene dolphins have come from both eastern and western sides of the northern Gulf of Mexico. It appears that this species may be found in the Gulf year-round, although no data exist regarding seasonal shifts in abundance. Male specimens appear to reach somewhat greater total lengths than females. Mean weight of males was also greater for males than females. Most of the strandings examined in this study were not of entire herds, and strandings appear to consist largely of one sex or the other. This suggests that Clymene dolphin herds may be be of different types, and may change throughout the year asreported for other *Stenella* dolphins.

KEYWORDS: Endangered Species; Gulf Of Mexico; Sightings.

**372.**

Jefferson TA, S. Leatherwood, L.K.M. Shoda, R.L. Pitman. 1992. Marine mammals of the Gulf of Mexico a field guide for aerial and shipboard observers. Texas A&M Printing Center College Station, TX

ABSTRACT: None.

KEYWORDS: Endangered Species; Gulf of Mexico.

**373.**

Jefferson, T.A. and Schiro A J. 1997. Distribution of cetaceans in the offshore Gulf of Mexico. Mammal Review 27:27-50.

ABSTRACT: In order to comprehend better the distribution of Gulf of Mexico cetaceans, all available records of whales and dolphins in the offshore Gulf were assembled and analysed. This included sightings, strandings and captures of all species, except the Bottlenose Dolphin Tursiops truncatus, from all sources, except the recently completed GulfCet project. An attempt was made to confirm species identification for each of the records. A total of 1223 records was available for analysis. Twenty-seven species of cetaceans have been confirmed to occur in the offshore Gulf of Mexico. All of the baleen whales, with the possible exception of the Bryde's Whale Balaenoptera edeni appear to be extraliminal in the Gulf. The Sperm Whale Physeter macrocephalus is, by far, the most common great whale in this body of water. All previous records of Common Dolphins Delphinus spp. in the Gulf are rejected as either incorrect or unreliable, and there is currently no convincing evidence that dolphins of the genus Delphinus occur in the Gulf. The Atlantic Spotted Dolphin Stenella frontalis is the only species, other than the Bottlenose Dolphin, that regularly occurs over the continental shelf The Pantropical Spotted Dolphin Stenella attenuata is the most common species of small cetacean in oceanic waters of the Gulf, but many other species also occur there in significant numbers.

KEYWORDS: Endangered Species; Cetaceans; North West Atlantic; Biogeography; Gulf Of Mexico; Sightings; Strandings; Gulf of Mexico.

**374.**

Johnson, D. 1977. Municipal Services, pp 160-208. In: Stallings EF, T. F. Reilly, R. B. Gramling , D. P. Manual. Outer Continental Shelf Impact, Morgan City, Louisiana. Louisiana Department of Transportation and Development., Baton Rouge, LA.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana.

**375.**

Jones, B.R., J.W. Antoine, and W.R. Bryant. 1967. A hypothesis concerning the origin and development of salt structures in the Gulf of Mexico sedimentary basin. Transactions Gulf Coast Association of Geological Societies 17:211-216.

ABSTRACT: Geologic and geophysical surveys conducted by Texas A&M University and Lamont Geological Observatory have established the existence of an extensive fold belt on the continental shelf and slope of eastern Mexico.
Indirect evidence suggest that evaporites are present beneath the fold belt and that they played a significant role in the origin and development of the fold belt.
The writers believe that the presence of the folds on the Mexican shelf and slope support Murray's (1966, p. 475) suggestion that the initial deformation of the salt was in the form of anticlines. Based on the assumption that the initial deformation of the salt was in the form of anticlines, the writers suggest a possible sequence of events in the Gulf sedimentary basin: 1) The folds developed under only relatively thin cover of sediments; 2) Anticlinal ridges blocked sediment transport until they were completely buried; 3) Secondary growth began from the crests of the anticlines when there was sufficient overburden to cause salt movement; 4) The development of secondary growth on the anticlines may have triggered the development of other salt stocks which are not directly related to the anticlines.

KEYWORDS: Geology.

**376.**

Jordan, G. F. 1951. Continental Slope off Apalachicola River, Florida. Bulletin of American Association of Petroleum Geologists 35(9):1978-93.

ABSTRACT: Illustrations are presented which reveal the physiography of a large part of the continental slope in an area not previously covered by hydrographic surveys. Graphic profiles obtained from electronic depth recorders reveal marine domes and details of the continental escarpment and shelf margin. No conclusions are presented, as interpretation of the submarine topography is left to the geologist.

KEYWORDS: Geology.

**377.**

Judd, T.R. and C.B. Wallace. 1996. Auger Platform Debottlenecking and expansion of fluid handling facilities. Production Operations and Engineering/General Proceedings – SPE Annual Technical Conference and Exhibition 135-142.

ABSTRACT: AUGER, Shell's first Tension Leg Platform (TLP), was installed in 1994 in 2860 feet of water in the Gulf of Mexico. The platform was designed to process 40 MBPD of oil, 100 MMSCFD of gas, and 25 MBPD of water. For most of its operation, the surface fluid handling facilities have proven to be the primary constraint limiting increased production. Through innovative debottlenecking and expansion of the surface facilities, Auger production rates have recently increased to more than 72 MBOPD and 150 MMSCFD of gas. Further plans are underway to ultimately increase the total platform capacity to 100-140 MBOPD and 300-400 MMSCFD. This paper will present the original platform design, describe the constraints on the facilities due to higher than anticipated well flow rates and surface temperatures, and discuss the steps taken to reduce the constraints and resolve most problems. These problems include: (1) poor gas/liquid separation efficiency in high pressure separators, (2) excessive natural gas liquid (NGL) condensation in the gas export pipeline, (3) gas dehydration system limitation due to high rates and surface temperatures and (4) other facilities engineering related problems.

**378.**

Kaluza, M.J.andE.H. Doyle. 1996. Detecting fluid migration in shallow sediments: continental slope environment, Gulf of Mexico, pp 15-26. In: Schumacher D, Abrams MA, (Editors). Hydrocarbon migration and its near-surface expression. AAPG Memoir 66.

ABSTRACT: The detection of shallow gas features on the northern Gulf of Mexico continental slope has been aided with a unique positively buoyant deep-towed subbottom profiler and side-scan sonar system. The tool provides high-quality, high-resolution seismic displays of the shallow (upper a75 m) stratigraphy and seafloor images (400-m swath) capable of resolving geologic features that may constrain exploration drilling or engineering development of potential petroleum reserves. From the more than 20,000 km (~10,000 nmi) of deep-tow data collected, numerous encounters of shallow gas features have been made. Gas and other fluid vents have been seen on the seafloor in association with seafloor and shallow buried fault systems. In some cases, vents have been identified by distinctive seafloor topography expressed as hills and mounds and by seafloor depressions, craters, and blister-like features. No distinctive topographic irregularities occur at other seafloor vent areas, which are identified primarily by the seismic character of the records. Shallow subsurface gas has been identified by the amorphous and wiped-out character of stratified sequences on subbottom profiler data and by high-amplitude "bright spot" reflections within sediment packages. Gas flow, both vertically along fault planes and laterally along permeable sediment layers, can be identified from these types of data.

KEYWORDS: Physical Oceanography.

**379.**

Kavanagh, K. and O'Sullivan. 1999. Deepwater Flexible, Steel and Hybrid Risers: Performance and Technical Challenges. Proceedings of the 8th SNAME Offshore Symposium .

ABSTRACT: The selection and design of the riser system for deepwater floating production represents a critical component of overall system feasibility and cost. Design methods and conventional materials that have been accepted and validated for shallower water again require to be challenged for deeper waters. Alternative innovative riser configurations, materials and design approaches are now proposed for deepwater, similar to the diversity of original floating production concepts proposed to the industry in the 1970s for shallower water. The limits of current deepwater flexible pipe technology restrict the diameter for which a totally flexible riser solution is feasible, largely due to pipe collapse strength. Other issues affecting the choice of risers in deeper water include insulation requirements for flow assurance, the high tensile loads in flexible and steel risers using conventional materials, the ability to install risers effectively and without damage, integrity monitoring and riser costs. All of these issues have fuelled the search for alternative steel and hybrid riser solutions. Such solutions include steel top tensioned, steel catenary (including steep wave and lazy wave) and hybrid riser concepts. Several solutions show merit for distinct applications and geographic locations and represent potentially significant feasibility and cost drivers in field development. This paper presents a critical review of deepwater floating production riser concepts. Conventional and innovative solutions are reviewed in terms of technical feasibility, installation and cost. Performance limits of alternative riser materials and configurations are presented and their capabilities compared in terms of feasible riser diameter and water depth. The validity of conventional shallower water riser design methods is challenged and emphasis is placed, where considered beneficial, on the integration of the riser and mooring design to achieve an optimum and compatible design of the riser and mooring system.

KEYWORDS: Technology.

**380.**

Kayen, R.E. and H.J. Lee. 1991. Pleistocene slope instability of gas hydrate-laden sediment on the Beaufort Sea margin. Marine Geotechnology 10(1-2):125-141.

ABSTRACT: In oceanic areas underlain by sediment with gas hydrate, reduction of sea level initiates disassociation along the base of the gas hydrate, which, in turn, causes the release of large volumes of gas into the sediment and creates excess pore-fluid pressures and reduced slope stability. Fluid diffusion properties dominate the disassociation process in fine-grained marine sediment. Slope failure appears likely for this sediment type on moderate slopes unless pressures can be adequately vented away from the gas hydrate base. Pleistocene eustatic-sea level regressions, likely triggered seafloor landslides on the continental slope of the Beaufort Sea and other margins where gas hydrate is present in seafloor sediment. -from Authors.

KEYWORDS: Geology; Slope Failure; Continental Slope; Sea Level Lowering; Pleistocene; Pore Pressure; Landslide; Gas Hydrate; Beaufort Sea.

**381.**
Kennicutt II, M.C., J.M. Brooks, and G.J. Denoux. 1988. Leakage of deep, reservoired petroleum to the near surface on the Gulf of Mexico continental slope. Marine Chemistry 24(1):39-59.

ABSTRACT: Reservoired oils, shallow sediment cores (2 m), sea slicks and tar balls were collected in the Green Canyon Lease area of the northern Gulf of Mexico continental slope. The gaseous and liquid hydrocarbons associated with near surface sediments and water have migrated from deep (2000<>9n\3000 m) subsurface reservoirs and/or source rocks. Gas has migrated to shallow sediments with little or no isotopic fractionation. In contrast, near surface hydrocarbon liquids are depleted in aliphatics, 4<>9n\ring or larger aromatics, naphthalene, C~1^<>9n\naphthalenes and C~2^<>9n\naphthalenes as compared to the reservoired fluids. However, the distributions of highly alkylated (>C~2^) naphthalenes, phenanthrenes and dibenzothiophenes, triterpanes, steranes and triaromatized steranes are similar to the precursor reservoired oil. This study documents a direct link between natural seepage in a deep water marine setting and sea slick and tar ball formation. -from Authors.

KEYWORDS: Reservoired Petroleum; Hydrocarbon Leakage; Sea Slick Formation; Tar Ball Formation; Deep Reservoirs; Near Surface Sediments; Isotopic Fractionation; Deep Water Marine Setting; Gulf of Mexico; Green Canyon Lease Area.

**382.**
Kennicutt, I.M.C., Defreitas D.A., Joyce J.E., and Brooks J.M. 1986. Nonvolatile organic matter in sediments from Sites 614 to 623, Deep Sea Drilling Project Leg 96., pp 747-756. In: Bouma A.H., Coleman J.M., et al. Initial reports Deep Sea Drilling Project, Leg 96, Ft. Lauderdale to Galveston, Texas, 1983 to 1986. Government Printing Office,

ABSTRACT: The bulk organic matter in sediments from the upper Pleistocene Mississippi Fan and two intraslope basins is primarily terrestrial in origin. Increasing amounts of hydrocarbons with depth at the Mississippi Fan sites suggest that the thermogenic hydrocarbons have migrated upward from deeper sediments. Vertical gradients in the intraslope basins were less dramatic, although an upward migration source is inferred. -from Authors.

KEYWORDS: Geology.

**383.**
Kennicutt II, M.C., G.J. Denoux, J.M. Brooks, and W.A. Sandberg. 1987. Hydrocarbons in Mississippi Fan and intraslope basin sediments. Geochimica Et Cosmochimica Acta 51(6):1457-1466.

ABSTRACT: Aliphatic and aromatic hydrocarbons in sediments of the middle and lower Mississippi Fan and two intraslope basins in the Gulf of Mexico are derived from terrestrial organic matter and thermogenic, mature hydrocarbons. The terrestrial hydrocarbon component consists primarily of terrigenous, plant biowaxes. Suggests that the majority of these mature hydrocarbons have migrated from a source much deeper in the sediment column. A portion of the thermogenic hydrocarbons may be derived from recycled material. The upward migration of hydrocarbons from deeper sources is a wide-spread phenomenon in the Gulf of Mexico with several documented cases of massive seepage (visible oil) as well as the more diffuse permeation of Pleistocene sediments of the Mississippi Fan and two intraslopes reported here.-from Authors.

KEYWORDS: Chemistry.

**384.**
Kennicutt, M.C., J.M. Brooks, and G.J. Denoux. 1988. Leakage of deep, reservoired petroleum to the near surface on the Gul f of Mexico. Marine Chemistry 24(1):39-60.

ABSTRACT: None.

KEYWORDS: Physical Oceanography; Petroleum Traps & Trapping Mechanisms; Petroleum Migration & Accumulation; Gulf of Mexico.

**385.**

Kennicutt, M.C., Denoux G.J., Brooks J.M., and Sandberg W.A. 1987. Hydrocarbons in Mississippi Fan and intraslope basin sediments. Geochimica Et Cosmochimica Acta 51(6):1457-1466.

ABSTRACT: The biological markers (triterpane, steranes and aromatized steranes), alkane, aromatic hydrocarbon distributions and C isotopic compositions, were analysed in sediments of the middle and lower Mississippi delta, and intraslope basins in the Gulf of Mexico, to determine the sources of the hydrocarbons and their transport to the present sites. The hydrocarbons are derived from terrestrial organic matter and thermogenic mature hydrocarbons, the former consisting primarily of plant biowaxes (n-alkanes with $C_{21}$ -$C_{33}$ ). Part of the thermogenic hydrocarbons includes phenanthrene, methyl phenanthrenes, chrysene and benzopyrenes, and may be derived from recycled material. The migrated thermogenic hydrocarbons include normal and isoprenoid alkanes with $<C_{21}$ , naphthalene, methyl naphthalenes, ethyl naphthalenes and other aromatics of similar volatility. Triterpane, sterane and aromatized sterane distributions suggest that the thermogenic hydrocarbons of both sites have a common source and are overprinted with immature sediment hydrocarbons; the evidence suggests a deep source in the sediment column. The biomarker distributions and C isotopic compositions of these hydrocarbons are atypical for petroleum produced in the Gulf of Mexico, where the upward migration of hydrocarbons from deep sources is widespread. Molecular distributions of the hydrocarbons are constant irrespective of the present depth of occurrence, suggesting that they have migrated in a separate phase. -R.K.H.

KEYWORDS: Geology.

**386.**

Kennicutt, M.C.I. and J.M. Brooks. 1990. Recognition of areas affected by petroleum seepage: Northern Gulf of Mexico continental slope. Geo-Marine Letters 10(4):p. 221-224.

ABSTRACT: The presence of large amounts of gas and/or liquid hydrocarbon seepage in near surface sediments can produce distinct features including an irregular topography (on several scales, ranging from meters to kilometers); seismically transparent/chaotic sediments; oil staining; gas plumes; sediments containing elevated concentrations of extractable organic matter, organic carbon, and calcium carbonate; associated brine seepage and anoxic conditions; extensive bacterial mats; hydrate formation and decomposition; and dense chemoautotrophic communities. Although no single characteristic is always uniquely associated with seepage, the co-occurrence of several of these features is strongly suggestive of an area being exposed to non-indigenous upward migrating hydrocarbons.

KEYWORDS: Gulf of Mexico; oil seepages; topography (geology); submarine features; marine geology; petroleum hydrocarbons; ecological associations; continental slope; Gas Seepages.

**387.**

Kennicutt, M.C.I., J.M. Brooks, and R.R. Bidigare. 1988. Hydrocarbon seep communities: Four years of study. Oceanography 1(2):p. 44-45.

ABSTRACT: A trawl retrieval of nearly two tons of organisms and shell debris in 500m of water at a location of known natural petroleum seepage in the Gulf of Mexico in 1984 marked the beginning of four years of interdisciplinary studies. It was soon recognized that the assemblage of organisms recovered was similar to that reported at the hydrothermal vents and the Florida Escarpment. These and other discoveries have now become referred to as the contrasting ecological niches of "hot vent" and "cold seep" communities. Hot vent areas are characterized by elevated temperatures caused by the recirculation of seawater through zones heated by magmatic intrusions. No temperature anomalies are apparent at the cold seep sites, but they have in common with hot seeps a supply of reduced compounds that creates a tenuous balance between oxic and anoxic conditions. Early studies at both types of sites revealed that the enhanced productivity and biomass of these communities was directly linked to symbiotic relationships between bacteria and invertebrates. The Gulf of Mexico petroleum seep sites are in relatively shallow water, which allows for extensive and repeated samplings as well as maintenance of living organisms at shore-based laboratories. The Louisiana seep organisms require water temperatures of 5-7 degree C and a supply of reduced compounds and dissolved oxygen for their survival in the laboratory. (DBO).

KEYWORDS: Gulf of Mexico; petroleum hydrocarbons; seepages; aquatic communities; zoobenthos; animal metabolism.

**388.**

Kennicutt, M.C.I., J.M. Brooks, R.R. Bidigare, R.R. Fay, T.L. Wade, and T.J. McDonald. 1985. Vent-type taxa in a hydrocarbon seep region on the Louisiana slope. Nature 317(6035):351-353.

ABSTRACT: Here the authors report the discovery of dense biological communities associated with regions of oil and gas seepage on the Louisiana continental slope. These communities of large epi- and infaunal organisms are similar to those associated with the vents of the Pacific and the hypersaline brine seeps of the Florida Escarpment. Carbon isotope analyses suggest that these communities are chemosynthetic and derive their energy from hydrogen sulphide and/or hydrocarbons. Similar communities may be widely distributed on the sea floor in other oil-producing regions of the ocean.

KEYWORDS: Physical Oceanography; Louisiana Coast; hydrocarbons; community structure; nutrient sources; continental slopes; marine fauna; aquatic communities; chemosynthesis; oil seepages; Louisiana; Seeps; Gulf of Mexico.

**389.**

Kennicutt, M.C.I., J.L. Sericano, T.L. Wade, F. Alcazar, and J.M. Brooks. 1987. High molecular weight hydrocarbons in Gulf of Mexico continental slope sediments. Deep-Sea Research 34(3A):403-424.

ABSTRACT: Sediments on the Gulf of Mexico continental slope contain a mixture of terrigenous, petroleum and planktonic hydrocarbons. The relative amount of these three inputs varies as a function of location, water depth, and time of sampling. The hydrocarbon concentrations measured are generally lower than those previously reported for shelf and coastal Gulf of Mexico sediments.

KEYWORDS: Physical Oceanography; sediment composition; sediment distribution; hydrocarbons; continental slope; petroleum hydrocarbons; provenance; Gulf of Mexico.

**390.**
Kennicutt, M.C.I., J.M. Brooks, R.R. Bidigare, and G.J. Denoux. 1988. Gulf of Mexico hydrocarbon seep communities--I. Regional distribution of hydrocarbon seepage and associated fauna. Deep-Sea Research 35(9A):1639-1651.

ABSTRACT: A series of otter trawls demonstrate that communities based on chemosynthesis are broadly distributed across the northwestern Gulf of Mexico continental slope in hydrocarbon seep areas. Thirty-nine trawls were taken at 33 locations reported to exhibit transparent or chaotic seismic "wipe-out" zones. The sites, in water depths from 180 to 900 m, span an are from offshore the Mississippi River delta to the upper Texas continental slope. Endosymbiont-containing organisms or their remains (either tube worms, mussels and/or clams) were recovered at 21 sites on the northern Gulf of Mexico slope. Tube worms, clams and mussels known to be associated with symbionts were retrieved at 18, 12 and sites, respectively.

KEYWORDS: continental slopes; hydrocarbons; seeps; marine fauna; community composition; ecological distribution; Gulf of Mexico; seepages; continental slope; marine organisms; ecology; trawling.

**391.**
Kibbee, S. 1996. TLP technology SeaStar mimimal platform for small deepwater reserves. Offshore Magazine 56(6).

ABSTRACT: None.

KEYWORDS: Technology.

**392.**
Kibbee, S.E., S.J. Leverette, K.B. Davies, and R.B. Matten. 1999. Morpeth SeaStar Mini-TLP. Proceedings of the 31th Annual Offshore Technology Conference (OTC paper 10855).

ABSTRACT: The Morpeth project is the world's first application of a SeaStar® Mini-TLP and establishes that mono-column TLP's can be used to economically develop deepwater fields. This paper discusses the evolution and development of SeaStar technology and its niche in the deepwater platform market. Specifics of the Morpeth SeaStar platform are presented along with a discussion of some execution challenges that arose during the execution of this prototype project.

KEYWORDS: Technology.

**393.**
Kibbee, S.E., K.B. Davies, J.W. Chianis, Sarwono, and Bambang A. 1994. Seastar tension leg platform an economic solution to deepwater marginal field development. Offshore and Arctic Operations American Society of Mechanical Engineers, Petroleum Division (Publication) 58:141-153.

ABSTRACT: The Seastar Tension Leg Platform (TLP) concept has been developed to unlock the economic potential of discovered, but as yet undeveloped, deepwater fields in the Gulf of Mexico and around the world. This new generation of economically attractive deepwater platforms combines the well-proven technology of TLP's with industry-accepted shallow water marginal field practices. The concept has been developed, and further enhanced, over a four-year period under the sponsorship of the U.S. Department of Energy. This paper describes the overall Seastar concept and also illustrates typical Seastar applications.

KEYWORDS: Offshore structures; Production platforms; Oil field; development; Industrial economics; Seastar tension leg platform; Deepwater marginal field; development.

**394.**
Kinder, T.H. 1983. Shallow currents in the Caribbean Sea and Gulf of Mexico as observed with satellite-tracked drifters. Bulletin of Marine Science 33(2):239-246.

ABSTRACT: Four satellite-tracked drifters released in the southeastern Caribbean Sea during November 1977 revealed features of the shallow (100-m depth) circulation. All drifters showed meanders and loops, and two showed a large counterclockwise eddy in the Golfo de los Mosquitos. Two drifters passed through the Straits of Yucatan and showed a double-lobed northward penetration of the Loop Current. Within the Caribbean, scales of meanders and loops were about 100 km near inflow passages but scales were larger (200-500 km) farther downstream. Taken together, the drifter tracks showed important spatial and temporal variability that is not part of the classical depictions of the Caribbean circulation.

KEYWORDS: Physical Oceanography; surface circulation; drifting data buoys; Caribbean; Gulf of Mexico.

**395.**
Kindinger, J.L., R.J. Miller, Stelting C. E., and A.H. Bouma. 1982. Depositional history of Louisiana Mississippi outer continental shelf,U.S. Geological Survey.

ABSTRACT:A geological study was undertaken in 1981 in the Louisiana-Mississippi outer continental shelf for the bureau of Land Management. The study included a high-resolution seismic reflection survey, surficial sediment sampling and surface current drifter sampling. Approximately 7100 sq km of the Louisiana-Mississippi shelf and upper slope were surveyed. The sea floor of the entire area is relatively smooth except for occasional areas of uplift produced by diapiric intrusion along the upper slope. Characteristics of the topography and subsurface shelf sediments are the result of depositional sequences due to delta outbuilding over transgressive sediments with intervening periods of erosion during low sea level stands. Little evidence of structural deformation such as faults, diapirs, and shallow gas is present on the shelf and only a few minor faults and scarps are found on the slope. Minisparker seismic records in combination with air gun (40 and 5 cu in) and 3.5-kHz subbottom profile records reveal that seven major stages of shelf development have occurred since the middle Pleistocene. The shelf development has been controlled by the rise and fall of sea level. These stages are defined by four major unconformities, several depositions of transgressive sediments, sequences of river channeling and progradational delta deposits. Surficial sediment sample and seismic records indicate that the last major depositional event was the progradation of the St. Bernard Delta lobe. This delta lobe covered the northwestern and central regions. Surficial sediments in most of the study area the product of the reworking of the San Bernard Delta lobe and previous progradations.

KEYWORDS:Geology.

**396.**
Kirkland, K.G., E.M. Richardson, and C. Hey. 1996. DeepStar evaluation of subsea trees and manifold concepts. Offshore Technology Conference, Annual Proceedings 4:835-844.

ABSTRACT: This paper reviews the results of a study performed for the DeepStar Project, CTR A802-2, `Concept Study and Investigation of Key Areas of Interest for Subsea Systems in Deepwater'. The report documents the results of a study of subsea manifold systems as applied to the deepwater Gulf of Mexico. Of particular interest is the development of a range of system level philosophies based on recent and ongoing experience from the operators and vendors.

KEYWORDS: Offshore oil well production; Christmas trees (wellheads); Submarine pipelines; Petroleum pipelines.

**397.**

Kirwan, A.D., G. Mcnally, M.S. Chang, and R. Molinari. 1975. The effect of wind and surface currents on drifters. Journal of Physical Oceanography 5(2):361-368.

ABSTRACT: None.

KEYWORDS: Physical Oceanography; Dynamic Properties of Sea Water; Oceanographic Equipment; Gulf of Mexico.

**398.**

Kirwan, A.D., W.J. Merrell Jr, R.E. Whitaker Jr, J.K. Lewis Jr, and R. Legeckis Jr. 1984. A model for the analysis of drifter data with an application to a warm core ring in the gulf of mexico. Journal of Geophysical Research 89(C7):3425-3438.

ABSTRACT: A model developed primarily for the analysis of drifter data is discussed. The model is based on a parametric representation of the drifter velocity in terms of Monge potentials, two of which are constants following the motion of the fluid. In the application presented here, one of the potentials is taken as the frequency of rotation about a ring by a parcel. A more restricted intepretations of the velocity gradient invariant for horizontal flow is also discussed. The other potential is taken as the streamline of a parcel that is locally approximated as a conic section. For the restricted interpretation, solutions to the model equations are critically dependent on the relative sizes of the squares of the vertical vorticity and the total deformation rate. This model differs from drifter cluster models in that each drifter provides independent estimates of the vorticity and deformation rates. Application is made to path data from three drifters that were seeded in a warm core ring in the Gulf of Mexico in November 1980. The model provided estimates of the ring translation and swirl velocities along with the ring geometry. The analysis showed that the ring was persistently elliptical with the major axis aligned in the east-west direction. A satellite infrared photo on January 21, 1981, confirmed this orientation.

KEYWORDS: Physical Oceanography; Water Currents; Velocity; Vortex Flow; Shear; Fluctuations; Tides; Gulf of Mexico.

**399.**

Kirwan, A.D.J., J.K. Lewis, A.W. Indest, P. Reinersman, and I. Quintero. 1988. Observed and simulated kinematic properties of Loop Current rings. Journal of Geophysical Research 93(C2):1189-1198.

ABSTRACT: Two rings, shed by the Loop Current in 1980 and 1982, were observed for several months by satellite-tracked drifters to migrate across the Gulf of Mexico. The drifter path data have been inverted to obtain estimates of the paths of the centers of the two rings, ring shape, and the swirl velocities. Three drifters were deployed in the 1980 ring, and the analysis of that data set establishes the variability of the above kinematic estimates for one ring. A comparison of the analysis of data from both rings provides some idea on inter-ring variability. Both rings impacted the Mexican continental slope at about 22.8 degree N, 95.5 degree W. After a brief adjustment period, both rings reestablished and maintained a vortex character for several months in the slope region while migrating slowly to the north. The paths of the centers of the two rings along the slope are virtually identical.

KEYWORDS: Physical Oceanography; current rings; current observations; kinematics; Loop Current; mathematical models; vortices; Dynamical Oceanography; Gulf of Mexico.

**400.**
Kirwan, A.D.Jr., W.J.Jr. Merrell, J.K. Lewis, and R.E. Whitaker. 1984. Lagrangian observations of an anticyclonic ring in the western Gulf of Mexico. Journal of Geophysical Research 89(C3):3417-3424.

ABSTRACT: This analysis documents, for the first time, the movement and velocity characteristics of an anticyclonic ring. The ring was pinched off from the Loop Current in the fall of 1980 and moved into the western Gulf of Mexico. Lagrangian measurements obtained from satellite-tracked drifters show that typical speeds of the near-surface currents associated with this ring are about 50 cm/s. There is also a surprising amount of higher-frequency current fluctuations. These include diurnal and semidiurnal tides, a basin tidal resonance, and a free gravity mode.

KEYWORDS: Physical Oceanography; Oceanography; Dynamics; Ocean; Currents; Anticyclonic Ring; Movement; Velocity; Pinched Off; Loop Current; Speeds; Near-Surface; Diurnal; Semidiurnal Tides; Basin Tidal Resonance; Gulf of Mexico.

**401.**
Koch, S.P., J.W. Barker, and J.A. Vermersch. 1991. The Gulf of Mexico loop current and deepwater drilling. Journal of Petroleum Technology 43(9):1046-1119.

ABSTRACT: None.

KEYWORDS: Physical Oceanography; Oil Drilling; Ocean Circulation; Ocean Engineering; Gulf of Mexico.

**402.**
Kohl, B. and H.E. Vokes. 1994. On the living habits of *Acesta bullisi* (Vokes) in chemosynthetic bottom communities, Gulf of Mexico. Nautilus 108(1): 9-14.

ABSTRACT: The supposedly pathologic paratype of *Acesta bullisi* (Vokes, 1963) has been re-evaluated based on additional information from the type locality. The specimen is not aberrant, as originally thought, but represents a normal mode of growth in which the shell is attached over the anterior end of chemosynthetic tube worms of the genus *Lamellibrachia* sp., which occur at hydrocarbon seeps in the Gulf of Mexico. It is shown that the paratype is a final stage in the ontogeny of *A. bullisi*, which lives attached to the tube worm *Lamellibrachia*.

KEYWORDS: marine molluscs; chemosynthesis; hydrothermal springs; community composition; biological collections; Acesta bullisi; Lamellibrachia; ASW, Gulf of Mexico; life cycle; hydrothermal vents; Bivalvia.

**403.**
Kornacki, A.S., J.W. Kendrick, and J.L. Berry. 1994. Impact of oil and gas vents and slicks on petroleum exploration in the deepwater Gulf of Mexico. Geo-Marine Letters 14(2-3): 160-169.

ABSTRACT: Active petroleum vents and slicks have been identified in the deep water of the northern Gulf of Mexico using numerous techniques. The occurrence and distribution of these petroleum vents are strongly influenced by the local geological framework-especially the presence of vertical migration pathways into shallow sediments. Oil and gas vents may be more useful for establishing the existence of petroleum generation on a regional scale and for evaluating the gross properties of oil migrating in the subsurface than for appraising the exploration value of individual prospects. Knowledge about petroleum venting in the deepwater Gulf of Mexico has proven to be an important element of the successful exploration activities there.

KEYWORDS: Gulf of Mexico; seepages; hydrocarbons; oil and gas exploration; oil slicks.

**404.**
Krieger, W.F., J.C. Heslop, B.E. Lundvall, and D.T. McDonald. 1999. Genesis Spar Hull and Mooring System: Project Execution . Proceedings of the 31th Annual Offshore Technology Conference (OTC paper 10798).

ABSTRACT: This paper provides an overview of the project execution phase for the Genesis hull and mooring system, beginning with project team scope, responsibilities, and organization. Safety, quality, cost and schedule are reviewed, with special attention given to the issue of safety. Selected technical challenges are discussed, including deck leg to hull connection, chain jack foundation, transportation, connector testing, riser guides, and strakes. Lessons learned are noted.

KEYWORDS: Technology.

**405.**
Kupfer, D.H. 1989. Diapirism sequences as indicated by internal salt structures. Society of Economic Paleontologists and Mineralogists. Program and Abstracts 10:79-89.

ABSTRACT: None.

KEYWORDS: Geology.

**406.**
Kurtz, D.a.T.F. 1977. Government and Political Analysis. pp 144-159. In: Stallings EF, T. F. Reilly, R. B. Gramling , D. P. Manual. Outer Continental Shelf Impact, Morgan City, Louisiana. Louisiana Department of Transportation and Development., Baton Rouge, LA.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana.

**407.**
Kvenvolden, K.A. and M.A. McMenamin. 1980. Hydrates of natural gas: a review of their geologic occurrence. Geological Survey Circular (825):1-14.

ABSTRACT: Gas hydrates are a type of inclusion compound or clathrate formed as icelike mixtures of gas and water in which gas molecules are trapped within a framework or cage of water molecules. Large quantities of natural gas (mainly methane) can be trapped in sediments in the form of gas hydrates. The presence of gas hydrates in permafrost regions has been established at a number of wells. Geologic, geochemical, and geophysical evidence suggests that gas hydrates can exist in many areas beneath the seafloor. The main seismic evidence for submarine gas hydrates are reflectors that simulate the topography of the seafloor. If large quantities of gas hydrate are widespread in permafrost regions and in offshore marine sediments, they may be potential energy resources. Refs.

KEYWORDS: Geology; Natural Gas; Petroleum Geology; Chemical Reactions; Hydration; Energy Resources; Gas Hydrates.

**408.**
Kyle, J.R., M. R. Ulrich, and W. A. Gose. 1987. Textural and paleomagnetic evidence for the mechanism and timing of anhydrite cap rock formation, Winnfield salt dome, Louisiana, pp 497-542. In: Lerche I, O'Brien J, (Editors). Dynamical geology of salt and related structures. Academic Press, Orlando, FL.

ABSTRACT: None.

KEYWORDS: Geology.

**409.**

Kyle, J.R., M.R. Ulrich, and W.A. Gose. 1987. Textural and paleomagnetic evidence for the mechanism and timing of anhydrite cap rock formation, Winnfield salt dome, Louisiana, pp 497-542. In: Lerche I, O'Brien JJ. Dynamical geology of salt and related structures. Academic Press, Orlando, FL.

ABSTRACT: None.

KEYWORDS: Geology; Anhydrite; Calcite; Cap Rocks; Carbonates; Central Louisiana; Cretaceous; Diagenesis; Diapirs; Gulf Coastal Plain; Intrusions; Louisiana; Mesozoic; Paleomagnetism; Salt Domes; Salt Tectonics; Solution; Stocks; Structural Geology; Sulfates; Tectonics; Tem Data; United States; Winnfield Salt Dome; Winnrock Quarry; Zoning.

**410.**

Ladd, J. W., R. T. Buffler, J. S. Watkins, and J. L. Worzel. 1976. Deep seismic reflection results from the Gulf of Mexico. Geology 4(6):365-8.

ABSTRACT: New multichannel seismic reflection data provide details of the structure, stratigraphy, and geologic history of the deep western Gulf of Mexico unresolved by earlier single-channel work. These data show a thick sedimentary section lying on an irregular acoustic reflector thought to be oceanic crust that was possibly formed in late Paleozoic or early Mesozoic time. Above the irregular acoustic reflector, six seismic units are defined on the basis of reflection characteristics and basinwide continuity. One unit containing the salt (Jurassic?) that feeds the Campeche-Sigsbee Salt Dome province can be traced northward toward the Sigsbee Escarpment, but it pinches out against the base of the Campeche Escarpment. The four units lying above the salt unit reflect an extended period of pelagic sedimentation followed by mid-Tertiary to Pleistocene turbidite sedimentation.

KEYWORDS: Geology.

**411.**

Laendner GC. 1993. A failed strategy: the offshore oil industry's development of the outer continental shelf. Garland Publishing Co.

ABSTRACT: Traces changing oil company policies in response to international law, presidential initiatives, an oil embargo, and environmental legislation, 1970-76.

KEYWORDS: Socioeconomics; Petroleum industry; Underwater operations; Energy policy; Continental shelf; Oil and gas leases ; Regulation; Environmental policy.

**412.**

Lamkin, J. 1997. The loop current and the abundance of larval *Cubiceps pauciradiatus* (Pisces: Nomeidae) in the Gulf of Mexico: Evidence for physical and biological interaction. Fishery Bulletin 95:250-266.

ABSTRACT: By analyzing annual ichthyoplankton survey data from 1983 to 1988, I found a significant positive correlation in distribution and abundance between larval *Cubiceps pauciradiatus* and the Loop Current in the Gulf of Mexico. The data indicate that *C. pauciradiatus* is a species whose adult spawning grounds and larval habitat are tied to sharp temperature gradients. These gradients occur along the edge of the Loop Current in the eastern Gulf of Mexico and along the anticyclonic-cyclonic rings in the western Gulf of Mexico. Transects made across the Loop Current, in 1987 and 1988, show that larval C. pauciradiatus is found close to the frontal interface and that peak abundance occurs before peak SST (sea surface temperature). Variation in the extent of the frontal systems in the Gulf of Mexico would be expected to affect annual recruitment of a species that is tied to a frontal habitat. Annual abundance of C. pauciradiatus varied considerably but was similar to that of other pelagic species. This finding suggests that the physical processes in the Gulf of Mexico may affect a wide range of species.

KEYWORDS: Water column biology; Marine Ecology; bigeye cigarfish; *Cubiceps pauciradiatus* (Osteichthyes); epipelagic fishes; Abundance; Distribution; Gulf of Mexico; Larva; Recruitment; sea surface temperature.

**413.**

Lancraft, T.M., T.L. Hopkins, and J.J. Torres. 1988. Aspects of the ecology of the mesopelagic *Gonostoma elongatum* (Gonostomatidae, Stomiiformes) in the eastern Gulf of Mexico. Marine Ecology Progress Series 49(1-2):27-40.

ABSTRACT: Gonostoma elongatum is an important mesopelagic fish found throughout the world at subtropical-tropical latitudes. The species is a strong diel migrator, found from 25 to 325 m at night and from 425 to 725 m during the day with small fish occurring shallower than large fish. Numerical abundance and biomass were high, rivaling the dominant species of myctophids in the Gulf of Mexico. *G. elongatum* is a protandric hermaphrodite whose population breeds throughout the year and females probably once a lifetime. Growth rate, based on "daily" ring counts from otoliths, was linear (0.34 mm d super(-1)) and the largest fish (225 mm Standard Length) was estimated to live less than 2 yr. *G. elongatum* feeds primarily on crustaceans, with copepods and ostracods dominating in early juvenile stages (< 50 mm SL) and euphausiids in the larger sizes. A cyclic feeding pattern was observed with most active feeding occurring in the 25 to 250 m zone at night. Predation is substantial on large *Pleuromamma* (> 3 mm) in certain depth zones (150 to 200 m) at night.

KEYWORDS: Water column biology; vertical migrations; circadian rhythms; diets; population dynamics; food organisms; abundance; mesopelagic zone; *Gonostoma elongatum*; mesopelagic fishes.

**414.**

Larkin, J., P. Aharon, and M.C. Henk. 1994. *Beggiatoa* in microbial mats at hydrocarbon vents in the Gulf of Mexico and Warm Mineral Springs, Florida. Geo-Marine Letters 14(2-3):97-103.

ABSTRACT: Microbial mats were collected from a variety of sites near hydrocarbon vents along the slope in the northern Gulf of Mexico and, for comparison, from Warm Mineral Springs, Florida, USA. A predominant microorganism in each of the mats was the giant bacterium, *Beggiatoa*. Diameters of the bacterial filaments ranged from about 6 mu m to approximately 200 mu m. The latter organisms are the largest prokaryotic organisms yet found. All filaments over about 10 mu m in diameter contained a large central vacuole, producing a cell with the cytoplasm as a cylindrical tube underlying the cytoplasmic membrane. Sulfur globules were confined to this peripheral layer. Push cores often contained pyrite tubules whose appearance is suggestive of a *Beggiatoa* origin. Determinations of delta super(13)C in Beggiatoa mats from vents along the Louisiana slope yielded values in the range of -26.6 to -27.9ppt (PDB), suggesting an unusually high degree of isotope fractionation (-24.9ppt) relative to the carbon source in the ambient seawater, which is typical of sulfur-oxidizing chemoautotrophs. The presence of S super(0) (elemental sulfur) within cells of *Beggiatoa* resulting from oxidation of H sub(2)S supports the importance of bacterial sulfate reduction processes in the underlying vents for the sustenance of the Beggiatoa mats.

KEYWORDS: Gulf of Mexico; USA, Florida, Warm Mineral Springs; Beggiatoa; bacteria; seepages; hydrocarbons; hydrogen sulphide; sulphate reduction.

**415.**

Laska, S., V.K. Baxter, R. Seydlitz, R.E. Thayer, and S. Brabant. 1993. Impact of Offshore Oil Exploration and Production on the Social Institutions of Coastal Louisiana. University Research Initiative,Final rept. Minerals Management Service, New Orleans, LA. Gulf of Mexico OCS Region.

ABSTRACT:The research contained in the report considers the relationship of oil production--a primary economic activity--to five social institutions: the family; poverty and social service provision; communities; government; and the political economy. Findings suggest a direct impact of offshore oil and gas production on these institutions. The impact is both positive and negative. It is long-term as well as short-term. It affects different institutions and sub-populations differently. The effects are on the entire state, not just the area directly involved with oil production. Mitigation recommendations range from research, data collection, impact monitoring, a national policy requiring the use of American contractors, the sharing of severance taxes with the affected area, the escrowing of monies by oil companies, and the expansion of government assistance to mitigate impacts.

KEYWORDS:Socioeconomics; Offshore drilling; Petroleum industry; Exploration; Social welfare; Services; Communities; Regional planning; Economic impact; Political science; Mitigation; Government policies; Technical assistance; Contractors.

**416.**

Leatherwood, S., T.A. Jefferson, J.C. Norris, W.E. Stevens, L.J. Hansen, and K.D. Mullin. 1993. Occurrence and sounds of Fraser's dolphins (*Lagenodelphis hosei*) in the Gulf of Mexico. Texas Journal of Science 45(4):349-354.

ABSTRACT: The Fraser's dolphin (*Lagenodelphis hosei*) is one of the least known cetacean species. Historical accounts show only one record (mass stranding) in the Gulf of Mexico. This paper details the first observations of free-ranging Fraser's dolphins in the Gulf, and describes sounds produced during one of those observations. Observations of Fraser's dolphins were made during systematic shipboard and aerial surveys which were conducted along the outer continental shelf and continental slope of the central and western Gulf. Individual sightings consisted of either single-species groups of Fraser's dolphins or mixed-species groups of Fraser's dolphins travelling with melon-headed whales (*Peponocephala electra*) and/or rough-toothed dolphins (*Steno bredanensis*). The sightings occurred within oceanic waters from 835 m to 1,750 m in depth. Sounds produced by Fraser's dolphins included whistles of two basic types: relatively long duration (0.4-0.5 seconds) single calls and groups of 3-5 relatively short duration (0.2 seconds) calls. Both of these calls were similar in frequency to whistles of dolphins of the genus Stenella. Pulsed vocalizations, presumably used for echolocation, were also recorded.

KEYWORDS: Endangered Species; Gulf Of Mexico.

**417.**

Leben, R.R. and G.H. Born. 1993. Advances in Space Research 13(11):325-333.

ABSTRACT: Geosat altimeter derived sea surface height (SSH) anomaly fields have been optimally interpolated onto a regular space time grid using both crossover data from the nonrepeating Geodetic Mission (Geosat-GM) and collinear data from the Exact Repeat Mission (Geosat-ERM).|Over four years of data were collected from the combined missions, spanning the time period from April 1985 through August 1989, during which six major and at least two minor Loop current eddies were directly observed.|Eddy paths determined by automated tracking of the local maximum values in the SSH anomaly fields were compared with eddy centers estimated from drifting buoy trajectories, validating the data processing and tracking techniques.|Accurate tracking of eddy centers allowed transits of 90 deg W to be used as a benchmark for determination of eddy shedding periods.|For this data set the average period between major eddy transits was 9.8 months, with individual separation periods ranging from 6 to 14 months.|The two minor eddies observed were associated with the deepest penetrations of the Loop current into the gulf, and were nearly coincident with the shedding of the strongest major Loop current eddies. <PREP> Author (revised).

KEYWORDS: Physical Oceanography; Gulf of Mexico.

**418.**

Leben, R.R., G.H. Born, J.D. Thompson, and C.A. Fox. 1990. Mean sea surface and variability of the Gulf of Mexico using GEOSAT altimetry data. Journal of Geophysical Research 95(3):3025-3032.

ABSTRACT: Geosat Exact Repeat Mission (ERM) altimetric measurements of the sea surface height in the Gulf of Mexico are used to determine the mean sea surface height with respect to the ellipsoid and mesoscale variability along Geosat ground tracks in the gulf for the time period from November 8, 1986, to November 25, 1988. The alongtrack mean sea surface is determined using a regional crossover adjustment procedure, in which the tilt and bias of mean arcs are estimated using a least squares technique to minimize the height differences at crossovers points. A mean surface generated using the Geosat ERM alongtrack mean is calculated and contrasted with a previously derived mean surface determined using GEOS 3 and Seasat crossover differences. This provides a first look at the variability in the mean between the time periods of 1987-1988 and 1975-1978. In addition, the alongtrack mesoscale variability time series has been produced from the Geosat ERM data set by using a robust orbit error removal algorithm to determine the variability of the sea surface height with respect to the alongtrack mean. A surface generated using the rms of this alongtrack time series shows good qualitative and quantitative agreement with previous in situ observations in the region. This study demonstrates the potential of satellite altimetry for oceanographic studies of the Gulf of Mexico. (DBO).

KEYWORDS: Physical Oceanography; continental shelves; radium isotopes; shelf dynamics; ocean circulation; mixing processes; satellite altimetry; radar altimeters; sea surface; surface topography; temporal variations; GEOSAT; Gulf of Mexico.

**419.**

Lee, C. 1995. Geology of hydrocarbon seeps on the northern Gulf of Mexico continental slope . Texas A&M University.

ABSTRACT: The geology of four hydrocarbon seeps on the Louisiana continental slope of the Gulf of Mexico was studied. The study area included GC 184/185, GC 234, GB 386, and GB 425. The data base includes 3.5 kHz, 12 kHz, and 25 kHz reflection profiles, 77 kHZ side-scan sonar records, piston cores, push cores, grab samples, video tapes, and bathymetry, which were obtained by the submarine NR-1, the submersible Johnson Sea-Link, and the R/V Gyre. Industry 3.5 kHz reflection records, minisleeve exploder records, and selected multi-channel seismic lines were also used. Hydrocarbon seeps were concentrated along active faults associated with salt movement. Seep sediments included authigenic carbonates, gas hydrates, and mud that was either oil- or gas-charged. Each of these substrates cause acoustic anomalies in high-frequency reflection profiles 25 kHz reflection profiles showed six echo types. Types I and II consisted of hard substrates either exposed or buried, respectively. Type III featured acoustic turbidity caused by gas bubbles or disseminated carbonates or both. Type IV showed acoustic reverberation resulting from scattered shell fragments and carbonate nodules. Type V exhibited zones of acoustic wipeout caused by gas in sediments. Type VI consisted of undisturbed mud layers. Authigenic carbonates were concentrated along hydrocarbon conduits. Chemosynthetic organisms concentrated on authigenic carbonate substrates, suggesting that these zones have high concentrations of hydrocarbons and provide solid substrates for benthic organisms. Round-top and flat-top seep mounds exist in the study areas. The round top of Bush Hill is believed to have been controlled by faults, which acted as fluid conduits. Sediments from the conduits began to deposit along the steep slope caused by fault scarps. As sediments accumulated, they were eventually deposited over the uplifted seafloor, forming an asymmetrical mud mound. In contrast, the flat-top mounds of GB 386 and GB 425 exhibited lateral deposit of fluidized sediments at the seafloor. Widespread fluid venting caused the formation of a carbonate crust and/or gas hydrates. Finally, a flat-top mud mound, covered by carbonates and/or gas hydrates, was formed, as in the GB 386 mound. At GB 425, fresh mud provided by vents eventually covered the mound's hard substrates.

KEYWORDS: Geology ; Geophysics.

**420.**

Lee, C.S., W.W. Sager, R. MacDonald, R. Sassen, and J.F. Reilly. 1993. Active mud vents on a hydrocarbon seep mound, continental slope, northern Gulf of Mexico. Eos, Transactions Supplement American Geophysical Union .

ABSTRACT: We studied the geology of a hydrocarbon seep mound at 590 m water depth on the northern Gulf of Mexico continental slope using a data base consisting of high frequency side-scan sonar records and 25 kHz seismic reflection profiles from the submarine *NR-1*; temperature profiles from gas vents, video tape photography, and geological samples from the *Johnson Sea-Link* submersible; as well as 3.5 kHz and 12 kHz echo sounder records, bathymetry, and piston cores from the R/V *Gyre*. The flat-topped semi-circular mound has diameter of about 1100 m and stands about 20 m above the surrounding sea floor. Extensive thin crusts of calcium carbonate were found atop the mound, evidently as a product of microbial degradation of hydrocarbons. On the southern and northeastern flanks we observed recent mud slides and sediment flows. Following these features upslope, we found active mud vents discharging gas, oil and mud at the perimeter of the mound top. Sediments entrained by this discharge have probably contributed to the formation of the mound. Gas and droplets of oil were observed to be escaping from the vents. A temperature probe, lowered immediately beneath the surface of the fluid mud within the vent, recorded a temperature of 20°C, about 12°C warmer than the ambient sea water. Geochemical data, piston core samples, and 25 kHz subbottom profiles imply gas hydrates within the sediments on the western periphery of the mound. Although the hydrates may prevent the escape of gas and oil elsewhere, the high temperatures would prevent gas hydrate formation around the vents, so fluid flow appears to be unrestricted in this area. Morphologically, this mound closely resembles the "mud pie" mounds described from the Barbados accretionary prism. The fluid discharge processes which form mounds in both settings are probably similar, but the causes of fluid discharge are different. The mound that we studied has formed as a result of hydrocarbon seepage owing to salt tectonism and faulting of slope sediments.

KEYWORDS: Geology.

**421.**

Lee, G.H. 1990. Salt tectonics and seismic stratigraphy of the Keathley canyon area and vicinity, northwestern Gulf of Mexico. PhD. Dissertation. Texas A&M University. College Station, TX.

ABSTRACT: The continental slope of the northwestern Gulf of Mexico is a region of high degree geologic complexity due to deformation and movement of underlying salt. Analysis of over 7,500 km of multichannel seismic data from the Keathley Canyon Area and vicinity contributes to an understanding of the structure and stratigraphy of this area.^Salt in the northeastern part of the study area and adjacent updip regions originated from a deep mid-Jurassic salt layer. A NW-SE structural trend of salt in these areas may reflect basement influence. As the salt rose to shallower depths, the downslope part of the salt moved seaward as allochthonous tongues that evolved into ridges and massifs. Progradational differential loading of the Cenozoic sediments on the shelf and upper slope is believed to be the primary mechanism for the seaward migration of salt. Intraslope basins formed locally by withdrawal of the salt. Lobes of salt spreading seaward formed the Sigsbee Escarpment along the base of the slope. The NW-SE trending ridges and basins superposed on allochthonous salt may have been influenced by the NW-SE trending salt features in the updip regions. Potential hydrocarbon traps were created both below and above the salt layer.^Keathley and Bryant canyons indent the Sigsbee Escarpment salt front. Keathley Canyon appears to have been formed by salt tectonism. Beneath the upper Keathley Canyon, laterally moving salt lobes uplifted continental slope and rise sediments. These coalesced and resulted in a valley-like feature with walls of uplifted and deformed strata. Erosion of canyon-wall sediments may have preserved or steepened the upper canyon. Downslope, a broad interlobal bathymetric low forms the lower Keathley Canyon. In contrast, Bryant Canyon appears to be an erosional feature that was part of an old Mississippi River-canyon-fan system. Bryant Canyon involves several intraslope basins and well-developed valleys. In interbasinal areas where Bryant Canyon apparently cuts shallow salt masses, the canyon has little seafloor expression probably due to intensive salt tectonism. Seismic stratigraphic interpretation suggests that sea-level cycles were a major factor in the depositional patterns of the area. As sea level fell, sediments from the shelf and upper slope were transported downslope. Most sediments were deposited as slope fans within subsiding salt-withdrawal basins. During sea-level lowstands, shallow-water sediments prograded onto the slope filling salt-withdrawal basins with turbidites. During sea-level rises and highstands, most sediments were deposited on the self and upper slope and sediment-starved condensed sections formed on the lower slope and deeper water regions.

KEYWORDS: Geology; Geophysics; Gulf of Mexico.

**422.**

Lee T.N., Clarke M.E., Williams E., Szmant A.F., and T. Berger. 1994. Evolution of the Tortugas gyre and its influence on recruitment in the Florida Keys. Bulletin of Marine Science 54:621-646.

ABSTRACT: Moored current measurements, satellite-tracked drifters, shipboard hydrography and a time sequence of satellite derived surface thermal images are used to show the formation and evolution of cold, cyclonic gyres coupled to large offshore meanders of the Florida Current in the southern Straits of Florida (SSF). Gyre formation is dependent upon the orientation of the Loop Current as it enters the SSF. Gyre formation provides enhanced food supply, retention and shoreward transports for successful recruitment in the western and lower Florida Keys of locally spawned snapper and grouper larvae. A previously unknown potential retention area for larval invertebrates and fish on the southwest Florida shelf has been identified, and a local lobster recruitment pathway combining advective influences from the Tortugas gyre, Loop Current and shelf circulation are proposed. -from Authors.

KEYWORDS: gyres; current meanders; recruitment; evolution; Florida; Florida Keys; Water column biology.

**423.**

Lehner, P. 1969. Salt tectonics and Pleistocene stratigraphy on continental slope of Northern Gulf of Mexico. American Association of Petroleum Geologists Bulletin 53(12):2431-2479.

ABSTRACT: During a sparker and core- drill program conducted by Shell, salt was cored on 10 prominent structures on the continental slope. Broad salt swells and pillows are typical structures in this region. The Sigsbee scarp appears to be the surface expression of a salt front. A zone of active down- to- the- ocean faults follows the Texas shelf edge. They appear to be related to the flow of salt at depth away from the advancing clastic wedge. 37 refs.

KEYWORDS: Geology; Petroleum Geology; Gulf of Mexico; Petroleum Geology; Sedimentation.

**424.**

Leipper, D. F. 1967. Observed ocean conditions and Hurricane Hilda, 1964. Journal of the Atmospheric Sciences 24(2):182-96.

ABSTRACT: Hurricane Hilda crossed the Gulf of Mexico in the period 30 September to 4 October 1964, developing into a very severe hurricane in the central Gulf. Sea temperature data available prior to the storm indicated what was probably a typical late summer situation with some surface temperatures running above 30C. Beginning 5 October 1964, a 7-day cruise was conducted over the area where hurricane winds had been observed. Using the GUS III of the Galveston Biological Laboratory of the Bureau of Commercial Fisheries, four crossings of the hurricane path were made. Bathythermograph observations were taken regularly to 270 m and hydrographic casts to 125 m. The data on all four crossings indicated similar patterns. The observed temperature-depth structures after the storm indicated that the warm ocean surface layers were transported outward from the hurricane center, cooling and mixing as they ved; that these waters converged outside of the central storm area with the result that downwelling to the 80 to 100 m in depth took place there; and that cold waters upwelled along the hurricane path from depths of approximately 60 m. Sea surface temperatures decreased by more than 5C over an area of some to 200 mi. A cyclonic current system was observed around the area of greatest hurricane intensity. It is estimated that the total heat loss from the ocean to the atmosphere in area of hurricane force winds was $8x10^{18}$ cal with the transfer unit per area being 4500 cal $cm^{-2}$. The data collected on the GUS III cruise was the first systematic observations available immediately after a severe hurricane in deep water.

KEYWORDS: Geology.

**425.**

Leipper, D.F. 1970. Sequence of current patterns in the Gulf of Mexico. Journal of Geophysical Research 75(3):637-57.

ABSTRACT: The primary current in the Gulf of Mexico is in the form of a loop entering through the Yucatan Chnnel and eventually leaving through the Florida Straits. It usually transposts more than 25 million cu m/sec of water at 50 to 200 cm/sec. Although it retains its basic characteristics along the line of flow, it is known to be highly variable in position. A series of eight cruises of about 2- wk duration each was conducted over a 30- mo period in the different seasons. The primary current was crossed 40 times. Five of these cruises supplemented by three others having somewhat differing objectives provided a series ofeight cruises in one 16- mo period beginning in July 1965. A reasonable sequence of current patterns for the primary current loop is indicated by the observations. The variations in pattern are compared with those indicated by data available from other time periods. The flow is well represented year- around by the topographies of the 22 C isothermal surfaces. This permits a simplified analysis and allows conclusions about the current systems to be drawn from cruises on which only limited data were collected. 12 refs.

KEYWORDS: Physical Oceanography; continental shelves; radium isotopes; shelf dynamics; ocean circulation; mixing processes; Gulf of Mexico.

**426.**
Leipper, D.F. and D. Volgenau. 1972. Hurricane heat potential of the Gulf of Mexico. Journal of Physical Oceanography 2:218-224.

ABSTRACT: It has been demonstrated that a large input of energy from the ocean is necessary to establish and maintain hurricane force winds over the sea. However, there has been no suitable data which could serve as a basis for calculating this input. Now, observations are available to show that, early in the hurricane season, there are varying initial conditions in the Gulf of Mexico which could lead to significantly different total heat exchanges. The sea can provide some seven days of energy flow into a hurricane at some times and at some locations, but less than one day in others depending upon the amount of heat initially available in the Gulf waters. In the four summers represented by the data, a quantity defined as hurricane heat potential was found to vary from a low of 700 cal cm super(-2) column north of Yucatan to a high of 31,600 in the central east Gulf. Synoptic data on hurricane heat potential, if made regularly available to forecasters, might serve as a basis for improved forecasts of changes in intensity and movement of hurricanes.

KEYWORDS: Physical Oceanography; Hurricanes; Heat transfer; Ocean-atmosphere system; Heat budget; continental shelves; radium isotopes; shelf dynamics; ocean circulation; mixing processes; Gulf of Mexico.

**427.**
Lewandowski, S.A. 1994. Effects of Offshore Oil and Gas Development: A Current Awareness Bibliography,Final rept. Minerals Management Service, New Orleans, LA. Gulf of Mexico OCS Region.

ABSTRACT:After a brief history of the project is presented with a description of the format of the bibliography, the compilation of four years of citations pertaining to the effects of offshore oil and gas development is divided into four sections: biology/chemistry/geochemistry, engineering/physics/geology, general/spills/environment and socioeconomics/regulation. The items cited are in several formats but are primarily journal articles, books, book chapters and technical reports.

KEYWORDS:Socioeconomics; Petroleum industry; Gas industry; Offshore drilling; Bibliographies; Offshore operations; Offshore platforms; Biology; Chemistry; Geochemistry; Petroleum engineering; Physics; Geology; Oil spills; Environmental effects; Environmental impact assessments; Socioeconomic factors; Regulations; Ntisdilmla.

**428.**
Lewis, J.K. 1992. The physics of the Gulf of Mexico. Journal of Geophysical Research 97(C2):2141-2142.

ABSTRACT: During the last 10 years, a good deal of research has been conducted in the Gulf of Mexico (GOM). Study topics have included the Loop Current, coastal processes, eddies, tides, and the effects of tropical storms. Scientific contributions have been made by the offshore industry, academia, environmental agencies, and naval research groups. A great deal of information has quietly accumulated concerning the gulf, most of which is applicable to other regions in the world. We now know for certain that the GOM is not the quiescent mediterranean sea that we had once supposed. Aside from the occasional severe tropical storm, the gulf is often filled with Loop Current eddies, strong coastal jets, and a rapidly meandering Loop current. All of this is contained in a basin of only 1.5 million km super(2). In the spring of 1989 an international conference was convened to allow for an exchange of information and the development of cooperative plans for the future in the Gulf of Mexico.

KEYWORDS: Physical Oceanography; continental shelves; radium isotopes; shelf dynamics; ocean circulation; mixing processes; conferences; ocean currents; tides; oceanic eddies; storms; Gulf of Mexico.

**429.**

Lewis, J.K. and S.A. Hsu. 1992. Mesoscale air-sea interactions related to tropical and extratropical storms in the Gulf of Mexico. Journal of Geophysical Research 97(C2):2215-2228.

ABSTRACT: Data indicate that the climatological vorticity of the lower atmosphere of the northwestern Gulf of Mexico is relatively strong, with monthly means exceeding a Rossby number of 3 from October through March, with a maximum of 4.6 in December. It has been hypothesized that wintertime cyclogenesis over the northwestern gulf is enhanced by this lower level atmospheric vorticity field when it occurs simultaneously with appropriate upper level venting. Observations from November 1982 to mid-February 1983 were studied in which seven significant cyclones were generated in the northwestern gulf. It was found that all seven storms occurred when the vorticity correlate of horizontal air temperature difference was similar to 3-5 degree C above the climatological mean difference. Two plausible effects of the Loon Current and its rings on tropical storms are discussed. One is that these ocean features are large and consolidated heat and moisture sources from which a nearby, slowly moving atmospheric disturbance can extract energy. The second is that of the cyclonic vorticity that can be generated in the lower atmosphere by such oceanographic features.

KEYWORDS: Physical Oceanography; Loop Current; ocean currents; ocean circulation; current observations; seasonal variations; annual variations; modelling; rotating fluids; Loop Current; oceanic eddies; current meandering; statistical analysis; storms; mesoscale features; air-sea interaction; air-sea coupling; ocean-atmosphere system; atmospheric circulation; vorticity; cyclogenesis; Gulf of Mexico.

**430.**

Lewis, J.K. and A.D.Jr. Kirwan. 1985. Some observations of ring topography and ring-ring interactions in the Gulf of Mexico. Journal of Geophysical Research 90(C5):9017-28.

ABSTRACT: The movement and interactions of Loop Current rings are studied using trajectory and sea surface temperature (SST) data from the Gulf of Mexico. The movements of three rings as determined by drifters seeded in the rings are compared. The data show the rings moving west through the deepest portion of the Gulf and then northward after impacting with the Mexican coast. The trajectory data indicate a ring life span of at least 9-13 months, with two of the rings persisting off the Mexican coast for at least 3-5 months. The trajectory of a fourth drifter, not seeded in a ring, still shows strong anticyclonic motion.

KEYWORDS: Physical Oceanography; Oceanography; Ocean; Dynamics; Ad 1980; Ad 1982; Ad 1983; Ring Topography; Ring-Ring Interactions; Movement; Loop Current Rings; Ring Life Span; Gulf of Mexico.

**431.**

Lewis, J.K., A.D.J. Kirwan, and G.Z. Forristall. 1989. Evolution of a warm-core ring in the Gulf of Mexico: Lagrangian observations. Journal of Geophysical Research 94(C6):8163-8178.

ABSTRACT: During 1985 and 1986, a Gulf of Mexico ring shed by the Loop Current was observed to migrate toward the western Gulf of Mexico. This movement across the gulf was well documented by observations that included drifter data within and outside the ring, sea surface temperature at weekly intervals, expendable bathythermograph surveys at various times, one major hydrographic cruise when the ring was in the northwestern gulf, and currents from moorings over which the ring passed. The drifter data were used to infer the movement of the ring center as well as the eccentricity and orientation of the major axes. The synthesis of these diverse but complimentary data sources provides a detailed description of how the ring interacted with the bathymetry of the northern Gulf of Mexico.

KEYWORDS: Physical Oceanography; ocean circulation; current rings; current meandering; ocean currents; Loop Current; bottom topography effects; Dynamical Oceanography; Gulf of Mexico.

**432.**
LGL Ecological Research Associates, I. and Texas A&M University. 1985. Northern Gulf of Mexico Contintental Slope Study., Executive Summary (Year 1). Minerals Management Service, Metairie, LA. Gulf of Mexico OCS Regional Office.

ABSTRACT:The study prepared for the Minerals Management Service summarizes the Year I Annual report which details the findings of one year sampling on the continental slope of the Gulf of Mexico. Results of two cruises are presented with information concerning field and laboratory methods and procedures for identifying organisms.

KEYWORDS:Hydrocarbons; Marine biology; Marine geology; Water pollution; Gulf of Mexico; Instructions; Benthos; Sampling; Deep water; Geological sedimentation; Particle size; Marine fishes; Abundance; Nematoda; Comparison; Tables(Data); Leasing; Offshore drilling; Outer Continental Shelves.

**433.**
LGL Ecological Research Associates, I. and Texas A&M University. 1985. Northern Gulf of Mexico Continental Slope Study. Annual Report (Year 1),Minerals Management Service, Metairie, LA. Gulf of Mexico OCS Regional Office.

ABSTRACT:The report includes the sampling results of two cruises which are presented with information concerning field and laboratory methods and procedures for identifying organisms. A general overview of the physical and chemical processes in the Gulf of Mexico is presented along with preliminary findings concerning the high molecular weight hydrocarbons in sediments and organisms. Sediment texture, organic carbon and carbonate and carbon isotope analysis. The biological oceanographic section discusses macroepifauna, fish, meiofauna and macroinfauna including an analyses of zonation patterns in these organisms and comparison of species diversity with previously recorded results.

KEYWORDS:Hydrocarbons; Marine biology; Marine geology; Water pollution; Gulf of Mexico; Surveys; Identifying; Benthos; Sediments; Carbonates; Particle size; Marine fishes; Abundance; Nematoda; Sites; Ocean temperature Graphs(Charts); Offshore drilling; Leasing; Outer Continental Shelves.

**434.**
LGL Ecological Research Associates, I. and Texas A&M University. 1986. Gulf of Mexico Continental Slope Study Annual Report, Year 2., Volume 1. Executive Summary. Minerals Management Service, Metairie, LA. Gulf of Mexico OCS Regional Office.

ABSTRACT:The report summarizes the data management and scientific analyses accomplished during the first two years of a multiyear joint LGL Ecological Research Associates/Texas A&M University study of the continental slope of the northern Gulf of Mexico, which was initiated in 1983 by the Gulf of Mexico Regional Office of Minerals Management Service (MMS). The study when completed will be based upon five cruises. The original delineation of objectives established for the project was compatible with the environmental responsibility of MMS to control, in the Gulf of Mexico, the development of hydrocarbons in time and space within the geographic purview of the Regional Office. To do this the Service would have to gain knowledge of what biological and other valuable resources are present on the slope and thus are vulnerable to inevitable impacts of petroleum development.

KEYWORDS:Marine biology; Water pollution; Continental slopes; Gulf of Mexico; Hydrocarbons; Vulnerability; Ecology; Benthos; Populations; Crude oil; Offshore drilling; Natural gas.

**435.**
LGL Ecological Research Associates, I. and Texas A&M University. 1986. Gulf of Mexico Continental Slope Study Annual Report, Year 2,Volume 2. Primary Volume: Interim rept. 1985-86. Minerals Management Service, Metairie, LA. Gulf of Mexico OCS Regional Office.

ABSTRACT:The report, which was prepared in three volumes (Executive Summary, Primary Volume, and Appendix), details the findings of two years of sampling on the continental slope of the northern Gulf of Mexico at depths of 300-3000 m. Preliminary results from a third year of sampling are also presented. Physical and chemical measurements included: CTD casts at 35 stations; sediment characteristics, including hydrocarbons and bulk sediment parameters from 60 stations; tissue hydrocarbon levels of representative benthic organisms; and delta carbon-13 values from sediments and organisms, including comparison of areas of natural petroleum seepage to prevailing slope conditions. The biological oceanography section provides detailed enumeration of megafaunal specimens collected by trawling and of macro- and meiofaunal specimens collected with a 600 sq cm box core. Major megafaunal groups treated are Arthropoda, Echinodermata, and demersal fishes.

KEYWORDS:*Water pollution; Marine biology; Continental slopes; Gulf of Mexico; Petroleum industry; Abundance; Spatial distribution; Sediments; Size determination; Reproduction; Offshore drilling; Crude oil; Fishes; Crustacea; Mollusca.

**436.**
LGL Ecological Research Associates, I. and Texas A&M University. 1986. Gulf of Mexico Continental Slope Study Annual Report, Year 2., Volume 3. Appendices: Interim rept. 1985-86. Minerals Management Service, Metairie, LA. Gulf of Mexico OCS Regional Office.

ABSTRACT:The report, which was prepared in three volumes (Executive Summary, Primary Volume, and Appendix), details the findings of two years of sampling on the continental slope of the northern Gulf of Mexico at depths from 300-3000 m. Preliminary results from a third year of sampling are also presented. Physical and chemical measurements included: CTD casts at 35 stations; sediment characteristics, including hydrocarbons and bulk sediment parameters from 60 stations; tissue hydrocarbon levels of representative benthic organisms; and delta carbon-13 values from sediments and organisms, including comparison of areas of natural petroleum seepage to prevailing slope conditions. The biological oceanography section provides detailed enumeration of megafaunal specimens collected by trawling and of macro- and meiofaunal specimens collected with a 600 sq cm box core.

KEYWORDS:*Water pollution; Marine biology; Continental slopes; Gulf of Mexico; Crude oil; Fisheries; Abundance; Spatial distribution; Sediments; Reproduction(Biology); Offshore drilling; Crustacae; Mollusca; Ntisdimms.

**437.**
Lin, S. and J.W. Morse. 1991. Sulfate reduction and iron sulfide mineral formation in Gulf of Mexico anoxic sediments. American Journal of Science 291(1):55-89.

ABSTRACT: Sulfate reduction and iron sulfide mineral formation were investigated in Mississippi River delta and Gulf of Mexico continental shelf and slope sediments. Sulfate reduction rates and pyrite concentrations generally decrease exponentially with increasing overlying water depth. This is probably a result of decreasing sedimentation rates and organic carbon concentrations with increasing water depth. A linear relationship between sulfate reduction rates and organic carbon concentrations as well as normal marine C/S ratios indicate that organic carbon is probably limiting sulfate reduction and iron sulfate mineral formation in this region. Organic carbon reactivity appears to be substantially higher in Mississippi River delta sediments than in other sediments from this region.

KEYWORDS: Chemistry; Mineralization; Iron Sulphides; Sediment; Chemical Reactions; Water Depth; Organic Carbon; , Gulf of Mexico; Anoxic Sediments; Limiting Factors; Deltas; Continental Shelves; Continental Slope; Sulphate Reduction.

**438.**

Lindberg, W.J. and Lockhart F. D. 1993. Depth-stratified population structure of geryonid crabs in the eastern gulf of mexico. Journal of Crustacean Biology 13:713-722.

ABSTRACT: Manned submersible transects and synchronous trap-sampling were conducted in the eastern Gulf of Mexico along 5 depth contours on the upper continental slope, during September 1986 and 1987. Female golden crabs, Chaceon fenneri, were more abundant at 350 m and 445 m than at 550, 675, or 780 m. Male golden crabs were most abundant at 550 m. On the average, the largest crabs of each sex were caught near 350 m. More mated pairs (50%) were observed in situ along the deepest 2 contours than expected by chance alone. Within the bathymetric range of golden crabs, crab abundance may be related more to habitat type than to depth. The greatest density (36.5 crabs/ha) occurred on or near hard-bottom canyon features. Red crabs, Chaceon quinquedens, occurred only at 675 m and 780 m on heavily bioturbated soft sediments, with the largest of each sex at 675 m. Male red crabs outnumbered females, but depth did not affect the number caught. Golden and red crabs also differed in their refuging habits and responses to being disturbed. We suggest that bathymetric patterns in sex and size within geryonid populations reflect, in part, severe male-male competition for mates and alternative mating strategies for males.

KEYWORDS: Behavior; Ecology; Physiology; Malacostraca; Crustacea ; Arthropoda; *Chaceon fenneri* ; *Chaceon quinquedens* ; Habitat; Male-Male Competition; Mating Strategy.

**439.**

[Anonymous]. 1990. Lindberg, WJ and Wenner EL. Geryonid Crabs and Associated Continental Slope Fauna: A Research Workshop Report: <NOTE> Technical paperUnited States.

ABSTRACT: Considerable research in recent years has been invested in the basic biology, ecology, and fisheries of deep-water crabs, Family Geryonidae. These efforts have been concentrated off the southeastern United States and southwest Africa, following earlier work from the Mid-Atlantic states of the U.S. to the Canadian Maritime Provinces. Species of primary interest have been the golden crab, *Chaceon fenneri,* and the red crabs *Chaceon maritae* and *Chaceon quinquedens*. On January 19 and 20, 1989, an invited panel of scientists, fishermen, and Sea Grant Extension faculty met in Tampa, Florida to share their results, conclusions, and latest hypotheses. The report, as a summary of workshop presentations and discussions, is simply a vehicle by which that expertise can be delivered to a broader audience. In due time, the data summarized here should appear in the primary literature. Meanwhile, persons needing greater detail are encouraged to communicate directly with individual investigators.

KEYWORDS: Meetings/ Crabs/ Continental Shelves/ Marine Biology/ Assessments/ Populations/ Reproduction(Biology)/ Animal Physiology/ Animal Behavior/ **Chaceon fenneri*/ *Chaceon maritae*/ *Chaceon quinquedens*/ Sea Grant Program.

**440.**

Linn, J.B.III. 1975. Sea-surface topography of the Gulf of Mexico, based on ship drift. M.S. Thesis. Texas A&M University. College Station, TX.

ABSTRACT: The monthly sea-surface topography of the Gulf of Mexico is calculated from ship-drift observations. A correction for wind effect is determined from the part of the surface current velocity field estimated to result from the stress of the wind. These results are compared with topographies calculated from *in situ* measurements of temperature, salinity, and pressure in the water column.
The results show an annual cycle of intrusion and contraction in the Gulf Loop Current into the eastern Gulf. The topography is found to agree qualitatively with results of studies based on *in situ* measurements. The contribution of the wind effect is significant.

KEYWORDS: Physical Oceanography.

**441.**
Liu, J.Y. and W.R. Bryant. 1999. US gulf deepwater seafloor dominated by canyons, ridges, and faults. Offshore January:60-62.

ABSTRACT: None.

KEYWORDS: Geology; Bathymetry; Seafloor topography.

**442.**

Lohoefener, R., W. Hoggard, K. Mullin, C. Roden, and C. Rogers. 1990. Association of sea turtles with petroleum platforms in the north-central Gulf of Mexico, OCS Study/MMS 90-0025.

ABSTRACT:In 1988 there were over 4,500 petroleum platforms in the north-central Gulf of Mexico. Once a platform is no longer used for petroleum production, federal regulations require that the platform be removed. For platform removals, explosives are commonly used to sever pilings that anchor the platform to the bottom. The use of explosives has the potential to kill or injure marine animals, including sea turtles, in the vicinity of the platform. The five species of sea turtles which occur in the Gulf of Mexico are listed as either threatened or endangered under the provisions of the Endangered Species Act of 1973. The five species are as follows: loggerhead (*Caretta caretta*), leatherback (*Dermochelys coriacea*), green sea turtle (*Chelonia mydas*), Kemp's ridley (*Lepidochelys kempi*) and hawksbill (*Eretmochelys imbricata*). Anecdotal evidence indicated that at least some individual sea turtles, primarily loggerheads, were commonly found in the vicinity of specific platforms. However, the general relationship of the sea turtle population to petroleum platforms was unknown. From June 1988 through June 1990, we used aerial surveys to estimate sea turtle abundance and to study the spatial relationship between sea turtles sighted near the surface of the water and petroleum platforms. We surveyed seven study areas which sample the range of water depths (3-200 m) in the oil and gas fields offshore of Louisiana. For each study area we used three types of statistical procedures (Hamill and Wright's method, Kendall's rank correlation and chi-square analysis) to test the null hypothesis: Surfaced sea turtles were randomly located with respect to platform locations. We used line transect methods to estimate sea turtle density for each study area. During the study, we sighted 316 chelonid sea turtles of which we estimated 92% were loggerheads. Most of the sea turtles (78%) were sighted just northeast of the Mississippi River delta in two study areas offshore of Breton and Chandeleur Islands, Louisiana. Sea turtles were present throughout the year but fewer sea turtles were sighted during the coldest months (January and February). East of the river, sea turtle densities were seasonally variable, ranging from 0.92 sea turtles/100 $km^2$ in winter to 4.83 sea turtles/100 $km^2$ in spring. Because of the small number of sea turtles sighted in the five study areas west of the river, seasonal density estimates were not made. However, the annual densities in these areas ranged from 0.50 sea turtles/100 $km^2$ in 13-48 m water depths to 0.11 sea turtles/100 $km^2$ in 60-120 m water depths. Rather than leaving the north-central Gulf of Mexico in the winter, we believe some sea turtles may have brumated or moved to slightly deeper water during cold winter periods. We saw mud trails coming off some loggerheads. These mud trails indicate that they had been brumating by partially burying in bottom sediments. West of the river, sightings of sea turtles in deeper water areas increased slightly in winter. However, this was not observed east of the river. East of the river, all three statistical tests indicated that, except during winter, offshore of Chandeleur and Breton Islands, sea turtles were positively associated with platform locations (i.e., generally closer to platforms than expected). In winter, sea turtles were randomly located with respect to platform locations. In the study areas west of the river, sea turtles were randomly located with respect to platforms locations. Before the explosive removal of a platform can proceed, current mitigation measures require that no sea turtle can be sighted within 1,000 m of the platform. East of the river, based on the density of sea turtles (corrected for subsurface turtles) and the observed distance distribution of sea turtles to platforms, we estimated the probability of one or more chelonid sea turtles being within 1,000 m of any platform selected at random was great, generally more than 60%. West of the river, depending on the study area, we estimated that this probability ranged from 2-7%. We identified 18 petroleum platforms which may have had one or more positively associated chelonid sea turtles at some time during the study. To understand why sea turtles were associated with these 18 platforms, we compared them to other platforms using nine platform characterization variables. Overall, the platforms with associated sea turtles tended to be smaller unmanned platforms that were closer to shore than other platforms. Offshore of Breton and Chandeleur Islands, we found chelonid sea turtles preferred more shallow water (generally <20 m) over sandy bottom sediments. West of the river, we did not detect a sea turtle preference for bottom sediments but most were in waters less than 50 m deep. In addition to shallow water (<200 m) sea turtle studies, we also surveyed deep water Gulf waters (>200 m) for cetaceans from July 1989 through June 1990. Twenty-four were sighted in waters less than 200 m. We concluded that for an area from the mouth of the Mississippi River, west to about 92°W longitude, the current Minerals Management Service/National Marine Fisheries Service mitigation measures should adequately protect sea turtles when explosives are used to assist petroleum platform removals. However, for the area offshore of the Breton and Chandeleur Islands including deeper waters of at least 60 m, special precautions should be taken. The probability will be high that one or more sea turtles may be near any given petroleum platform.

KEYWORDS:Endangered species.

**443.**

Lohoenhofer, R.R., W. Hoggard, C. L. Roden, K.D. Mullin, and C.M. Rogers. 1990. Distribution and relative abundance of surfaced sea turtles in the north-central Gulf of Mexico: Spring and Fall 1987,In: Schroeder BA, (Compiler). Proceedings of the eighth annual workshop on sea turtle conservation and biology. Technical Memorandum NMFS-SEFC-214. NOAA,

ABSTRACT: None.

KEYWORDS: Endangered Species; Gulf of Mexico.

**444.**

Lohrenz, S.E., M.J. Dagg, and T.E. Whitledge. 1990. Enhanced primary production at the plume/oceanic interface of the Mississippi River. Continental Shelf Research 10:639-664.

ABSTRACT: Mechanistic and empirical models were used to examine relationships between primary production and environmental variables along the Mississippi River plume/oceanic gradient off Southwest Pass, Louisiana. A large proportion of variation in primary production could be explained on the basis of light and biomass. However, comparison of observed chlorophyll concentrations with those predicted using a steady-state light limitation model suggested factors in addition to light availability constrained maximum biomass levels in the plume. Factors that may have contributed to low observed biomass included growth limitation or inhibition by substances not measured, losses due to grazing and sinking, and a short residence time for plume water. The dissipative effects associated with plume/oceanic mixing may have been enhanced by potential inhibitory effects of large and varying salinity gradients. Nutrient-salinity distributions, in conjunction with approximate calculations of primary consumption of riverine nutrient sources by phytoplankton, led to the conclusion that biomass and production were controlled by nutrient supply at salinities above 30.

KEYWORDS: nutrients; river plumes; river discharge; salinity gradients; Mississippi River; Mississippi Delta; Primary Production; Water column biology.

**445.**

Lohrenz, S.E., G.L. Fahnenstiel, D.G. Redalje, G.A. Lang, X. Chen, and M.J. Dagg. 1997. Marine Ecology Progress Series 155:45-54.

ABSTRACT: Increases in nutrient concentrations in the Mississippi River over the past 35 yr have led to speculation that primary production of organic carbon has been elevated as a result of increased nutrient fluxes that have occurred in the northern Gulf of Mexico coastal ecosystem. However, studies thus far have not provided direct demonstration of temporal relationships between measured primary production in continental shelf waters and riverborne nutrient fluxes. This investigation compared temporal variations in primary production with associated annual and interannual changes in riverborne nutrient inputs. Primary production in shelf waters near the river delta were found to be significantly correlated with nitrate ($NO_3^-$) + nitrite ($NO_2^-$) concentrations and fluxes over a 6 yr period from 1988 to 1994. Although light limitation was probably an important factor during winter months, a positive correlation was demonstrated between river inputs of $NO_3^-$ +$NO_2^-$ and primary production for data collected from other times of the year. Peak nutrient inputs generally occurred in the spring. The magnitude of the riverborne $NO_3^-$+$NO_2^-$inputs averaged 106% of estimated nitrogen requirements for phytoplankton in the river-impacted region, considerably greater than in Amazon shelf waters, which have been less subject to anthropogenic nutrient increases. The possibility exists that further increases in anthropogenic nutrients in the Mississippi River could lead to higher and more widespread primary production, and this may intensify and extend the depletion of oxygen that has already been observed in the Louisiana shelf ecosystem. However, such a prediction is difficult because relationships between increasing nutrient inputs and primary production are unlikely to be linear, and a complete understanding of processes intermediate between primary production of organic matter and oxygen depletion in bottom waters on the Louisiana shelf is still lacking.

KEYWORDS: Water column biology; Gulf of Mexico ; Mississippi River ; Oxygen Depletion ; Nutrient Flux ; River Discharge ; Primary Production ; Nitrate ; Nitrite ; Primary Production ; Continental Shelves ; Nutrient Dynamics ; River Discharge.

**446.**

Lokay, B., K. Loch, and J. Adamson. 1999. How effective is flowline burial as a thermal insulation method? Offshore Magazine 59(9).

ABSTRACT: None.

KEYWORDS: Technology.

**447.**

Long, J.M. 1978. Seismic stratigraphy of part of the Campeche Escarpment, southern Gulf of Mexico. Master's Thesis. University of Texas. Austin, TX.

ABSTRACT: Interpretation of the seismic data acquired by the University of Texas Marine Science Institute from the Campeche escarpment northwest of the Yucatan peninsula suggests the following features and sequence of events in the evolution of the Gulf of Mexico. The profile of the "basement" surface resembles topography typical of subaerial erosion of block faulted homogeneous crystalline or metasedimentary rock. A Jurassic salt layer covers erosional debris on a downthrown basement block and pinches out against a pediment cut into the upthrown block. Updip of the salt pinch-out and two kilometers topographically higher are possible Late Jurassic carbonate reefs which onlap the basement erosional surface. A major unconformity separating the Campeche slope front fill unit from the underlying Challenger seismic probably corresponds to the world-wide Middle Cretaceous unconformity. Since the Late Cretaceous the study area has been dominated by deep water turbidite and pelagic sedimentation. The scenario revealed at the Campeche escarpment suggests that an early Mesozoic mantle event (?plume?) uplifted this once continental area and caused thinning of the crust to near oceanic thickness. Whether and how much of the Gulf of Mexico is underlain by thinned Paleozoic or Mesozoic continental crust, or true oceanic crust, is still uncertain. The central Gulf and interior basins subsided after this period of crustal thinning. It was in these basins that the Sigsbee and Louann salt were deposited. Later, as the basin margins subsided further, sediments onlapped and covered these margins, marking five kilometers of subsidence by the Cretaceous. Since the Cretaceous, clastics have infilled the northwestern Gulf causing an additional three kilometers of subsidence of the Gulf basin, while the central Florida and Yucatan platforms have stabilized above sea level.

KEYWORDS: Geology; Atlantic Ocean; Campeche Escarpment; Geophysical Surveys; Gulf of Mexico; Marine Geology; North Atlantic; Oceanography; Seismic Surveys; Stratigraphy; Surveys.

**448.**

Lopez, A.M., D.B. McClellan, A.R. Bertolino, and M.D. Lange. 1979. The Japanese longline fishery in the Gulf of Mexico, 1978. : Marine Fishery Review 41(10):23-28.

ABSTRACT: The general fishing operation of Japanese longline vessels is described and information is provided on the incidental catch of all species including billfishes and sharks. The typical Japanese longline fishing vessel operating in the Gulf of Mexico ranges from 50 to 70 m in length and is well equipped with radio and navigational equipment. The longline used by Japanese tuna vessels in the Gulf of Mexico consists of a main line suspended horizontally from the surface by floats and a series of branch lines (gangions) with baited hooks suspended from the main line. During the 1978 longline season, the vessels observed captured a total of 8,237 fish and 6 turtles. The target species from March to June was bluefin tuna; yellowfin tuna was the target species from June to July. The composition of the catch changed significantly during the season. This change was not only between the target species but among the incidental catch as well. The catch of blue marlin and white marlin, for example, was low early in the season, but increased significantly as the season extended into the summer months.

KEYWORDS: Fisheries; Japan; Istiophoridae; longlining; Chlamydoselachiformes; pelagic fishes.

**449.**
Lopez, M. and A.J. Clarke. 1989. The wind-driven shelf and slope water flow in terms of a local and a remote response. Journal of Physical Oceanography 19(8):1091-1101.

ABSTRACT: Clarke and Van Gorder suggest that many coastally trapped wave modes are needed to describe the wind-driven shelf and slope water alongshore velocity field. Calculations with an harmonic wind forcing confirm this and show that, for example, the alongshore velocity fields is usually underestimated by using only three coastally trapped wave modes. This is a serious drawback in the forced-wave mode method since it is difficult to calculate the many needed higher order modes. Fortunately large mode-number coastally trapped wave asymptotics also suggest that these higher order modes are effectively generated by just the local wind. Both computationally and physically, it is therefore convenient to regard the velocity fields as being due to a two dimensional "local" solution which depends only on local winds and a "remote" solution driven by the alongshore pressure gradient and depending on non-local wind stress.

KEYWORDS: Physical Oceanography; FLorida; California; mathematical models; wind-driven circulation; continental shelves; trapped waves; Nearshore Dynamics; Gulf of Mexico.

**450.**
Ludwick, J.C. 1964. Sediments in northeastern Gulf of Mexico, pp 204-238. In: Miller RL. Papers in marine geology--Shepard Commemorative Volume. Macmillan Company, New York.

ABSTRACT: None.

KEYWORDS: Geology; Atlantic Ocean; Barrier Islands; Composition; Deltas; Distribution; Geomorphology; Gulf of Mexico; North Atlantic; Northeastern Coast; Sedimentation; Sediments; Shore Features; Shore Features and Deposits; Size Analyses.

**451.**
Lynch, C.W. and R. W. Rudolph. 1984. Gulf of Mexico Summary Report: Outer Continental Shelf Oil and Gas Activities in the Gulf of Mexico and their Onshore Impacts.,U.S. Department of the Interior, Minerals Management Service, Outer Continental Shelf Oil and Gas Information Program. MMS 84-0073.

ABSTRACT:None.

KEYWORDS:Socioeconomics.

**452.**
MacDonald, I.R. 1992. Sea-floor brine pools affect behavior, mortality, and preservation of fishes in the Gulf of Mexico: lagerstatten in the making? Palaios 7(4):383-387.

ABSTRACT: Pools of hypersaline, anoxic brine on the continental slope of the Gulf of Mexico promote the preservation of organic material to an exceptional degree. One type of brine pool, the brine-filled pockmark, supplies nutritive methane to a symbiont-containing mussel that forms dense beds around the pool. Fish, attracted by this abundant food supply, are subjected to lethal concetrations of H "SUB 2" S, anoxia, and osmotic stress. Many die, sink into the pool, are preserved by the brine, and possible are buried by the collapsing walls of the pockmark. These features are potential fossil lagerstatten. -Author.

KEYWORDS: Brine Pool ; Anoxic Brine ; Fish ; Preservation ; Mortality ; Lagerstatten; Gulf of Mexico.

**453.**
MacDonald, I.R. 1992. Chemosynthetic Ecosystems Study: Literature Review and Data Synthesis.,Volume 1: Final rept. Minerals Management Service, New Orleans, LA. Gulf of Mexico OCS Region.

ABSTRACT:The three-volume report was prepared by Texas A and M University and others in partial fulfillment of a research contract with MMS and brings together knowledge of chemosynthetic communities in the Gulf of Mexico from the time of their discovery until 1992. It contains sections on historical perspectives, seep associations and types, regional geological settings and origins of petroleum, paleoecology, associated fauna and microflora, general biology, community distribution and description, and conceptual models. The report is the Executive Summary, which presents a brief overview of the findings.

KEYWORDS:Chemistry; Biological communities; Marine biology; Gulf of Mexico; Aquatic ecosystems; Environmental effects; Paleontology; Microorganisms; Food chain; Marine geology; Marine environments; Hydrothermal systems; Hydrocarbons; Crude oil; Sediments; Seeps; Petroleum deposits; Chemosynthetic Communities.

**454.**
MacDonald, I.R. 1992. Chemosynthetic Ecosystems Study: Literature Review and Data Synthesis,Volume 2. Technical Report. Minerals Management Service, New Orleans, LA. Gulf of Mexico OCS Region.

ABSTRACT:The three-volume report was prepared by Texas A and M University and others in partial fulfillment of a research contract with MMS and brings together knowledge of chemosynthetic communities in the Gulf of Mexico from the time of their discovery until 1992. It contains sections on historical perspectives, seep associations and types, regional geological settings and origins of petroleum, paleoecology, associated fauna and microflora, general biology, community distribution and description, and conceptual models. The report is a Technical Report, which presents the detailed findings.

KEYWORDS:Chemistry; Biological communities; Marine biology; Gulf of Mexico; Aquatic ecosystems; Environmental effects; Marine environments; Marine geology; Paleontology; Biological effects; Petroleum deposits; Reviews; Data collection; Tectonics; Hydrocarbons; Food chain; Crude oil; Seeps; Hydrothermal systems; Microorganisms; Chemosynthetic Communities.

**455.**
MacDonald, I.R. 1992. Chemosynthetic Ecosystems Study: Literature Review and Data Synthesis. Volume 3. Appendix: Final rept. Minerals Management Service, New Orleans, LA. Gulf of Mexico OCS Region.

ABSTRACT:The three-volume report was prepared by Texas A and M University and others in partial fulfillment of a research contract with MMS and brings together knowledge of chemosynthetic communities in the Gulf of Mexico from the time of their discovery until 1992. It contains sections on historical perspectives, seep associations and types, regional geological settings and origins of petroleum, paleoecology, associated fauna and microflora, general biology, community distribution and description, and conceptual models. The report is an Appendix, which includes 19 papers considered to be core literature on the subject.

KEYWORDS:Chemistry; Biological communities; Marine biology; Gulf of Mexico; Aquatic ecosystems; Environmental effects; Marine environments; Marine geology; Paleontology; Biological effects; Hydrothermal systems; Microorganisms; Seeps; Petroleum deposits; Reviews; Hydrocarbons; Crude oil; Food chain; Chemosynthetic Communities.

**456.**
MacDonald, I.R. 1998. Habitat formation at Gulf of Mexico hydrocarbon seeps. Cah. Biol. Mar. 39:337-340.

ABSTRACT: None.

KEYWORDS: Biology; seeps; Benthos.

**457.**
MacDonald, I.R., G.S. Boland, J.S. Baker, J.M. Brooks, M.C.I. Kennicutt, and R.R. Bidigare. 1989. Gulf of Mexico hydrocarbon seep communities. 2. Spatial distribution of seep organisms and hydrocarbons at Bush Hill. Marine Biology 101(2):235-247.

ABSTRACT: Sediment and water samples were collected by submersible in September 1986 at 16 locations on the carbonate cap overlying a conical diapir off Louisiana, USA (27 degree 47'N; 91 degree 30.4'W). The biological community at the site was photographed quantitatively with still and video cameras. Rigorous spatial sampling indices were maintained so that variation in chemical parameters and in the abundance of photographed organisms could be estimated within the bounds of the study site. Concentrations of extractable organic material (EOM) ranged from 0.24 to 119.26 ppt in the sediment samples, while methane concentrations in the water samples were from 0.037 to 66.474 mu M. The visible biological community was predominantly composed of the chemosynthetic tube worms (Vestimentifera) Lamellibrachia sp. and Escarpia sp., and an undescribed, methane-oxidizing mussel (Mytilidae: Bathymodiolus -like), as well as diverse non-chemosynthetic organisms.

KEYWORDS: petroleum hydrocarbons; seepages; spatial distribution; methane; Louisiana,; Bush Hill; *Lamellibrachia*; *Escarpia*; Zoobenthos; Community Composition.

**458.**
MacDonald, I.R., W.R. Callender, R.A.J. Burke, S.J. McDonald, and R.S. Carney. 1990. Fine-scale distribution of methanotrophic mussels at a Louisiana cold seep. Progress in Oceanography 24(1-4):15-24.

ABSTRACT: Extensive aggregations of methanotrophic mussels (Mytilidae: Bathymodiolus -like) were found in a 60 x 300 m zone on the 640 m isobath of the Louisiana slope. Within the aggregations, living mussels occurred in dense curvilinear clusters up to 5 m in length. Defunct clusters, consisting of gaping and disarticulated valves, were also common. Comparison of length frequency distributions and mean densities of mussel clusters demonstrated that recruitment of juvenile mussels was ongoing in certain clusters and completely lacking in others. Surface sediments within the zone were characterized by dark patches and linear depressions, apparently associated with seeping hypersaline fluids. Pore fluids in surface sediments contained elevated salt concentrations (289% of ambient sea water), concentrations of ammonia up to 1.6 mM, and up to 3 mM H sub(2)S.

KEYWORDS: benthos; trophic relationships; deep water; seepages; Gulf of Mexico; deep sea; Gulf of Mexico; Mytilidae; Methane; Methanotrophic.

**459.**
MacDonald, I.R., N.L.J. Guinasso, S.G. Ackleson, J.F. Amos, R. Duckworth, R. Sassen, and J.M. Brooks. 1993. Natural oil slicks in the Gulf of Mexico visible from space. Journal of Geophysical Research 98(C9):16351-16364.

ABSTRACT: Natural oil seepage in the Gulf of Mexico causes persistent surface slicks that are visible from space in predictable locations. A photograph of the sun glint pattern offshore from Louisiana taken from the space shuttle Atlantis on May 5, 1989, shows at least 124 slicks in an area of about 15,000 km super(2); a thematic mapper (TM) image collected by the Landsat orbiter on July 31, 1991, shows at least 66 slicks in a cloud-free area of 8200 km super(2) that overlaps the area of the photograph. Samples and descriptions made from a surface ship, from aircraft, and from a submarine confirmed the presence of crude oil in floating slicks. The imagery data show surface slicks near eight locations where chemosynthetic communities dependent upon seeping hydrocarbons are known to occur on the seafloor. Additionally, a large surface slick above the location of an active mud volcano was evident in the TM image. In one location the combined set of observations confirmed the presence of a flourishing chemosynthetic community, active seafloor oil and gas seepage, crude oil on the sea surface, and slick features that were visible in both images. We derived an analytical expression for the formation of floating slicks based on a parameterization of seafloor flow rate, downstream movement on the surface, half-life of floating oil, and threshold thickness for detection. Applying this equation to the lengths of observed slicks suggested that the slicks in the Atlantis photograph and in the TM image represent seepage rates of 2.2-30 m super(3)/1000 km super(2)/d and 1.4-18 m super(3)/1000 km super(2)/d, respectively. Generalizing to an annual rate suggests that total natural seepage in this region is of the order of at least 20,000 m super(3)/yr (120,000 barrels/yr).

KEYWORDS: ASW, Gulf of Mexico; oil slicks; seepages; satellite sensing; chemosynthesis; aquatic communities; water pollution; oil spills; satellite technology; remote sensing; oil; Gulf of Mexico.

**460.**
MacDonald, I.R., N.L.J. Guinasso, J.F. Reilly, J.M. Brooks, W. Callender, and S.G. Gabrielle. 1990. Gulf of Mexico hydrocarbon seep communities: 6. Patterns in community structure and habitat. Geo-Marine Letters 10(4):p. 244-252.

ABSTRACT: Communities of chemosynthetic fauna that depend on seeping oil and gas have been found in the Gulf of Mexico at approximately 45 sites between 88 degree W and 95 degree W and between the 350 and 2,200 m isobaths. Investigations suggest that the number of sites and the range of occurrence will increase with additional exploration. The dominant fauna consist of species within four groups: tube worms, seep mussels, epibenthic clams, and infaunal clams. These species co-occur to some degree, but tend to form assemblages dominated by a single group. Community development is closely coupled to the geological and geochemical processes of seepage.

KEYWORDS: gas seepages; seepages; benthos; hydrocarbon seeps; Gulf of Mexico; deep sea; aquatic communities; habitats; hydrocarbons; ecology; biocenoses; ASW, Gulf of Mexico; community composition; habitat; ecological associations; Oil Seepages; Community Structure.

**461.**
MacDonald, I.R., N.L.J. Guinasso, R. Sassen, J.M. Brooks, L. Lee, and K. Scott. 1994. Gas hydrate that breaches the sea floor on the continental slope of the Gulf of Mexico. Geology 22(8):699-702.

ABSTRACT: We report observations that concern formation and dissociation of gas hydrate near the sea floor at depths of similar to 540 m in the northern Gulf of Mexico. In August 1992, three lobes of gas hydrate were partly exposed beneath a thin layer of sediment. By May 1993, the most prominent lobe had evidently broken free and floated away, leaving a patch of disturbed sediment and exposed hydrate. The underside of the gas hydrate was about 0.2 degree C warmer than ambient sea water and had trapped a large volume of oil and free gas. An in situ monitoring device, deployed on a nearby bed of mussels, recorded sustained releases of gas during a 44 day monitoring period. Gas venting coincided with a temporary rise in water temperature of 1 degree C, which is consistent with thermally induced dissociation of hydrate composed mainly of methane and water. We conclude that the effects of accumulating buoyant force and fluctuating water temperature cause shallow gas hydrate alternately to check release gas venting.

KEYWORDS: Gulf of Mexico; chemical oceanography; sediment-water interface; gas hydrates; methane; gas exchange; temperature anomalies.

**462.**

MacDonald, I.R., J.F.I. Reilly, N.L.J. Guinasso, J.M. Brooks, R. Carney, W.A. Bryant, and T.J. Bright. 1990. Chemosynthetic mussels at a brine-filled pockmark in the northern Gulf of Mexico. Science 248(4959):1069-1099.

ABSTRACT: A larg (540 square meters) bed of Bathymodiolus n. sp. (Mytilidae: Bivalvia) rings a pool of hypersaline (121.35 practical salinity units) brine at a water depth of 650 meters on the continental slope south of Louisiana. The anoxic brine (dissolved oxygen less than or equal to 0.17 milliliters per liter) contains high concentrations of methane, which nourishes methanotrophic symbionts in the mussels. The brine, which originates from a saltcored diapir that penetrates to within 500 meters of the sea floor, fills a depression that was evidently excavated by escaping gas. The spatial continuity of the mussel bed indicates that the brine level has remained fairly constant; however, demographic differences between the inner and outer parts of the bed record small fluctuations.

KEYWORDS: Gulf of Mexico; new species; anoxic basins; brines; pock marks; ecological distribution; methane; Bathymodiolus; Chemosynthesis; Gulf of Mexico.

**463.**

MacDonald, I.R., J.F. ReillyJr., S.E. Best, R. Venkataramaiah, R. Sassen, N.L. GuinassoJr., and J. Amos. 1996. Remote sensing inventory of active oil seeps and chemosynthetic communities in the northern Gulf of Mexico., pp 27-37. In: Schumacher D, Abrams MA, (Editors). Hydrocarbon migration and its near-surface expression. AAPG Memoir 66.

ABSTRACT: We compiled locations of probable oil slicks from interpretation of a Space Shuttle photograph, a Landsat Thematic Mapper scene, three European Radar Satellite scenes, and collections of floating oil and observations of sea floor seeps from submarines. These locations were ranked according to recurrence of evidence for natural oil seepage among the various data sets. As a result, we have verified 43 biological communities that depend on hydrocarbon seeps and 63 locations where remote sensing data indicate that sea floor sources are capable of producing perennial oil slicks.
Monitoring individual seeps over time contributes to understanding the natural loading of hydrocarbons in the marine environment. The seeps also form a natural test bed for development of sensors and techniques to detect oil floating on the sea. Remote detection of natural seepage extends the probable range of chemosynthetic communities dependent on hydrocarbon seepage in the northern Gulf of Mexico. This technique for detecting areas of macroseepage is potentially applicable to hydrocarbon basins in which oil production is in an earlier stage of development than the Gulf of Mexico.

KEYWORDS: Geology.

**464.**
MacDonald, I.R. and W.W. Schroeder. 1993. Chemosynthetic Ecosystems Studies,Interim Report. Contract No. 14-35-0001-30555. OCS Study MMS 93-0032. .

ABSTRACT:The U.S. Department of the Interior, Minerals Management Service (MMS), Gulf of Mexico OCS Region Office has initiated the Chemosynthetic Ecosystems Study (Contract 14-35-0001-30555) to compile management-relevant scientific information concerning the prominent biological communities of tube worms, mussels, and clams that occur at natural oil seeps on the continental slope and that derive their food supply from chemicals associated with the seeps. This is the second of three major reports that will be issued by the Study, which is sponsored by the MMS. This document is the Interim Report of the Study and is issued following the completion of all scheduled field work and data collection. The report describes the methods, techniques, and equipment used during the field program, will outline the data sets and collections collected during the field program, will outline the data sets and collections collected during the field study, and will discuss the analyses and interpretations employed to treat these materials. The individual study topics covered in the report comprise the following:
Chapter 2 - Geological Studies;
Chapter 3 Geochemical Processes;
Chapter 4 Long-Term Change;
Chapter 5 Community Structure and Short-Term Change;
Chapter 6 Methods, Collections, and Status of Growth Studies of Chemosynthetic Fauna and Associated Analyses of Animals and Habitats;
Chapter 7 Heterotrophic Megafauna of Chemosynthetic Seep Ecosystems;
Chapter 8 Ancillary Studies: Topics not included in proposal, but under consideration for additional work.

KEYWORDS:Geology.

**465.**
MacDonald I. R., Schroeder W. W., and Brooks J. M. 1996. Northern Gulf of Mexico Chemosynthetic Ecosystems Study: Final Report. Volume 1-Technical Report. Minerals Management Service, New Orleans, LA. Gulf of Mexico OCS Region.

ABSTRACT:The Chemosynthetic Ecosystems Study concerns the prominent biological communities of tube worms, mussels, and clams that occur at natural hydrocarbons seeps on the continental slope in the Gulf of Mexico and that derive their food supply from chemicals associated with the seeps.|The Study delineated the abiotic factors that determine why communities of chemosynthetic fauna become established and persist at hydrocarbon seeps.|Assessment of the relative importance of the communities to the slope ecosystem was given a high priority.|To address the question of possible harm due to human activity from primarily energy-related industry, the Study examined the growth rates of the major faunal groups, the paleontological record of the community, and the incidence and causes of short-term change.|Because the communities occur at depths of 500 m or greater and tend to be small in area, the investigations have relied heavily upon research submarines for sample collection and study at 5 sites located in water depths of 500 to 720 m.

KEYWORDS:Chemistry; Abstract ; Animal ; Compounds ; Continental Shelf ; Depth ; Ecosystem ; Growth ; Gulf ; Gulf of Mexico ; Health; Disease ; Hydrocarbon ; Invertebrate ; Man ; Marine ; North America ; Nutrient Medium ; Report ; Sampling ; Shellfish ; Ship ; Subsurface ; Toxic Effect ; Underwater.

**466.**
Manheim, F.T. and J.L. Bischoff. 1969. Geochemistry of pore waters from Shell Oil Company drill holes on the continental slope of the northern Gulf of Mexico. Chemical Geology 4(1-2):63-82.

ABSTRACT: Increase of pore-water salinity with depth and anomalous concentrations of K and Br near diapiric structures, little change in pore-water chemistry from holes away from diapiric structures, diapiric structures due to salt intrusives.

KEYWORDS: Geology; Atlantic Ocean; Geochemistry; Ground Water; Gulf of Mexico; Hydrogeology; North; North Atlantic.

**467.**
Manual, D.P. 1984. Employment and industrial growth. pp 67-102. In: Gramling RB, S. Brabant. The Role of Outer Continental Shelf Oil and Gas Activities in the Growth and Modification of Louisiana's Coastal Zone. U.S. Department of Commerce, National Oceanic and Atmospheric Administration; Louisiana Department of Natural Resources, Lafayette, Louisiana.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana.

**468.**
Manual, D.P. 1984. Median income in coastal zone parishes. pp 53-66. In: Gramling RB, S. Brabant. The Role of Outer Continental Shelf Oil and Gas Activities in the Growth and Modification of Louisiana's Coastal Zone. U.S. Department of Commerce, National Oceanic and Atmospheric Administration; Louisiana Department of Natural Resources, Lafayette, Louisiana.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana.

**469.**
Manual, D.P. 1984. Trends in Louisiana OCS Activity, pp 27-40. In: Gramling RB, S. Brabant. The Role of Outer Continental Shelf Oil and Gas Activities in the Growth and Modification of Louisiana's Coastal Zone. U.S. Department of Commerce, National Oceanic and Atmospheric Administration; Louisiana Department of Natural Resources, Lafayette, Louisiana.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana.

**470.**
Manual, D.P.andR. B. Gramling. 1984. Population, OCS Production and Industrial Growth: Projections to 1990, pp 199-216. In: Gramling RB, S. Brabant. The Role of Outer Continental Shelf Oil and Gas Activities in the Growth and Modification of Louisiana's Coastal Zone. U.S. Department of Commerce, National Oceanic and Atmospheric Administration; Louisiana Department of Natural Resources, Lafayette, Louisiana.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana.

**471.**
Manuel DP. 1983. Energy and Economic Growth in Lafayette, LA: 1965-1980. The University of Southwestern Louisiana Lafayette, LA

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana.

**472.**
Manuel, D.P. 1985. Unemployment and drilling activitiy in major energy-producing states. The Journal of Energy and Development 10:45-62.

ABSTRACT: None.

KEYWORDS: Socioeconomics.

**473.**
Manuel, D.P. and R. Gramling. 1983. Energy and Economic Growth in Lafayette, LA: 1965-1980,Executive Summary. The University of Southwestern Louisiana. Lafayette, LA.

ABSTRACT:None.

KEYWORDS:Socioeconomics; Offshore oil industry.

**474.**
Manuel, D.P. 1977. The Role of OCS Activity in the Economic Growth of Morgan City, pp 28-105. In: Stallings EF, T. F. Reilly, R. B. Gramling , D. P. Manual. Outer Continental Shelf Impact, Morgan City, Louisiana. Louisiana Department of Transportation and Development., Baton Rouge, LA.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana.

**475.**
Manuel, D.P. 1980. An Assessment of Offshore Oil and Natural Gas Production and Reserve Forecast. pp 316-324. In: Gramling RB, (Editor). East St. Mary's Parish Economic Growth and Stabilization Strategies. Louisiana Department of Natural Resources, Baton Rouge.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana.

**476.**
Manuel, D.P. 1980. East St. Mary Parish in the 1970's: the Economics of a Sustained Energy-Impact, pp 44-58. In: Gramling RB, (Editor). East St. Mary's Parish Economic Growth and Stabilization Strategies. Louisiana Department of Natural Resources, Baton Rouge.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana.

**477.**

Marmorino, G.O. 1982. Wind-forced sea level variability along the west Florida shelf (winter, 1978). Journal of Physical Oceanography 12(5):389-405.

ABSTRACT: Coastal tide gauge and meteorological records from Pensacola to Key West for the period January-April 1978 have been examined for low-frequency fluctuations. The dominant 6-day period signals in sea level, alongshore wind stress, and atmospheric pressure were coherent over the entire shelf and propagated southward, consistent with the movement of cold fronts through the area. Sea level response lagged the local wind stress by 18 h (in the north) to 9 h (in the south). In response to a 1 dyn cm super(-2) alongshore stress, sea level amplitudes were largest ( similar to 60 cm) where the shelf is widest (200 km) and undergoes an abrupt bend, and were similar to 30 cm elsewhere; large transient alongshore sea level slopes, on the order of 10 super(-6), were thus set up. A linear steady-state shelf circulation model (Hsueh, 1980) is used to explore the sea level distribution that is in frictional equilibrium with a wind stress of given orientation.

KEYWORDS: Physical Oceanography; sea level changes; sea level; continental shelves; wind stress; ocean-atmosphere system; Florida; Tidal Data; Gulf of Mexico.

**478.**

Martens, C.S., J.P. Chanton, and C.K. Paull. 1991. biogenic methane from abyssal brine seeps at the base of the florida escarpment. Geology 19(8):851-854.

ABSTRACT: Dissolved methane is present at concentrations exceeding 10mM in the pore waters of sulfidic, salt-brine-enriched sediments underlying chemosynthetic communities at the base of the Florida Escarpment. Light hydrocarbon samples were obtained from brine seep sediments by means of an in situ probe and push cores deployed by the deep submersible Alvin. Porewater methane had a delta "SUP 13" C value of -83.3 +/-7.0 (Peedee belemnite, N=17), contained <1.3% modern carbon, and was enriched over ethane concentrations by 10 "SUP 3" to 10 "SUP 5" ; these results all indicate a fossil, biogenic carbon source within the Florida Platform. Methane-rich brine fluids arriving at seep sites are depleted in dissolved sulfate, although they have been diluted twenty-fold with sulfate-rich seawater during transit. It appears that sulfate reduction and methanogenesis are important processes within the platform. -Authors.

KEYWORDS: Methanogenesis; Sulphate Reduction; Methane; Brine Seep; Pore Water; Biogenic Activity; Gulf of Mexico; Florida Escarpment.

**479.**

Martin, R.G. 1978. Northern and eastern Gulf of Mexico continental margin; stratigraphic and structural framework, pp 21-42. In: Bouma AH, Moore GT, Coleman JM. Framework, facies, and oil-trapping characteristics of the upper continental margin. Studies in Geology American Association of Petroleum Geologists, Tulsa, OK.

ABSTRACT: The continental margin of the northern Gulf of Mexico extends from DeSoto Canyon to northern Mexico and from more than 300 km inland in the central Gulf Coast to the deep gulf floor. It is composed of a broad wedge of Mesozoic and Cenozoic strata that accumulated almost continuously from Jurassic time to the present. Mesozoic and Cenozoic deposits are more than 15 km thick beneath the lower coastal plain and adjacent continental shelf. For the most part, the margin is a Cenozoic clastic embankment built by the inpouring of sediments from the continental interior after the Late Cretaceous_Paleocene Laramide orogeny. Sediment supplies generally exceeded the subsidence rate, prograding the seaward face of the margin more then 400 km from the edge of Cretaceous carbonate platform deposits under the coastal plain, to the present portion of the continental slope. Along the inner regions of the coastal plain from Alabama to southwestern Texas, updip members of Mesozoic and Cenozoic units rest unconformably on complexly folded and faulted Paleozoic rocks of the Ouachita and Appalachian tectonic belts. Major structural anomalies affecting the Mesozoic-Cenozoic sequence of the coastal plain, shelf, and slope are salt diapirs, growth faults, and shale uplifts. Salt structures are concentrated in interior basins in the inner coastal plain, along the lower coast from central Texas to DeSoto Canyon, and across the continental shelf to the foot of the slope. Regional systems of growth faults slice through Cenozoic units beneath coastal Texas and Louisiana and in the adjacent shelf. Many of these faults formed as a response to sediment overloads along the Tertiary and Quaternary shelf edges, to differential compaction associated with abrupt changes in sediment thickness and gross lithology, and (locally) to the withdrawal of large volumes of salt from depth during diapiric growth. The continental margin of the eastern Gulfof Mexico is dominated by the Florida platform, composed of a thick accumulation of bathyal to neritic carbonate rocks and evaporite deposits of Mesozoic and Cenozoic age. The platform is fronted by a prominent escarpment built by shelf-edge reef complexes during the early Cretaceous. The northern half of the platform was built on a continental foundation composed of upper Precambrian and lower Paleozoic igneous and metamorphic rocks and capped by undeformed clastic sediments of Ordovician, Silurian, and Devonian age. Triassic red beds and associated diabase are common in the extensive graben systems that underlie northwestern Florida. Southern peninsular Florida is underlain by basement composed of volcanic and hypabyssal rocks of Triassic and Early Jurassic age. Geophysical data suggest similar basement complexes beneath the West Florida Shelf and Slope.

KEYWORDS: Geology; Atlantic Ocean; Carbonate Rocks; Cenozoic; Chemically Precipitated Rocks; Clastic Rocks; Clastic Sediments; Complexes; Continental Margin; Diabase; Diapirs; Evaporites; Faults; Florida Platform; Grabens; Gulf of Mexico; Igneous Rocks; Laramide Orogeny; Mesozoic; North Atlantic; Northeast; Phanerozoic; Plutonic Rocks; Rates; Red Beds; Sedimentary Rocks; Sedimentation; Sediments; Stratigraphy; Structural Geology; Subsidence; Tectonics; Uplifts.

**480.**

Martin, R.G. 1984. Diapiric trends in the deep-water Gulf Basin. Gulf Coast Section. Society of Economic Paleontologists and Mineralogists. Program and Abstracts 5:60-62.

ABSTRACT: None.

KEYWORDS: Geology.

**481.**

Martin, R.G.andA.H. Bouma. 1978. Physiography of Gulf of Mexico, pp 3-19. In: Bouma AH, Moore GT, Coleman JM. Framework, facies, and oil-trapping characteristics of the upper continental margin. Studies in Geology American Association of Petroleum Geologists, Tulsa, OK.

ABSTRACT: The Gulf of Mexico covers an area of more than 1,500,000 sq km, has a maximum depth of about 3,700 m, and includes many of the geomorphic features of large oceans. The continental shelf, slope rise, and abyssal plain comprise the major physiographic provinces of the gulf and contain a variety of subprovinces distinguished by topographic character and geomorphic history. The gulf shelf is a relatively smooth, gently sloping surface marked locally by low-relief features formed by sea-level fluctuation during the Pleistocene, reef growth, near surface movement of diapiric salt and mud, and faulting. Shelf width varies from about 280 km off the Florida and Yucatan Penisulas to less than 10 km at the Mississippi Delta. The continental slope consists of a considerable variety of physiographic subprovinces and individual features that encircle the deep gulf floor. The distinctive subprovinces of the gulf slope have evolved in response to reef building and constructional sedimentation on the Florida and Yucatan carbonate platforms; erosion, nondeposition, slumping and faulting in the Straits of Florida and Yucatan Channel; salt diapirism and differential sedimentation in the region off Texas and Louisiana; the large accumulation of mainly Pleistocene sediment on a former continental slope seaward of the Mississippi Delta; tectonic uplift and diaprism in the Golfo de Campeche; and shale mobilization off eastern Mexico. In contrast to the greatly varied, irregular topography of he continental slope, the deep seafloor of the gulf (composed of continental rise and abyssal plain provinces) is an almost featureless plain smoothed by turbidite and pelagic sedimentation and marked locally by low-relief knolls, sedimentary aprons, and small-leveed channels.

KEYWORDS: Geology; Atlantic Ocean; Bathymetry; Bottom Features; Continental Margin; Continental Shelf; Continental Slope; East Mexico Shelf; Gulf of Mexico; Mississippi-Alabama Shelf; North Atlantic; Ocean Floors; Oceanography; Physiography; Texas-Louisiana Shelf; West Florida Shelf; Yucatan Shelf.

**482.**

Martin, R.G. and Bouma A.H. 1982. Active diapirism and slope steepening, northern Gulf of Mexico continental slope. Marine Geotechnology 5(1):63-91.

ABSTRACT: Large diapiric and nondiapiric masses of Jurassic salt and Tertiary shale underlie the northern Gulf of Mexico continental slope and adjacent outer continental shelf. Local steepening of the sea floor in response to the vertical growth of these structures is a serious concern to those involved in the site selection and the construction of future oil and gas production and transportation facilities in this frontier petroleum province. The evidence given in this paper supports the conclusion that the present continental slope region of the northern Gulf of Mexico is undergoing active diapirism and consequent slope steepening. Because most of the sediment on the flanks of diapiric structures consists of underconsolidated muds, slumping will take place regularly in response to further diapiric movement.-from Authors.

KEYWORDS: Geology; Jurassic Salt; Tertiary Shale; Gas Production; Transportation Facilities; Slumping.

**483.**

Martin, R.G.Jr. 1980. Continental slope stratigraphy of Texas and Louisiana. U. S. Geological Survey Professional Paper :160-161.

ABSTRACT: None.

KEYWORDS: Geology; Atlantic Ocean; Continental Slope; Geophysical Surveys; Gulf Coastal Plain; Gulf of Mexico; Jurassic; Louann Salt; Louisiana; Mesozoic; North Atlantic; Oceanography; Salt Tectonics; Seismic Surveys; Stratigraphy; Structural Geology; Surveys; Tectonics; Texas; United States.

**484.**

Maruggi, V. and C. R. Wartenberg. 1996. *Louisiana Net Migration, 1980-1990: the Oil Bust Reflected.* Division of Business and Economic Research, College of Business Administration, University of New Orleans. New Orleans, LAResearch Study 60.

ABSTRACT:None.

KEYWORDS:Socioeconomics.

**485.**

Mason, P.G.T. and J.L. Upchurch. 1996. Seastar Subsea Cluster Manifold system design and installation. Offshore Technology Conference, Proceedings 3:129-134.

ABSTRACT: The SeaStar Cluster Manifold system was engineered as a low cost alternative to larger and more expensive completion template designs. Utilizing field-proven equipment and installation techniques, it was the first of its kind to be installed in the Gulf of Mexico. The Cluster Manifold system allows the connection of flowlines from adjacent satellite wells and numerous in-field flowlines consisting of export, service, and methanol lines. With new technological advances, and a variety of flowline connection systems on the market today, deep water completions are being used with increasing frequency. Subsea operations are becoming more routine and installation times are being reduced. The SeaStar system was successfully installed in Garden Banks Block 70/71 in the Gulf of Mexico during the first quarter of 1995. Currently two (2) 4 inches multiplied by 2 inches 10,000 psi lay-away trees are installed and connected to the manifold. Production is being processed at a Marathon platform in Vermilion Block 386 B approximately 13.5 miles away from the subsea installation.

KEYWORDS: Submarine pipelines; Cost effectiveness; Flowlines; Natural; gas well production.

**486.**

Matten, R., K. Davies, S. Kibbee, and S. Leverette. 1999. SeaStar-Fast Track, Low Cost, Proven the Mono-Column TLP with many Deepwater Applications. Proceedings of the 8th SNAME Offshore Symposium :46-57.

ABSTRACT: The SeaStar® mono-column TLP is a proven concept providing the fastest, cheapest, most versatile field development tool to support payloads up to at least 10,000t in water depths from 1000' to 6000' and beyond. The first field development solution using SeaStar is described in the paper. The platform was installed in 1670' in the Gulf of Mexico in summer 1998. The time from project sanction to first oil was eighteen months and the installed cost was $100 million. Key aspects of controlling costs, schedule and risk were the project execution strategy, the control of platform weight, the hull design, the independence of the hull and deck, and the ease of installation. The Morpeth SeaStar is the first TLP in the world to be classed. The second SeaStar, a sister hull, is presently under construction and planned for installation in 2nd quarter 1999. The payload carried and the platform installed cost is also similar despite the doubling of water depth to 3330'. Repeat of the platform design and the project execution and contracting strategy resulted in cost savings and minimized the technical, commercial and schedule risk. This enabled a field development to proceed that had been previously considered uneconomic using other substructures. The hull concept is relatively insensitive to depth. The same hull design that provides support for 4,000st in a water depth of 1670' can carry a payload of about 3,600st in a water depth of 6000'. A family of substructure designs has been developed to cater for a range of functions with payloads from 500t to 10,000t. Smaller hulls may be serve as deepwater utility platforms, providing flow assurance from remote wells, or as hubs on a pipeline network, providing tie-in and pumping capability. The larger hulls include an option for a central moonpool, to provide drilling capability and production with surface completions as a wellhead platform with or without full process for up to 70,000 bopd and 100 million scf gas.

KEYWORDS: Technology.

**487.**
Maul, G.A. 1977. The annual cycle of the Gulf Loop Current. Part 1. Observations during a one-year time series. Journal of Marine Research 35(1):29-47.

ABSTRACT: The Gulf Loop Current is that portion of the Gulf Stream System which connects the Yucatan Current and the Florida Current in the easten Gulf of Mexico. An experiment to test the annual cycle proposed by Leipper (1970) was conducted from Aug, 1972, through Sept, 1973. Twelve pathlines of the 22 C isotherm at 100 m depth were made from Yucatan to the Florida Keys at 36-day intervals in conjunction with a satellite oceanography project. The sequence of pathlines shows an annual cycle of penetration into the eastern Gulf that is in phase with the historical annual cycle of current speeds and transports of the Gulf Stream, and is also reflected in tide gage sea-level records taken between Key West, Havana, and Progreso. The data suggest that an excess inflow of Yacatan Current water of $4 \times 10^{-6}$ $m^{-3}$ $s^{-1}$ over outflow of Florida Current water in the upper 500 m is required to make the Loop Current grow; the outflow required to maintain static sea level conditions in the Gulf is postulated to be into the Caribbean Sea through the Yucatan Strait below this reference level. Separation of an anticyclonic eddy appears to be part of the annual cycle, which is shown to have great year-to-year variability.

KEYWORDS: Physical Oceanography; Water Currents; Annual Variation; Gulf Loop Current; Sea Level; Eddies; Gulf of Mexico.

**488.**
Maul, G.A., D.A. Mayer, and S.R. Baig. 1985. Comparisons between a continous 3-year current-meter observation at the sill of the Yucatan Strait, satellite measurements of Gulf Loop Current area, and regional sea level. Journal of Geophysical Research 90(C5):9089-9096.

ABSTRACT: From October 1977 through November 1980 a current-meter mooring was maintained in the Yucatan Strait. The meter was moored halfway between Mexico and Cuba, 145m above the sill or in 1895m of water. Motions of low frequency (less than $14^{-1}$cycles/day) are oriented approximately parallel to the isobaths, 021°-030° true. Net drift for 3 years is to the SSW at an average velocity of 1.8 cm/s. Sustained southward flows at intervals of eight months, which persisted for several months each, have average velocities of 5 cm/s, with randomly spaced bursts as high as 15 cm/s. Energy in subtidal frequency bands has significant peaks near $38^{-1}$ and $19^{-1}$ cycles/day, with a broad band of energy between $300^{-1}$and $200^{-1}$cycles/day. -from Authors.

KEYWORDS: Physical Oceanography; Gulf of Mexico.

**489.**
Maul, G.A., D.R. Norris, and W.R. Johnson. 1974. Satellite photography of eddies in the Gulf loop current.

ABSTRACT: None.

KEYWORDS: Physical Oceanography; Dynamic Properties of Sea Water; Photogrammetry; Gulf of Mexico.

**490.**

Maul, G.A. and F.M. Vukovich. 1993. The relationship between variations in the Gulf of Mexico Loop Current and Straits of Florida Volume Transport. Journal of Physical Oceanography 23(5):785-796.

ABSTRACT: Twelve years of monthly mean positions of the northern boundary of the Loop Current in the eastern Gulf of Mexico from satellite and in situ data have been compared with coincident 1977-1988 estimates of volume transport in the Straits of Florida in the subseasonal frequency band 15 super(-1) to 5 super(-1) cycles per month. Volume transport estimated from Cuba minus Florida sea level difference in this frequency band accounts for 69% of the variance in volume transport estimated from the Florida-Grand Bahama Island submarine cable. On average, the Loop Current has a dominant period of 11 months whereas the volume transport is dominated by annual spectral energy; little significant coherence squared occurs between them. The maximum northward penetration of the Loop Current occurs on average in winter when the volume transport is a minimum, but this is an artifact of the sampling epoch. This negative relationship is most pronounced for 1979-1981 when transport is characterized as unimodal, but for 1984-1985 and 1987 the Loop Current and volume transport are more in phase, bimodal, and transport and position tend to have more semiannual energy. In this subseasonal band, the volume transport undergoes a significant change in the phase of its annual cycle after 1985 as compared with 1977-1984. For the twelve years considered in this study, the ensemble correlation between monthly position of the Loop Current and volume transport is essentially zero.

KEYWORDS: Physical Oceanography; Loop Current; Florida Strait; current observations; Sverdrup transport; frequency analysis; seasonality; volume transport; comparative studies; Gulf of Mexico.

**491.**

McBride, B.C. 1997. The geometry and evolution of allochthonous salt and its impact on petroleum systems, northern Gulf of Mexico basin: studies in three- and four-dimensional analysis. PhD. Dissertation. University of Colorado. Boulder, CO.

ABSTRACT: The geometry and evolution of allochthonous salt in the northern Green Canyon and Ewing Bank region of the northern Gulf of Mexico Basin are examined using a variety of techniques. Regional two-dimensional restorations illustrate the complex geometry of a multi-level salt system and the types of interactions between counter-regional and salt-stock canopy models of allochthonous salt system evolution. Salt geometry commonly changes dramatically through time as it provides much of the accommodation for sediments and absorbs much of the extension and contraction within its overburden. Sequential restorations of a N-S megaregional cross section across the entire northern Gulf of Mexico recognized several salt provinces. These restorations place the local study area into perspective relative to the entire basin. Salt sheet formation and evacuation occurred progressively basinward through time in response to basinward shifts of major Cenozoic sedimentary depocenters. The cross-sectional area of autochthonous salt represents at most 45% of its maximum along this transect. The total cross-sectional area of salt through time is more stable with variations of only 30% from its maximum. Little translation/extension (1.46%) occurred at the autochthonous salt level during the evolution of the basin. Most of the translation/extension occurred above allochthonous salt sheets (25%) and was compensated laterally by salt flow. Petroleum systems are significantly impacted by the evolution of allochthonous salt. The high thermal conductivity of salt retards the thermal maturation of subsalt petroleum source rocks and causes late generation. Oil generation varies spatially and temporally as a function of the overlying allochthonous salt evolution. The impermeability of salt causes petroleum migration pathways to be deflected laterally up dip along the base salt. Where salt welds form, petroleum migration continues vertically. All fields/discoveries within the study area are associated with predicted zones of paleo-subsalt petroleum concentration. Finally, three-dimensional structural restorations constrain the evolution of allochthonous salt, its influence on sediment pathways, and the geometry of salt welds through time. Analysis of the changing salt geometry and salt welds is used to model petroleum migration pathways and zones of petroleum concentration through time.

KEYWORDS: Geology; Geology ; Geophysics.

**492.**
McDonald, S.J. 1990. Benzo (A) pyrene metabolism in a deep sea mussel associated with natural petroleum seeps in the Gulf of Mexico. Ph.D. dissertation, Texas A&M University, College Station, TX.

ABSTRACT: Natural oil and gas seepage is a widespread phenomena on the northern Gulf of Mexico continental slope. Chemosynthetic communities are often intimately associated with these hydrocarbon seeps. Several parameters describing the seep environments are examined, including levels of sediment extractable organic matter (to indicate petroleum), percent organic carbon, percent carbonate, and sediment organic matter $\delta\sp{13}$C. Polynuclear aromatic hydrocarbon (PAH) concentrations in the tissues of seep-associated fauna indicate that most organisms are exposed to oil (including mussels); total PAH concentrations range from $<$5 to $>$2300 ng g$\sp{-1}$ dry weight. The amount and types of accumulated PAH appear to be related to nutritional strategy.^A cytochrome P450-dependent monooxygenase system which oxidatively transforms PAH to more water soluble and excretable metabolites was examined in the seep mussel. The tissue and subcellular distribution of cytochrome P450, cytochrome b$\sb5$, and associated enzymes (NADPH cytochrome P-450 reductase, NADH cytochrome b$\sb5$ reductase, and benzo (a) pyrene hydroxylase) are described for the seep mussel and compared to the blue mussel, Mytilus edulis, and the American oyster, Crassostrea virginica. Mixed function oxidase activities and cytochromes are localized in digestive gland microsomes. BPH activity in seep mussels is NADPH-dependent and the average specific activity is considerably higher than those reported for other bivalves. BPH activity is inhibited by known cytochrome P450 inhibitors ($\alpha$-naphthoflavone, SKF-525A, and ellipticene). Benzo (a) pyrene metabolites, identified by high-performance liquid chromatography, are predominately phenolic derivatives (60-80%). BaP metabolizing activities are significantly lower in mussels associated with a brine pool located in GC-233; these low activities may be related to the reduced levels of PAH in their tissues ($<$5 to 22 ng g$\sp{-1}$). The relationship between BPH activities and PAH concentration in seep mussels suggests that mussel BPH activities may adapt in response to a high hydrocarbon environment. Also, the absolute requirement for NADPH and metabolite-type production in the seep mussel are different from other bivalves and in some instances are similar to mammalian requirements which also may be a reflection of the mussel's unique environment.

KEYWORDS: Biological Oceanography.

**493.**
McEachran JD, Fechhelm Janice D. 1998. Fishes of the Gulf of Mexico, vol. 1. Myxiniformes to gasterosteiformes. University of Texas Press Austin, TX

ABSTRACT: This book is a reference to the identification and description of the fishes that occur in the Gulf of Mexico. A key is provided for the 44 orders of fishes known to occur in the Gulf of Mexico. The orders and families are arranged phylogenetically, and keys are provided for all families within each order. Keys are also provided for all species within the families, and each species is arranged alphabetically and illustrated. References are provided at the end of each species account for those interested in further information. This book targets scientists, students, and fishers with interests in the fishes of the Gulf of Mexico.

KEYWORDS: Biogeography; Osteichthyes; Fish ; Phylogenetics; Identification Guide; Taxonomic Key.

**494.**
McGeary, D.F.R. and J.E. Damuth. 1973. Postglacial Iron-Rich Crusts in Hemipelagic Deep-Sea Sediment. Geological Society of America Bulletin 84(4):1201-1211.

ABSTRACT: Change in color and oxidation, climatic curves, Globorotalia menardii, Quaternary, chemistry, solution of interstitial iron and redeposition at interface, Atlantic Ocean.

KEYWORDS: Geology; Globorotalia Menardii; 73; Amazon Abyssal Fan; Atlantic Ocean; Cenozoic; Chemically Precipitated Rocks; Composition; Diagenesis; Duricrust; Equatorial; Foraminifera; Genesis; History; Invertebrata; Iron-Rich; Marine Geology; Microfossils; Paleoclimatology; Protista; Quaternary; Rotaliina; Sed Imentary Petrology; Sedimentary Rocks; Sedimentation; Sediments; West.

**495.**

McGowan, M.F. and W.J. Richards. 1986. Distribution and abundance of bluefin tuna (Thunnus thynnus ) larvae in the Gulf of Mexico in 1982 and 1983 with estimates of the biomass and population size of the spawning stock for 1977, 1978 and 1981-1983. Collective Volume of Scientific Papers. International Commission for the Conservation of Atlantic Tunas 35:182-195.

ABSTRACT: Estimated abundance of bluefin larvae in the Gulf of Mexico in 1982 was $2.00 \times 10^{12}$ with coefficient of variation 0.28. Abundance in 1983 was $2.22 \times 10^{12}$ or $3.70 \times 10^{12}$depending on assumptions of spawning duration and area. Coefficient of variation in 1983 was 0.40. Assuming larval mortality rate 0.1 per day, fecundity of $60.3 \times 10^{6}$ eggs per female, and mean weight of spawning fish of 242 kg, the spawning stock in 1982 was 100,338 fish with total biomass of $2.43 \times 10^{4}$ metric tons.

KEYWORDS: tuna fisheries; fish larvae; stock assessment; population dynamics; bluefin tuna; Thunnus thynnus; Water column biology.

**496.**

McIlwain, T.D. 1999. Fisheries and fishing practices in the De Soto canyon area., pp 284-285. In: U.S. Department of the Interior MMS. Proceedings: seventeenth annual Gulf of Mexico information transfer meeting, December 1997. U.S. Dept. of the Interior, MMS, Gulf of Mexico OCS Region, New Orleans, La.

ABSTRACT: None.

KEYWORDS: Fisheries; fishing operations; Gulf of Mexico.

**497.**

McKee, T.R., L.M. Jeffrey, B.J. Presley, and U.G.II. Whitehouse. 1978. Holocene sediment geochemistry of continental slope and intraslope basin areas, Northwest Gulf of Mexico, pp 313-326. In: Bouma AH, Moore GT, Coleman JM, (Editors). Framework, facies, and oil-trapping characteristics of the upper continental margin. Studies in Geology American Association of Petroleum Geologists, Tulsa, OK.

ABSTRACT: Slope topography has a major effect on the geochemical properties of near-surface sediment on the Texas-Louisiana Slope. Sediment in intraslope basins accumulates faster than in areas outside the basins, leading to a more anoxic character for basin sediment. One basin was found to be partly filled with a high-density brine, resulting in completely anoxic water and sediment, undisturbed by benthic organisms. Iron and manganese are mobilized in the sediment column, and recrystallize in patterns depending on sediment accumulation rates and redox conditions.

KEYWORDS: Geology; Anaerobic Environment; Atlantic Ocean; Basins; Brines; Cenozoic; Chemical Composition; Continental Slope; Cores; Distribution; Environment; Geochemistry; Gulf of Mexico; Gyre Basin; Holocene; Iron; Manganese; Marine Environment; Metals; North Atlantic; Northwest; Ocean Floors; Oceanography; Orca Basin; Quaternary; Sedimentary Basins; Sedimentation; Sediments.

**498.**
McKenzie, L.S., P.J. Xander, M.T.C. Johnson, D.W. Davis, and B. Baldwin. 1995. Socioeconomic impacts of declining outer continental shelf oil and gas activities in the Gulf of Mexico,Minerals Management Service, New Orleans, LA. Gulf of Mexico OCS Region.

ABSTRACT:The Gulf of Mexico (GOM) outer continental shelf oil and gas industry experienced dramatic changes over recent years. These changes impacted socioeconomic conditions in the adjacent coastal communities. The analysis of individual socioeconomic characteristics provides a base of information which illustrates the changed conditions. Select socioeconomic data for each parish and county in the study area for the years 1960, 1970 and 1980 were inventoried, assembled and tabulated.

KEYWORDS:Socioeconomics; Gulf coast; Socioeconomic conditions; Natural gas industry; Petroleum industry; Gulf of Mexico; Jobs; Employment; Economically depressed areas; Texas Gulf Coast; Louisiana; Mississippi; Alabama; Economic analysis.

**499.**
McKenzie, L.S.I., M. W. Wascom, W. R. Keithly, R. E. Emmer, W. H. Hudnall, M. T. C. Johnson, F. Niami, and B. A. Touchet. 1995. Land Use and Socioeconomic Status and Trends in the Barataria-Terrebonne Estuarine System. Barataria-Terrebonne National Estuary Program. Thibodaux, LA.

ABSTRACT:None.

KEYWORDS:Socioeconomics.

**500.**
McLaughlin, D.C. 1998. Mensa Project An overview. Offshore Technology Conference, Annual Proceedings 4(OTC 8576): 9-20.

ABSTRACT: This paper presents an overview of the Shell Offshore Inc. (SOI) Mensa Project, a very remote subsea gas development in 5300 feet of water in the Gulf of Mexico. Planning and execution of the Project required a challenging balance throughout between the desire to utilize proven solutions from SOI's Popeye Project, the requirements to extend and develop new technology, continuing emphasis on cost and cycle time reductions, and working within a newly created Subsea Systems Alliance. Mensa was successfully installed and the first well started up in July 1997. It represented application of an innovative, cost-effective field development system, which established dramatic new offshore standards for water depth and offset distance.

KEYWORDS: Offshore petroleum prospecting; Natural gas well drilling; Strategic planning; Cost effectiveness; Standards.

**501.**
McLaughlin, D.C. and B.J. Alford. 1996. Popeye Project An overview . Offshore Technology Conference, Annual Proceedings 3: 89-95.

ABSTRACT: This paper presents an overview of the Shell Offshore Inc. (SOI) Popeye Project, a remote subsea gas development in 2040 ft. of water in the Gulf of Mexico. Planning and execution of the Project required a balance throughout between proven methods, cost reduction, requirement for extending technology, and the desire to develop a system which could be used as a stepping stone to future deep water prospects. Popeye was successfully installed and started up in January 1996. It represents application of an innovative, yet cost-effective, field development system which advanced the state of deep water subsea technology.

KEYWORDS: Natural gas fields; Natural gas well production; Project; management; Cost effectiveness; Strategic planning.

**502.**
McLellan, H. J. and W. D. Nowlin. 1963. Some features of the deep water in the Gulf of Mexico. Journal of Marine Research 21(3).

ABSTRACT: In the central Gulf of Mexico, 52 stations having depths greater than 1500 m were occupied within a seven-week period. The data for waters below sill depth (2000 m) show that the ranges of potential temperature and salinity are very limited, although weak vertical gradients indicate a slight positive stability. Water characterizations are consistent with the flooding through the Yucatan Channel, but the data are inadequate to examine the possibility of present-day exchange. In contrast to the potential temperature and salinity, which show no horizontal variations, the dissolved oxygen content appears nonuniform on all horizontal surfaces below the sill depth.

KEYWORDS: Physical Oceanography.

**503.**
McNeely, P., R. Kota, P. Powell, P. Leitch, and R. D'Souza. 1999. FPSO fabrication escalating as subsea, flow assurance mastered. Offshore Magazine 59(8).

ABSTRACT: None.

KEYWORDS: Technology.

**504.**
Merrell, W.J.J. and J.M. Morrison. 1981. On the Circulation of the Western Gulf of Mexico With Observations From April 1978. Journal of Geophysical Research 86(C5):4181-4185.

ABSTRACT: In April 1978 the circulation pattern in the western Gulf of Mexico was dominated by a cyclonic circulation feature centered near 25 degree 20'N, 95 degree 20'W and an anticyclonic circulation feature centered near 23 degree 30'N, 95 degree 50'W. The north-south scales of both gyres are similar to 225 km, while the east-west scales are > 450 km. An eastward geostrophic transport of 29.7 x $10^6 m^3/s$ is found between the centers of the cyclone and the anticyclone. The authors believe that both the anticyclone and the cyclone migrated to the western Gulf from the Loop Current region of the eastern Gulf. The anticyclone is probably supplemented by a wind-driven circulation as described by Blaha and Sturges, and an eastward extension of the wind-driven current which flows to the south along the lower Texas shelf may intensify the cyclone and/or anticyclone. Also, this extension of the Texas shelf may tend to confine the anticyclone to the south and the cyclone to the north of the current's location.

KEYWORDS: Physical Oceanography; ocean circulation; gyres; cyclones; anticyclones; geostrophic flow; wind-driven circulation; shelf currents; Loop Current; Texas; Gulf of Mexico.

**505.**
Merrell, W.J.J. and A.M. Vazquez. 1983. Observations of changing mesoscale circulation patterns in the western Gulf of Mexico. Journal of Geophysical Research 88(C12):7721-7723.

ABSTRACT: In the western Gulf of Mexico, depth contours of the 15 degree C isotherm are compared during two observations periods: April 1-12 and April 12-26, 1978. Comparison of the two isothermal maps allows one to estimate changes in the mesoscale current patterns. A cyclonic circulation feature and an anticyclonic feature are found in both data sets and seen to have intensified and weakened respectively. The observed changes may be due to the effects of a severe norther (cold air outbreak) that occurred between the observation periods. An alternate mechanism is the dissipation of energy associated with the spindown of a westward moving anticyclone as it reaches the western boundary of the Gulf of mexico.

KEYWORDS: Physical Oceanography; mesoscale features; hydrographic data; ocean circulation; Gulf of Mexico.

**506.**
Meyer, E.E., M. Al-Sharif, and J.L. Upchurch. 1998. An Overview of the Neptune Phase IV Subsea Tieback. Proceedings of the 10th Deep Offshore Technology Conference .

ABSTRACT: This paper presents the plans and accomplishments for Phase IV of the Neptune development; a subsea tieback to the Neptune Spar, located in the Gulf of Mexico in Viosca Knoll Block 825, approximately 135 miles southeast of New Orleans. The water depth at the Neptune Spar is approximately 1,930 ft. and the subsea wells are to be located approximately four (4) miles west of the Spar in 1,700 ft. water depth. The project includes a single subsea tree, a three slot manifold, jumper connections between the tree and manifold, four miles of dual four (4) inch nominal flowlines and electro-hydraulic control umbilical, dual flexible catenary risers and production control equipment. Neptune was the first Spar installed in the Gulf of Mexico and this is its first subsea tieback. Innovations associated with this project include the use of a pipeline-end production manifold, flexible catenary risers for the flowlines and an umbilical that combines electrical conductors; thermoplastic hoses and zinc coated carbon steel tubes. It was also the first GOM use of a multiple well manifold without a control pod. Detailed engineering for the project began in October 1997. Delivery of all of the subsea equipment is scheduled for August 1998. Drilling, completion and installation should start in August 1998 and first production is scheduled for October 1998.

KEYWORDS: Technology.

**507.**
Middleton, G.V.andM.A. Hampton. 1976. Subaqueous sediment transport and deposition by sediment gravity flows, pp 197-218. In: Stanley DJ, Swift DJP, (Editors). Marine sediment transport and environmental management. John Wiley & Sons, New York, N.Y.

ABSTRACT: None.

KEYWORDS: Geology; Clastic Rocks; Conglomerate; Currents; Debris Flows; Deposition; Grain Flows; Gravity Flows; Marine Transport; Mass Movements; Mechanics; Mudstone; Processes; Sediment Flows; Sedimentary Rocks; Sedimentary Structures; Sedimentation; Textures; Transport; Turbidite; Turbidity Currents.

**508.**
Mofjeld, H.O. and M. Wimbush. 1977. Bottom pressure observations in the Gulf of Mexico and Caribbean Sea. Deep-Sea Research 24(11):987-1004.

ABSTRACT: During 1971 to 1974, offshore pressure gages were deployed in the Gulf of Mexico and the Caribbean Sea to measure tides and bottom pressure continuum. The observations indicate that the Gulf of Mexico has a Helmholtz resonance with a period of 1.56d. While the lack of confidence limits on theoretical cotidal charts hinders the comparison between theory and observation, the latter tend to support a model with direct astronomical forcing. The observations in the Caribbean Sea verify the general features of theoretical cotidal charts. At a 6-month long station in the Eastern Carribean, bottom pressure fluctuations with 4 to 5-d period are coherent and in phase with atmospheric waves in the Easterlies. The inverse barometer compensation appeared to be less complete in this semi-enclosed sea, spanned by weather systems, than in the open ocean. An appendix gives corrections to the response method of tidal analysis, the procedure for converting the results to harmonic constants with error estimates, and tables of analytical results.

KEYWORDS: Physical Oceanography; water pressure; tides; benthic environment; Caribbean; Harmonic Analysis; Resonance; Gulf of Mexico.

**509.**
Molinari, R.L. 1978. The relationship of the curl of the local wind stress to the circulation of the Cayman Sea and the Gulf of Mexico. Journal of Physical Oceanography 8(5):779-784.

ABSTRACT: The curl of the annual mean wind stress is proposed as the forcing mechanism for the anticyclonic gyre observed in the Cayman Sea. A simple wind-driven model is presented to illustrate how a steady-state gyre in the Cayman Sea and another gyre in the western Gulf of Mexico can be spun-up by the wind. The model results also indicate that the exchange by mass between the two basins can be enhanced by the wind field. Temporal changes in the upper layer temperature structure of the Cayman Sea gyre are consistent, qualitatively, with changes predicted by a simple wind-forcing model. The same model does not appear valid in the western Gulf of Mexico.

KEYWORDS: Physical Oceanography; wind stress; water circulation; Cayman Sea; Gulf of Mexico.

**510.**
Molinari, R.L. 1980. Current variability and its relation to sea-surface topography in the Caribbean Sea and Gulf of Mexico. Marine Geology 3:409-436.

ABSTRACT: None.

KEYWORDS: Physical Oceanography; sea surface topography; current measurements; Caribbean; Marine Geodesy; Gulf of Mexico.

**511.**
Molinari, R.L., D.W. Behringer, G.A. Maul, S. Baig, and R. Legeckis. 1977. Winter intrusions of the Loop Current. Science 198:505-507.

ABSTRACT: The circulation in the eastern Gulf of Mexico is dominated by the so-called Loop Current, which enters the Gulf through the Yucatan Straits and exits through the Straits of Florida.|A description is presented of recent observations, made between November 1974 and April 1977, which show the northern most intrusions of the Loop Current during the winter months.|The observed winter intrusions were all north of 26 deg N. The considered data include sea-surface temperature data derived from satellite measurements and subsurface temperature data.

KEYWORDS: Physical Oceanography; Ocean Currents; Ocean Surface; Water Temperature; Winter; Latitude; Satellite Observation; Gulf of Mexico.

**512.**
Molinari, R.L., J.F. Festa, and D.W. Behringer. 1978. The circulation in the Gulf of Mexico derived from estimated dynamic height fields. Journal of Physical Oceanography 8(6):987-996.

ABSTRACT: Monthly mean dynamic height topographies for the upper 500 m of the Gulf of Mexico, seasonal mean topographies for the upper 1000 m and annual topographies for the deep flow are presented. The dynamic height values on a 1 degree x 1 degree grid were determined from observed temperature values and salinities derived from mean T-S relations. The seasonal intrusion of the Loop Current is observed and found to vary directly with the geostrophic transport through the Yucatan Straits. At the Straits, the transport in the upper 500 m is a maximum in June. The transports in the upper 500 m of an anticyclone in the western Gulf are a maximum in winter and summer, and a minimum in spring and fall. There is a permanent westerly flow on the Texas Shelf. After turning cyclonically, this flow joins the eastward transport of the northern limb of the anticyclone in the western Gulf of Mexico. Most of this eastward flow recirculates in the anticyclone; however, a portion flows east across the central Gulf to become entrained in the Loop Current. The deep circulation between 1500 and 3000 m is dominated by an anticyclonic gyre which fills the entire deep basin.

KEYWORDS: Physical Oceanography; dynamic topography; water circulati; vertical profiles; Gyres; Gulf of Mexico.

**513.**
Molinari, R.L. and D.A. Mayer. 1982. Current meter observations on the continental slope at two sites in the eastern Gulf of Mexico. Journal of Physical Oceanography 12(12):1480-1492.

ABSTRACT: Current-meter observations obtained at two sites on the continental slope of the eastern Gulf of Mexico, at nominal positions of 29 degrees N, 88 degrees W (the Mobile site) and 27.5 degrees N, 85.5 degrees W (the Tampa site) are presented. Data were collected at three levels at Mobile (90, 190 and 980 m) from July 1977 through August 1978 and at four levels at Tampa (150, 250, 550 and 950 m) from June 1978 through June 1979. At 90 and 190 m, the flow at Mobile was on the average to the east. Sustained periods of flow to the west were observed during the summer 1977 and spring 1978. At both sites, the motions are perturbed by events associated with the Loop Current. These events make it difficult to define any seasonal variability in the upper layers. The flow at the bottom meters is strongly aligned with the bottom topography and lacks a strong seasonal signal. Little barotropic tidal energy was observed at either site. Other current characteristics are described.

KEYWORDS: Physical Oceanography; Oceanography; Current; Dynamics; Ocean; Ad 1977 to 1979; Continental Slope; Loop Current; Gulf of Mexico.

**514.**
Molinari, R.L. and J. Morrison. 1988. The separation of the Yucatan Current from the Campeche Bank and the intrusion of the Loop Current into the Gulf of Mexico. Journal of Geophysical Research 93(C9):10645-10654.

ABSTRACT: Data collected in the eastern Gulf of Mexico during 1974, 1975, and 1976 show that the penetration of the Loop Current into the gulf is strongly correlated with the location of the Yucatan Current on the Campeche Bank. The Loop does not penetrate far into the gulf when the Yucatan Current separates from the bank in the vicinity of the Catoche Tongue (i.e., the eastern Campeche Bank). Deep Loop penetrations are correlated with separations farther west on the bank. The angle of the Yucatan Current at separation is also correlated with the location of separation (i.e., smaller angles relative to due east are correlated with separations from farther east on the bank). Thus small angles at separation are correlated with shallow intrusions of the Loop.

KEYWORDS: Physical Oceanography; ocean circulation; current observations; potential vorticity; Loop Current; Yucatan Current; Campeche Bahia; water mixing; Dynamical Oceanography; Gulf of Mexico.

**515.**
Moore, D.G. and J.R. Curray. 1963. Structural framework of the continental terrace, northwest Gulf of Mexico. Journal of Geophysical Research 68(6):1725-1747.

ABSTRACT: Intricate detail of stratigraphy and structure, to depths of about 5000 feet (probably Miocene), is shown in Rayflex Electro-Sonic Profiler records collected on the continental shelf and the upper continental slope of the northwest Gulf of Mexico. The Rayflex Electro-Sonic Profiler is a continuous-recording, acoustic reflection surveying system which utilizes a high-intensity spark source, rather than chemical explosives. The recorded sections of the continental terrace of this area show essentially horizontally stratified deposits underlying the continental shelf (probably shelf, littoral, deltaic, lagoonal, and continental facies) changing smoothly over the shelf break into seaward-dipping continental slope deposits. The upper part of this terrace has thus formed during the late Tertiary and Quaternary by both upbuilding and outbuilding. This basic framework has been modified locally by folding and faulting, which are largely associated with salt or shale intrusion structures. The irregular topography of the upper continental slope, previously attributed to slumping, gravity tectonics, and turbidity current erosion, is to be controlled by these intrusive structures modified by varying amounts of contemporaneous deposition of sediment. No evidence of extensive slope erosion is shown by records of this survey.

KEYWORDS: Geology; Atlantic Ocean; Continental Shelf; Gulf of Mexico; North Atlantic; Northwestern; Sediments; Seismic Reflection Survey; Seismic Survey; Structural Geology; Structure.

**516.**
Moore, G.T. 1973. Submarine current measurements-northwest Gulf of Mexico. Transactions-Gulf Coast Association of Geological Societies 23:245-255.

ABSTRACT: None.

KEYWORDS: Physical Oceanography; Current; Holocene; Sand; Transport; Gulf of Mexico.

**517.**
Moore, G.T., G.W. Starke, L.C. Bonham, and H.O. Woodbury. 1978. Mississippi fan, Gulf of Mexico; physiography, stratigraphy, and sedimentational patterns, pp 155-191. In: Bouma AH, Moore GT, Coleman JM, (Editors). Framework, facies, and oil-trapping characteristics of the upper continental margin. Studies in Geology American Association of Petroleum Geologists, Tulsa, OK.

ABSTRACT: The Mississippi Fan, located in the northeastern part of the Gulf of Mexico, is a gentle, arcuate pile of clastic sediments derived primarily from the ancestral Mississippi River drainage basin. The fan is confined by the Florida Escarpment on the east and the Texas-Louisiana-Florida continental slope on the north and west. On the south the fan abuts the Yucatan Escarpment and merges to the southeast with the Florida Plain (3,300m) and to the west with the Sigsbee Plain (3,500m). The radius of the fan from its apex (at a water depth of 1,200m) to the plains is about 350 km. The fan has a surface area of about 170,000 sq km, slightly smaller than New England. The upper fan contains a partly leveed channel cut into older fan sediments. The channel is filled with late Pleistocene (Wisconsin) fine clastic sediments. The middle part of the fan, typical of many, is composed of a massive complex of fan channels that has constructed a crown or suprafan up to 500 m above the surrounding fan surface. The lower fan is characterized by smooth, gentle slopes that contain depositional distributary channels. Reflection seismic profiles from the 1969 USNS *Kane* Gulf survey show sufficient continuity of seismic character to permit subdividing the upper part of the sedimentary section into three seismic stratigraphic units. Unit A, the youngest, consists of a proximal facies of disrupted seismic zones and a distal facies of generally parallel reflections separated by transparent zones. The former is interpreted to be a channel, slump, and debris-flow deposits, and the latter is turbidite flows interbedded with hemipelagic sediments. Unit A is correlated with the Sigsbee (Pleistocene) seismic unit; the fan formed during the time represented by unit A. Two older intervals were mapped to show the relation present in this region before fan development. Unit B contains three or four bands of generally continuous reflectors that gradually converge down the lower fan and on the plain. These are inferred to be turbidite sequences. Unit C is largely an acoustically transparent layer, indicative of a homogenous hemipelagic sediments. Computer-generated isopach maps of each unit allow study of the Neogene-Quaternary regional depositional patterns. Sediments comprising unit A exceed 3 km in thickness in the middle fan. Unit B thickens rather uniformly to the north and northwest, which suggests that the source was from that direction also. The oldest section mapped, unit C, is distributed more uniformly over the whole area.

KEYWORDS: Geology; Age; Atlantic Ocean; Bathymetry; Cenozoic; Channels; Clastic Sediments; Distribution; Environment; Geophysical Surveys; Gulf of Mexico; Mississippi Fan; Mississippi Trough; Neogene; North Atlantic; Northeast; Petroleum; Physiography; Pleistocene; Possibilities; Pro Files; Quaternary; Rates; Reflection Methods; Reservoir Rocks; Sedimentation; Sediments; Seismic Surveys; Source Rocks; Stratigraphy; Submarine Fans; Surveys; Tertiary; Traps.

**518.**
Morgan City Historical Society. 1960. A History of Morgan City, Louisiana. King-Hannaford Company, Inc Morgan City, LA.

ABSTRACT: None.

KEYWORDS: Socioeconomics.

**519.**
Morrison, D.G. 1997. Low-Cost Designs for Facilities in Shelf and Deepwater Developments. OMAE JONC Workshop .

ABSTRACT: Concept selection is driven by reservoir and site parameters. The process of concept selection consists of configuring various field development concepts, comparisons of various concepts, economics screening, and concept selection. After concept selection preliminary field development, design, fabrication, installation, commissioning and final operation of the chosen concept ensues. This presentation describes the new emphasis on deepwater development in the Gulf of Mexico, development drivers, concept options, some example trade-offs, sensitivities in economic screening and remaining challenges. The description concentrates on the various trade-offs amongst the concepts rather than the many important other influences, such as reservoir or economic trade-offshore.

KEYWORDS: Technology.

**520.**
Morrison, J.M. and W.J.J. Merrell. 1983. Property distributions and deep chemical measurements within the western Gulf of Mexico. Journal of Geophysical Research 88(C4):2601-2608.

ABSTRACT: The purposes of this paper are to describe the distribution of nutrients in the upper 1600 m of the western Gulf of Mexico and to report the results from a deep station where a number of chemical parameters were measured.

KEYWORDS: Physical Oceanography; nutrients (mineral); radioisotopes; salinity; dissolved oxygen; distribution; deep water; Gulf of Mexico.

**521.**
Morrison, J.M. and W.D.J. Nowlin. 1977. Repeated nutrient, oxygen, and density sections through the Loop Current. Journal of Marine Research 35(1):105-128.

ABSTRACT: Based on observations made in May, 1972, the nutrient and dissolved-oxygen concentrations in the offshore waters of the eastern Gulf of Mexico are described and related to the Loop Current and anticyclonic current rings, which are the principal circulation features of this region. The characeristic relationships of oxygen and nutrients to density parameters are presented, and the following water masses are characterized in the Gulf: Subtropical Underwater, 18 C Sargasso Sea Water, upper subtropical oxygen minimum, Antarctic Intermediate Water, and North Atlantic Deep Water. Repeated sections through the Loop Current allow some estimation of variability within a period of weeks, as well as descriptions of spatial variations of properties. The relative geostrophic flow within the Loop is described. Transport estimates are compared to previous estimates of the Loop and to estimates through the Yucatan and Florida Straits based on measurements also made during May, 1972. The results are in good agreement: values for the total transport of the current are approximately $30x10^{-6}$ $m^{-3}$ $sec^{-1}$ , while for the waters above SUB-t =27.0 mg $cm^{-3}$ a value near $23x10^{-6}$ $m^{-3}$ $sec^{-1}$ is obtained.

KEYWORDS: Physical Oceanography; nutrients (mineral); dissolved oxygen; density currents; water currents; Gulf Loop Current; Ocean Circulation; Gulf of Mexico.

**522.**

Mueller-Karger, F.E., J.J. Walsh, R.H. Evans, and M.B. Meyers. 1991. On the seasonal phytoplankton concentration and sea surface temperature cycles of the Gulf of Mexico as determined by satellites. Journal of Geophysical Research 96(C7):12645-12665.

ABSTRACT: Monthly climatologies of near-surface phytoplankton pigment concentration and sea surface temperature (SST) were derived for the Gulf of Mexico from multiyear series of coastal zone color scanner (CZCS) (Nov 1978 to Nov 1985) and advanced very high resolution radiometer (AVHRR) (Jan 1983 to Dec 1987) images. We complement these series with SST from the comprehensive ocean-atmosphere data sea (1946-1987) and Climate Analysis Center (1982-1990), and hydrographic profile data from the NOAA National Oceanographic Data Center (1914-1985). The CZCS ocean color satellite data provide the first climatological time series of phytoplankton concentration for the region. The CZCS images show that seasonal variation in pigment concentration seaward of the shelf is synchronous throughout the gulf, with highest values (> 0.18 mg/m super(3)) in Dec to Feb and lowest values ( similar to 0.06 mg/m super(3)) in May to Jul. Variation in SST is also synchronous throughout the gulf, with maxima in Jul to Sep and minima in Feb to Mar.

KEYWORDS: Water column biology; surface temperature; phytoplankton; seasonality; satellite sensing; Gulf of Mexico.

**523.**

Mullin, K., W. Hoggard, C. Roden, R. Lohoefener, C. Rogers, and B. Taggart. 1991. Cetaceans on the upper continental slope on the north-central Gulf of Mexico,OCS Study/MMS 91-0027.

ABSTRACT:At least 29 species of cetaceans occur or have occurred in the Gulf of Mexico (Gulf) including five species listed as endangered under the provisions of the Endangered Species Act. All cetaceans in the U.S. waters are protected by the Marine Mammal Protection Act of 1972. Except for data from strandings, opportunistic sightings and limited aerial surveys, very little is known about cetaceans in the Gulf beyond the continental shelf. The continental shelf (<180 m deep) in the U.S. Gulf has been well studied compared to the deep waters (>180 m) and the bottlenose dolphin has been found to be the only species which commonly inhabits most shelf waters. Seaward of the shelf, water depths increase rapidly and the cetacean community becomes more diverse. Minerals development has occurred widely in U.S. Gulf waters on the continental shelf west of Mobile Bay, Alabama (over 4,500 oil and gas platforms). Plans for development of the continental slope and central Gulf waters are in place and some exploratory activities have already occurred in these waters. Because of their protected status, information on cetacean diversity, abundance, and seasonality is needed in order to assess the potential impact of minerals development. In 1989, the Minerals Management Service and the National Marine Fisheries Service began cooperative aerial surveys of the upper continental slope with the following objectives: (1) determine the species diversity of cetaceans, (2) learn about the temporal and spatial distribution of each species and (3) estimate the relative abundance of each species. From July 1989 through June 1990, we conducted aerial surveys each month (except December) in the north-central Gulf. The area studied was centered along the shelf break (180 m) south of the Mississippi River delta and extended from DeSoto Canyon (87°30.0'W) to west of the Mississippi Trough (90°30.0' W). The area studied was about 44 km wide. Water depths ranged from 18 to 2,000 m. During the study, we sighted at least 15 species of cetaceans. Seven species accounted for 93% of the sightings of identified herds. These species included: Risso's dolphin (61 herd sightings), sperm whale (43), bottlenose dolphin (39), Atlantic spotted dolphin (36), dwarf/pygmy sperm whales (32), striped/spinner/Clymene dolphins (24) and pantropical spotted dolphin (23). Beaked whales (Cuvier's beaked whale and mesoplondonts) were sighted nine times and short-finned pilot whales five times. Herds of the following species were sighted once: melon-headed/pygmy killer whales, false killer whale, killer whale, rough-toothed dolphin, fin whale and sei/Bryde's whale. Cetacean species had a wide spatial and temporal distribution on the upper continental slope. Six species were sighted in every season (summer, fall, winter and spring) and two species in each season but winter. Twelve species were sighted in summer, 10 in spring and fall, and only six in winter. Except for the short-finned pilot whale, all species sighted more than once were sighted throughout the length (east-west) of the study area. For all cetacean herds sighted, and for each species, we tested the location data for preferences in intervals of water depth and sea floor topography. Cetaceans as a group did not prefer any water depth or topography interval on the upper continental slope. However, cetaceans that were sighted more than 20 times and could be identified to species were partitioned by these two factors. Bottlenose (<300 m) and Atlantic spotted dolphins (<600 m) preferred shallow waters over steep

sea floor (a large relative change in water depth). Risso's dolphins preferred waters between 300-900 m over steep sea floor. Pantropical spotted dolphins (>900 m) and sperm whales (600-1,200 m) preferred deeper waters over less precipitous sea floor (a smaller relative change in water depth). Dwarf/pygmy sperm whales were found throughout the range of waters depths and topographies. Striped/spinner/Clymene dolphins may prefer deeper waters (>1,200 m) but showed no preference for topography. Of the species sighted more than once, beaked whales were sighted at the deepest mean water depth (966 m). The overall density of cetaceans on the upper continental slope was 0.78 cetaceans/km$^2$. Because of large average herds sizes ( 88 dolphins/herd), striped/spinner/Clymene dolphins had the highest overall density (0.22 dolphins/km$^2$). Pantropical spotted dolphins averaged 72 dolphins/herd and had a density of 0.18 dolphins/km$^2$. Risso's dolphins, Atlantic spotted and bottlenose dolphins averaged much smaller herds (<30 dolphins/herd) and densities ranged from 0.05-0.08 dolphins/km$^2$. The physeterids only averaged about 2 whales/herd and the beaked whales only one, and their densities were much smaller (<0.006 whales/km$^2$). Because of its extremely large size (about 20,000 kg), the sperm whale, an endangered species, is an important part of the cetacean community on the upper continental slope. Although they had a small overall density, we estimated that sperm whales made up between 21-44% of the total biomass of cetaceans. Sperm whales were found throughout the study area but were concentrated in the region near the Mississippi River delta. On two days in June 1990, we conducted surveys in deeper water south of the regular study area. During those two days, we sighted at least eight species of cetaceans including three that were sighted only one to five times during the regular surveys (false killer whale, melon-headed/pygmy killer whale and short-finned pilot whale). These species may be more numerous in the pelagic Gulf. Pantropical spotted dolphins were the most commonly sighted species. These surveys indicated that the Gulf, beyond the upper continental slope, is also an area of high cetacean diversity and abundance.

KEYWORDS:Endangered species.

## 524.

Mullin, K.D.and L.J. Hansen. 1999. Marine mammals of the northern Gulf of Mexico, pp 269-277. In: Kumpf H, Steidinger K, Sherman K. The Gulf of Mexico large marine ecosystem. Blackwell Science.

ABSTRACT: In the northern Gulf of Mexico, two cetacean species, the bottle-nosed dolphin and the Atlantic spotted dolphins, inhabit the continental shelf (waters < 200m deep). Twenty species regularly inhabit oceanic waters (>200m deep) where about 50% of the cetaceans are pantropical spotted dolphins. Although sperm whales represent less than 1% of the cetaceans in oceanic waters, because of their large size they make up about 60% of the total cetacean biomass. Cetaceans are widely distributed in both space and time in the northern Gulf. Thirteen species have been sighted during three or more seasons of the year. Some species are found throughout the oceanic northern Gulf, whereas others are typically only found in specific parts of this region.

KEYWORDS: Endangered species.

## 525.

Mullin, K.D., W. Hoggard, C.L. Roden, R.R. Lohoefener, C.M. Rogers, and B. Taggart. 1994. Cetaceans on the Upper Continental Slope in the North-Central Gulf of Mexico. Fishery Bulletin 92(4):773-787.

ABSTRACT: The US Marine Mammal Protection Act and the Act mandate that federal agencies ensure that their activities do not contribute to the depletion of marine-mammal populations. In order to assess the impact of offshore oil and gas activities in the north-central Gulf of Mexico, aerial surveys have been conducted to determine which cetaceans are present, document spatial and temporal distributions, and estimate relative abundances for each species. Results are presented from these surveys. Of the 275 identified herds, seven species or species groups were determined: Risso's dolphin; sperm whales; bottlenose dolphins; Atlantic spotted dolphins; pygmy and dwarf sperm whales; striped, spinner, and clymene dolphins; and pantropical spotted dolphins. Mean herd sizes ranged 1.9-87.8 animals. The relative abundance of several species or species groups varied seasonally, and each species sighted had a wide spatial distribution. Some individuals of all species were sited at depths less than 200 m, which conflicts with what is generally known about the water-depth distribution of each species. All relevant data are tabulated.

KEYWORDS: Endangered Species; Marine Mammals; Gulf of Mexico.

**526.**

Mullin, K.D., L.V. Higgins, T.A. Jefferson, and L.J. Hansen. 1994. Sightings of Clymene dolphin (*Stenella clymene*) in the Gulf of Mexico. Marine Mammal Science 10(4):464-470.

ABSTRACT: The Clymene dolphin (*Stenella clymene*), though originally described in 1846, was not widely recognized as a valid species until 1981. Observations of the Clymene dolphin in the eastern United States, including the Gulf of Mexico, prior to 1981 may be unreliable because of misidentifications as a result of the lack of recognized species status. This paper presents data from Clymene dolphin sightings during shipboard surveys for cetaceans in the northern Gulf of Mexico. These sightings represent the first records of Clymene dolphin sightings from the Gulf. Twenty-nine Clymene dolphin herds were sighted during the survey period.. At sighting locations, sea surface temperatures ranged from 22.8° C to 29.1° C, and water depths ranged from 704 m to 3,064 m. Estimated herd sizes ranged from 2 to 100 individuals. None of the herds were associated with other cetaceans. Calves were observed in 45% of the observed herds. There were no significant trends in the temporal distribution of Clymene dolphins during the survey period. Vocalizations of Clymene dolphins were recorded during one survey. Twenty whistles were recorded from a herd of approximately 40 individuals. The structure of these whistles was similar to that described for other Stenella dolphins, but generally had higher frequencies. These data support the fact that the distribution of the Clymene dolphin in the Gulf of Mexico is primarily in deep oceanic waters. This species represents a significant component of the cetacean fauna of the northern Gulf of Mexico.

KEYWORDS: Endangered Species; Gulf Of Mexico; Sightings.

**527.**

Mullin, K.D., T.A. Jefferson, and W. Hoggard. 1994. First sightings of melon-headed whales (*Peponocephala electra*) in the Gulf of Mexico. Marine Mammal Science 10(3):342-348.

ABSTRACT: Little is known about the distribution of the melon-headed whale (*Peponocephala electra*), and most known sightings records are from the waters of the eastern tropical Pacific. Comparably, Atlantic Ocean and Gulf of Mexico records consist of relatively few sightings and strandings. This paper reports the first sighting records of melon-headed whales in the Gulf of Mexico. These records consisted of eight sightings that were made during marine mammal assessment surveys conducted during 1992 and 1993 . All sightings were made within oceanic waters of the Gulf, over the continental slope (>500 m) and away from the continental shelf edge. With one exception, all sightings were made off of Louisiana and Texas. The outlying sighting was made south of the Florida panhandle region.. Herd sizes ranged from 35 to 400 individuals, which is comparable to herds sighted in the Indian Ocean and Atlantic Ocean. Herds sighted in the eastern tropical Pacific were, on average, larger than the Gulf herds. These sightings suggest that the melon-headed whale is a regular inhabitant of the Gulf of Mexico.

KEYWORDS: Endangered Species; Gulf Of Mexico; Sightings.

**528.**

Mumphrey, A.J., R.E. Thayer, F.W. Wagner, J.K. Wildgen, and A.H. Young. 1977. OCS Development in Coastal Louisiana: A Socio-Economic Impact Assessment. Louisiana State Planning Office, Coastal Resources Program. Baton Rouge, LA.

ABSTRACT:In the seven chapters which comprise this study, various impacts of outercontinental shelf (OCS) oil and gas development on the Louisiana coastal zone and related topics are discussed. Chapter 2 deals with the OCS related production, employment, and population impacts. The public service sectors analyzed in Chapter 3 are education, highways, police protection, fire protection, water supply, solid waste disposal, sewarage, health and hospitals, and parks and recreation. Chapter 4 analyzes local needs, expenditures, and fiscal capabilities. Chapter 5, presents the stages of development, and the basic problems associated with development in this environment. The task of Chapter 6 is to assess the effectiveness of the planning and management capability of the local governments in Louisiana's coastal zone and recommend potential improvements. Chapter 7 provides a discussion of citizen participation at both the theoretical level and the practical level through an examination of the Louisiana Coastal Resources Program's Public Participation Program.

KEYWORDS:Socioeconomics; Natural gas; Crude oil; Economic development; Coasts; Louisiana; Social effect; Production; Employment; Populations; Expenses; Public utilities; Recommendations; Citizen participation; Highways; Economic impacts; Recreation; Financing; Investments; Construction costs; Maintenance; Subsidence; Outer Continental Shelves; Ntiscomnoa.

**529.**

Murdy, E.O., R.E. Matheson, J.D. Fechhelm, and M.J. McCoid. 1983. Midwater fishes of the Gulf of Mexico collected from the R/V *ALAMINOS,* 1965-1973. Texas Journal of Science 35(4):108-127.

ABSTRACT: Cruises of the R/V *Alaminos* during 1965-1973 involved the collection of fishes by midwater trawl from 38 locations in the Gulf of Mexico and northwestern Caribbean. The 4,232 specimens comprised 32 families, 75 genera, and at least 116 species of mesopelagic and bathypelagic fishes. Considering the collections as a whole, gonostomatids were the dominant group and *Cyclothone* the dominant genus. The families Gonostomatidae, Myctophidae, Sternoptychidae, and Melamphaidae accounted for 95% of the catch. Relative abundance of gonostomatids varied little with sampling depth (to 1,000 m); myctophids were relatively most abundant in samples from the upper 500 m; sternoptychids and melamphaids were relatively most abundant in samples extending to depths of 1,000 m.

**530.**

Murphy, D.L., D.F. Paskausky, W.D.Jr. Nowlin, and W.J.Jr. Merrell. 1975. Movement of surface drifters in the American Mediterranean. Journal of Physical Oceanography 5(3):549-551.

ABSTRACT: Between 25 October and 11 December 1973, 1015 surface drifters were launched at 36 stations in the American Mediterranean. Returns from 75 drifters (7.4%) have been received from 23 (64%) of the 36 stations. No flow into the Caribbean Sea through the Mona and Windward Passages was indicated. A net westward drift in the Caribbean Sea of 0.18 m s/sup -1/ was indicated. Movement in the Gulf of Mexico was consistent with observations and models of the Loop Current.

KEYWORDS: Physical Oceanography; Oceanography; Surface Drifters; American Mediterranean; Caribbean Sea; Loop Current; Mona Passage; Windward Passage; Gulf of Mexico.

**531.**
Murray, G.E. 1952. Volume of Mesozoic and Cenozoic sediments in central Gulf Coastal Plain of United States. Bulletin of the Geological Society of America 63:1177-1192.

ABSTRACT: Gulfward-dipping Mesozoic and Cenzoic sediments underline approximately 145,000 square miles in the Central Gulf Coast between Texas on the west and Georgia on the east. Pre-Cretaceous, Coahuilan, Comanchean, and early Gulfian rocks are predominantly red-bed clastics in the eastern portion of this area; westward and downdip marine facies predominate. Extensive marine deposits comprise the middle and late gulfian; arenaceous facies predominate in the east; argillaceous and calcareous facies are prevalent westward and downdi Tertiary deltaic sediments center in Louisiana and Mississippi; eastward and down-dip marine deposits prevail. Fluviatile and deltaic Quaternary deposits occur as a surficial mantle cover much of the Central Gulf Coast; offshore these deposits are replaced by marine facies. Stratigraphic studies indicate that major Jurassic and Lower Cretaceous sedimentary units are typically elongate-lenticular while those of the Upper Cretaceous are ladle-shaped. During Jurassic and Cretaceous times the major source of sediments was apparently eastern United States. In the Cenozoic appreciable quantities of material appear to have come from western United States. Regional isopachous maps illustrate variations in thickness of Mesozoic and Cenozoic stratigraphic units. In the emerged (onshore) portion of the plain, deep wells prove the presence of at least 265,000 cubic miles of sediments. Interpolations based on regional studies indicate that the total volume of Mesozoic and Cenozoic deposits in this area will exceed 300,000 cubic miles.

KEYWORDS: Geology.

**532.**
Murray, G.E. 1966. Salt structures of Gulf of Mexico Basin; a review. American Association of Petroleum Geologists Bulletin 50(3, Part 1):439-478.

ABSTRACT: Diapiric salt structures are concentrated in the Gulf of Mexico and adjacent areas of greater than normal sedimentary thickness, and their times of growth appear to be related to periods of greater than normal sedimentary accumulation. The author suggests that salt ridges or anticlines, as well as lesser structures which have a definite regional strike alinement, may have been positioned by regional strike flexures or strike-fault zones, and that the heights of the salt spines above the ridges or anticlines are probably related to the thickness of sediments above the rising mass of salt.

KEYWORDS: Geology; Atlantic Ocean; Chemically Precipitated Rocks; Diapirs; Evaporites; Gulf Coastal Plain; Gulf of Mexico; Gulf of Mexico and Adjacent Areas; Mechanism; North Atlantic; Review; Salt; Salt Structures; Salt Tectonics; Sedimentary Rocks; Structural Geology; Tectonics.

**533.**

Nagihara, S. 1992. New studies in marine heat flow instrumentation and observations from the salt structures on the Texas continental slope, Gulf of Mexico. University of Texas. Austin, TX.

ABSTRACT: A new type of marine heat flow instrument has been developed based on theoretical analyses on the existing probes. The thermal response of a heat flow probe was modelled in detail by a semi-analytic solution for a one-dimensional, multi-layered cylinder. The simulation was done for the violin-bow type probe designed by C. Lister, that used the pulse heating technique to measure thermal conductivity. I was able to show quantitatively that the low-conductivity interior of the probe and its contact resistance to the metal tube caused a large delay in response to the heat pulse. The probe responded to the frictional heat at its bottom entry with much less delay because much of the heat was produced in the sheared sediments around the probe, not inside, enabling a more rapid dissipation. No significant error in thermal gradient is predicted by the model, but $-$1 to +1.5% error in thermal conductivity due to the probe construction is predicted. Less initial heating or shorter thermal time constant of the probe would minimize such errors. The new heat flow probe has 3 or 4 short, thin outrigger-bow sensors. The accuracy of measurement improves because of the large number of temperature measurements and the short time constant of the thin probes. I used this instrument to collect 74 heat flow measurements over two salt structures on the Texas continental slope, Gulf of Mexico. A previous high resolution seismic survey implied that these structures are a cylindrical plug and a salt tongue with a wall-shaped feeder on one side. The salt plug showed high heat flow values, nearly all over 70 mW/m$\sp2$. The salt tongue had a sharp peak of 90 mW/m$\sp2$ over the presumed feeder and rather uniform values around 60 mW/m$\sp2$ over the remainder. The heat flow observations clearly reflect the structural difference between the two features and are best explained by the refraction of heat flux due to thickness variations of the highly conductive salt bodies. This result suggests that heat flow measurements may be used to constrain the bottom geometry of salt structures.

KEYWORDS: Chemistry; Geophysics.

**534.**

Nassauer, J.I. 1983. Oil and gas development in a coastal landscape: visual preferences and management implications. Coastal Zone Management Journal 11(3):199-217.

ABSTRACT: The study examines the relationships of four general landscape characteristics to viewer preference for a coastal landscape including oil and gas development. Landscape management possibilities that address these characteristics are apparent naturalness, compatibility of development with its setting, and ephemeral characteristics, including tidiness. Results suggest that, while natural-appearing coastal landscapes are attractive, some developed landscapes may also be attractive. Compatibility, nighttime viewing, and tidiness enhance the attractiveness of developed landscapes. Where these characteristics become part of the design and maintenance program for oil and gas facilites, viewer preference may increase.

KEYWORDS: Socioeconomics; Oil and gas; coastal zone management; development.

**535.**

National Marine Fisheries Service. 1999. Final fishery management plan for Atlantic tunas, swordfish, and sharks,Volume I. National Marine Fisheries Service, Highly Migratory Species Management Division, Office of Sustainable Fisheries.

ABSTRACT:None.

KEYWORDS:Fisheries; pelagic fishes; Gulf of Mexico.

**536.**
National Marine Fisheries Service. 1999. Final fishery management plan for Atlantic tunas, swordfish, and sharks,Volume II. National Marine Fisheries Service, Highly Migratory Species Management Division, Office of Sustainable Fisheries.

ABSTRACT:None.

KEYWORDS:Fisheries; pelagic fishes; Gulf of Mexico.

**537.**
National Marine Fisheries Service. 1999. Final Fishery Management Plan for Atlantic tunas, swordfish, and sharks,Volume III. National Marine Fisheries Service, Highly Migratory Species Management Division, Office of Sustainable Fisheries.

ABSTRACT:None.

KEYWORDS:Fisheries; pelagic fishes; Gulf of Mexico.

**538.**
National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1991. Recovery plan for U.S. population of Loggerhead Turtle (*Caretta caretta*),National Marine Fisheries Service. Washington D.C.

ABSTRACT:The loggerhead is federally listed as threatened worldwide. Nesting in the United States occurs primarily along North Carolina (1.0 percent), South Carolina (6.5 percent), Georgia (1.5 percent), and Florida (91 percent) beaches and accounts for approximately one-third of the world population. Nesting trends are declining in Georgia and South Carolina, unknown in North Carolina and appear stable in Florida. Coastal development threatens nesting habitat and populations while commercial fisheries and pollution pose significant threats in the marine environment. The recovery goal is to delist the species in the United States once recovery criteria are met. The southeastern United States population of the loggerhead can be considered for delisting if, over a period of 25 years, the following conditions are met: 1) The adult female population in Florida is increasing and in North Carolina, South Carolina and Georgia, it has returned to pre-listing nesting levels (NC = 800 nests/season; SC = 10,000 nests/season; GA 2,000 nests/season). 2) At least 25 percent (560 km) of all available nesting beaches (2240 km) is in public ownership, is distributed over the entire nesting range and encompasses greater than 50 percent of the nesting activity. 3) All priority one tasks have been successfully implemented. Six major actions are needed to achieve recovery. 1) Provide long-term protection to important nesting beaches. 2) Ensure at least 60 percent hatch success on major nesting beaches. 3) Implement effective lighting ordinances or lighting plans on all major nesting beaches within each State. 4) Determine distribution and seasonal movements for all life stages in marine environment. 5) Minimize mortality from commercial fisheries. 6) Reduce threat from marine pollution. If funds are available to accomplish recovery tasks and new information does not indicate other limiting factors, the anticipated date of recovery is 2015.

KEYWORDS:Endangered species.

**539.**
National Marine Fisheries Service and U.S. Fish and Wildlife Service . 1992. Recovery plan for Leatherback turtles in the U.S. Caribbean, Atlantic and Gulf of Mexico,National Marine Fisheries Service. Washington D.C.

ABSTRACT:The leatherback is federally listed as endangered worldwide. Nesting in the United States occurs primarily in southeastern Florida, Culebra, Puerto Rico and Sandy Point NWR, St. Croix. Nesting trends in the United States appear stable but populations face significant threats in the marine environment from plastics and commercial fisheries.
The recovery goal is to delist the species in the United States once recovery criteria are met. Leatherback populations in the United States can be considered for delisting if the following conditions are met: 1) the adult female population increases over the next 25 years, as evidenced by a statistically significant trend in the number of nests at Culebra, Puerto Rico, St. Croix, USVI and along the east coast of Florida, and; 2) nesting habitat encompassing at least 75 percent of nesting activity in USVI, Puerto Rico, and Florida is in public ownership, and; 3) all priority one tasks have been successfully implemented. Five major actions are needed to achieve recovery: 1) Provide long-term habitat protection for important nesting beaches. 2) Ensure at least 60 percent hatch success on major nesting beaches. 3) Determine distribution and seasonal movements for all life stages in marine environment. 4) Reduce threat from marine pollution. 5) Reduce incidental capture by commercial fisheries. If funds are available to accomplish recovery tasks and new information does not indicate other limiting factors, the anticipated date of recovery is 2015.

KEYWORDS:Endangered species.

**540.**
National Research Council. 1992. Assessment of the U.S. Outer Continental Shelf Environmental Studies Program., Social and Economic Studies: Final rept. National Research Council. Washington, DC.

ABSTRACT:In 1986, the Minerals Management Service requested that the National Research Council (NRC) evaluate the adequacy and applicability of studies conducted in the Environmental Studies Program (ESP), review the general state of knowledge in the appropriate disciplines, and recommend future studies. Under the auspices of the NRC Board on Environmental Studies and Toxicology, the Committee to Review the Outer Continental Shelf Environmental Studies Program was formed to conduct the assignment. The Socioeconomics Panel investigated the main questions of the social and economic relevance of OCS oil and gas activities and the social and economic aspects of ESP. The report presents the findings and recommendations of the Socioeconomics Panel.

KEYWORDS:Socioeconomics; Offshore drilling; Crude oil; Environmental impacts; Socioeconomic factors; Advisory committees; Investigations; Leasing; Natural gas; Sales; Assessments; Requirements; Government policies; Outer Continental Shelves; Ntisnasnrc.

**541.**
Nelson, T.H. 1991. Salt tectonics and listric-normal faulting, pp 73-89. In: Salvador A, (Editor). The Geology of North America, The Gulf of Mexico Basin. J. Geological Society of America, Boulder, CO.

ABSTRACT: None.

KEYWORDS: Geology.

**542.**
Nelson, T.H. and L. Fairchild. 1989. Emplacement and evolution of salt sills in the northern Gulf of Mexico. Bulletin of the Houston Geological Society 32(1):6-7.

ABSTRACT: None.

KEYWORDS: Geology; Atlantic Ocean; Cenozoic; Continental Slope; Diapirism; Emplacement; Evolution; Gulf of Mexico; Intrusions; North Atlantic; Northern Gulf of Mexico; Salt Tectonics; Sills; Structural Geology; Tectonics; Tertiary.

**543.**

Nelson, W.R. and J.S. Carpenter. 1968. Bottom longline explorations in the Gulf of Mexico. Commercial Fisheries Review 30(10):57-62.

ABSTRACT: The exploratory fishing vessel OREGON II made its first cruise to investigate bottom fish stocks in water depths of 50 to 200 fathoms. The objectives of this cruise were to determine the availability of deepwater bottom fish to longline gear, and to evaluate the commercial feasiblity of this gear. Fishing was conducted off Texas and Lousisana, the northern edge of the Campeche Bank, the west coast of Florida, and in the northern gulf from Cape San Blas, Florida to the mouth of the Mississippi river. The commerically important species most frequently collected was the tilefish *Lopholatilus chamaeleonticeps.* Tilefish were caught at all fishing areas; catches were made in water depths of 90 to 225 fathoms where water temperatures ranged from 55 to 57 F. Other commercially important species caught included yellowedge grouper (*Epinephelus flavolimbatus*), warsaw grouper (*Epinephelus nigritus*), and gray tilefish (*Caulolatilus* spp.). Sharks were the most abundant group caught representing 32% of the total catch from all fishing areas. Most sharks caught were dogfish (*Squalus* spp.; *Centrophorus* spp.) or smoothounds (*Mustelus* spp.). The 100 fathom depth offshore of Texas proved to be the most productive longline fishing area for tilefish and groupers.

KEYWORDS: Fisheries; demersal fishes; Gulf of Mexico; exploratory fishing; commercial species; tilefishes; groupers.

**544.**

Neurauter, T.W. and W.R. Bryant. 1990. Seismic expression of sedimentary volcanism on the continental slope, northern Gulf of Mexico. Geo-Marine Letters 10(4):225-231.

ABSTRACT: Defines acoustically amorphous, mounded structures on the upper, middle, and lower continental slopes of the northern Gulf of Mexico. Shows gassy sediments, sometimes in hydrated form and, in places, as chemosynthetic communities. -from Authors.

KEYWORDS: Geology; Seabed; Continental Slope; Carbonate; Gassy Sediment; Mud Diapir; Sedimentary Volcanism; Diapirism; Sea Bed; Usa, Gulf of Mexico; Gulf of Mexico.

**545.**

Niiler, P.P. and W.S. Richardson. 1973. Seasonal variability of the Florida Current
. Journal of Marine Research 31(3):144-167.

ABSTRACT: None (French).

KEYWORDS: Physical Oceanography; Florida Current; Ocean Currents; Seasonal Variations; Gulf of Mexico.

**546.**

Nikituk, P.M. and Virginia A. Farris. 1986. OCS National Compendium: Outer Continental Shelf Oil and Gas Information Through 1984. Minerals Management Service, Outer Continental Shelf Oil and Gas Information Program. MMS 86-0017.

ABSTRACT:None.

KEYWORDS:Socioeconomics.

**547.**

Nix, E.R., C.R. Fisher, J. Vodenichar, and K.M. Scott. 1995. Physiological ecology of a mussel with methanotrophic endosymbionts at three hydrocarbon seep sites in the Gulf of Mexico. Marine Biology 122(4):605-617.

ABSTRACT: In situ growth rates were determined, using two, 1-yr mark/recapture experiments, conducted between September 1991 and July 1993, for an undescribed mytilid, Seep Mytilid Ia, at three hydrocarbon seep sites in the Gulf of Mexico. The sites are located at depths of 540 to 730 m, approximately 27 degree 45'N; 91 degree 30'W, and are separated by distances of 6 to 18 miles. These seep mytilids harbor methanotrophic endosymbionts and use methane as both a carbon and energy source. The mussel habitats were chemically characterized by analysis of water samples taken from precisely located microenvironments over, among and below the mussels, using small-volume, interstitial water samplers and the Johnson Sea Link submersible. Substantial differences were found in habitat conditions, growth rates, and population structure for the mussels at the three sites examined. The growth rate of these seep mytilids reflects the methane concentration in their immediate habitat. Mussels at sites with abundant methane had growth rates that were comparable to shallow water mytilids at similar temperatures (5 to 8 degree C) with increases in shell length up to 17 mm/yr documented for smaller mussels (<40 mm shell length). In conjunction with measurements of growth rates, three condition indices (glycogen content, tissue water content, and the ratio of ash-free dry weight to shell volume) were used to determine the relationship between the condition of the mussels, their growth rates, and their habitat chemistry. The three condition indices were correlated with growth rate and were often significantly different between mussels in different samples.

KEYWORDS: growth; size distribution; seepages; hydrocarbons; water analysis; symbiosis; glycogen; condition factor; Mytilidae; ASW, Gulf of Mexico; ecophysiology; marine mollusks; methane.

**548.**

Northam, M.A. 1981. The organic geochemistry of lipids extracted from Orca Basin sediment. PhD. Dissertation. University of Texas. Austin, TX.

ABSTRACT: Orca Basin is an anoxic, highly reducing basin of the continental slope of the northwestern Gulf of Mexico. Stable isotope ratios and total organic carbon percentages were determined for subsamples taken from two cores from within the basin and one control core from the perimeter. Results show that the organic carbon content of the basin is consistently 2 to 3 times that of the control core. The Pleistocene-Holocene boundary, indicated by a break in the $^{13}C$ vs. depth profiles, occurs at a greater sediment depth and extends over a greater range in the basin cores than in the control core. A close core subsampling interval has made it possible to detect a fine structure in the $^{13}C$ profiles which may be a record of the effects of a small climatic changes of geologically short duration.^ The total lipid was extracted from subsamples from the control core and one basin core. Results of the compositional analyses show that there are no unusual sources of organic material to this sediment. Lipid concentration, relative to total organic carbon, is 3 to 5 times greater in the surface sediment of the basin than in the control core, indicating increased preservation of this material in the anoxic environment of the basin. The range of stable carbon isotope ratios (isotopic identity) for the total organic carbon, total lipid extract, and lipid fractions was determined for both cores and for representative biogenic source material. Results of these analyses show that the lipid at the surface of the basin core has a greater retention of isotopic identity than at the surface of the control core. This difference is interpreted to show that the lipid material deposited under anoxic conditions is preserved to a greater degree in the sediment than that deposited under normal aerobic conditions. Sediments from two shallower environments, the continental shelf of the Gulf of Mexico and Baffin, Bay, Texas, were also analyzed to determine the effects of water column length on degradation of lipid carbon. Results show that a substantial amount of the isotopic identity of lipid carbon, present in the source material, is lost in the upper water column.

KEYWORDS: Chemistry; Geo.

**549.**
Nowlin, Jr.W.D., A. E. Jochens, R. O. Reid, and S. F. DiMarco. 1998. Texas-Louisiana Shelf Circulation and Transport Study: Synthesis Report, Volume I: Technical Report. Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA MMS 98-0035.

ABSTRACT:None.

KEYWORDS:Physical oceanography.

**550.**
Nowlin, Jr.W.D., A. E. Jochens, R. O. Reid, and S. F. DiMarco. 1998. Texas-Louisiana Shelf Circulation and Transport Study: Synthesis Report,Volume II: Appendices. Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA MMS 98-0036.

ABSTRACT:None.

KEYWORDS:Physical oceanography.

**551.**
Nowlin, W.D.Jr. 1969. Winter circulation patterns and property distributions, pp 3. In: L.R.A. Capurro. Contributions on the Physical Oceanography of the Gulf of Mexico. Volume 2 Gulf Publishing, Houston, Texas.

ABSTRACT: Based on their characteristic properties, the water masses of the Gulf of Mexico and their vertical stratification are discussed. The *T-S* relationships specific to the region are presented. For the basin waters, below a sill depth of about 2000 m, the potential temperature, salinity and dissolved-oxygen concentrations show no measurable horizontal variation, although weak vertical density gradients evidence slight positive stability. Variations in the characteristics of the water in the following layers are shown, and the likely origins of these water masses are identified: North Atlantic Deep Water, Subantarctic Intermediate Water, oxygen minimum layer and Subtropical Underwater. For the winter season, the property distributions in the mixed surface layers are described. On the basis of dynamic computations the GEK measurements, the general winter circulation patterns within the Gulf are examined. The mode most often observed in the eastern Gulf is one dominated by the current Loop Current; water enters through the Yucatan Strait as the Yucatan Current and flows in a clockwise loop which extends well into the Gulf and exits via Florida Strait. The extent of penetration and location of this loop is quite variable. In other seasons, large current rings are known to separate from the Loop Current. In contrast, the winter circulation in the western Gulf seems more predictable; it consists primarily of a clockwise cell centered over the western central Gulf, having broad westward flow for its southern limb, a narrow east northeastward flow for its northern limb and flanked to the north by a southwestward current along the outer Texas-Louisiana shelf.

KEYWORDS: Physical Oceanography.

**552.**
Nowlin, W.D.Jr., D.L. Durham, and R.O. Reid. 1965. A preliminary program of direct current measurements over the northeastern shelf of the Gulf of Mexico,Department of Oceanography and Meteorology, Texas A&M University. College Station, TX65-25-T.

ABSTRACT:None.

KEYWORDS:Physical oceanography.

**553.**

Nowlin, W.D.JrandJ.M. Hubertz. 1969. Contrasting summer circulation patterns for the Eastern Gulf, pp 119. In: L.R.A. Capurro. Contributions on the Physical Oceanography of the Gulf of Mexico. Volume 2 Gulf Publishing, Houston, Texas.

ABSTRACT: The results of two oceanographic surveys of the eastern Gulf of Mexico in June, 1966, and June, 1967, illustrate two contrasting summer circulation patterns of the area and provide the first detailed description of an anticyclonic ring detached from the Loop Current. This ring was observed in 1967 along with part of an older ring which appears to move westward. The transport in the upper 1350 m of the principal ring, as well as the Loop Current in 1966 and 1967, is at least 30 x $10^6$ $m^3$/sec. The potential incipient formation of an eddy is noted in 1966 as a meander of the Loop Current. Water mass analysis indicates that the intermediate and upper waters bounded by the Loop Current and rings are the same as those found in the northwest Caribbean. Water not bounded by these circulations has lesser salinity values at the salinity maximum than the Caribbean water and appears to be formed from the Caribbean mass by vertical mixing along the western edge of the Yucatan Current and over the Campeche Bank. Vertical kinematic sections normal to the ring and Loop Current indicate that the geostrophic speed distributions, relative to 1350 db, observed in 1967 have the same general features as those observed in 1966.

KEYWORDS: Physical Oceanography.

**554.**

Nowlin, W.D.Jr., J. M. Hubertz, and R.O. Reid. 1968. A detached eddy in the Gulf of Mexico. Journal of Marine Research 26(2):185-186.

ABSTRACT: None.

KEYWORDS: Physical oceanography.

**555.**

Nowlin, W.D.J. and C.A. Parker. 1974. Effects of a cold-air outbreak on shelf waters of the Gulf of Mexico. Journal of Physical Oceanography 4(3):467-486.

ABSTRACT: Two surveys of the waters over an area of the continental shelf in the northwestern Gulf of Mexico were made during January 1966. The first observation period was just before a major outbreak of cold, dry air; the second was about 15 days later with the region still under the influence of this outbreak. Waters were well mixed to 100 m, or the bottom in shallower depths. During the 15-day period temperature decreased nearly 5C and salinity increased about 1ppt near the shore. Some 150 mi offshore, temperature decreased only 1-2C and salinity showed no significant change. Study of the change in T-S relationships before and after the outbreak indicates the strong possibility that subsurface water types generally found beneath the Subtropical Underwater core in the Gulf were formed locally over the shelf by evaporation and sensible heat exchange to the atmosphere. For the period between observations, the mean rates of change of vertically-averaged salinity, temperature and heat content were computed. Neglecting advection, the local rate of heat extraction averaged about 400 cal $cm^{-2}$ $day^{-1}$within 50 mi from shore and generally increased to 700-1500 cal $cm^{-2}$ $day^{-1}$at the offshore survey limits. These values agree reasonably well in magnitude and spatial distribution with estimates of heat fluxes using bulk formulas and meteorological data taken during the post-outbreak cruise. Average values of sensible and latent heat fluxes for the region were 255 and 542 cal $cm^{-2}$ $day^{-1}$, respectively, which generally agree with estimates by other workers for outbreak conditions. Such estimates are reviewed.

KEYWORDS: Physical Oceanography; Meteorology; Ocean-Atmosphere System; Air-Sea Coupling; Heat Transfer; Gulf of Mexico.

**556.**

O'Brien, J. J. and R. O. Ried. 1967. The Non-Linear response of a two-layer, baroclinic ocean to a stationary, Axially-Symmetric hurricane: Part I. Upwelling induced by momentum transfer. Journal of the Atmospheric Sciences 24(2):197-207.

ABSTRACT: This study is concerned with the theoretical description of upwelling induced in a stratified, rotating, two-layer ocean by momentum transfer from an intense stationary, axially-symmetric atmospheric vortex. The dynamic internal response of the ocean is assumed to be axially-symmetric which permits consideration of the solution in two independent variables, radial distance and time. Numerical integration via the method of characteristics is utilized to obtain values of radial velocity, tangential velocity, and depth of the upper layer for a period of two days. Transfer of momentum between the air and the sea and between the upper and lower layers are allowed. Transfer of heat and moisture with the atmosphere is not considered. A general model is derived which leads to a hierarchy of models of increasing complexity. The detail solution of the first of these is illustrated. Results agree qualitatively with observations taken in the Gulf of Mexico following Hurricane Hilda, 1964. Intense upwelling is confined to within twice the radius of maximum winds. The displaced warm central waters produce some downwelling adjacent to the upwelled region. The degree of upwelling is time-dependent and the hurricane-force winds must act on the ocean for several hours before significant upwelling occurs. The model indicates a strong coupling of the radially propagating internal wave mode and the vortex mode of the system. This coupling confines the significant internal disturbances to within the wind-forced region.

KEYWORDS: Physical Oceanography.

**557.**

O'Connell, S.B. 1986. Anatomy of modern submarine depositional and distributary systems. PhD. Dissertation. Columbia University. New York.

ABSTRACT: Five submarine depositional and distributary systems in the Gulf of Mexico and in the western Mediterranean were studied using bathymetry, side-looking sonar, reflection seismics and Deep Sea Drilling Project (DSDP) cores. Specific study areas were located in; (a) the distal Mississippi Fan, which includes DSDP Sites 614 and 615, located near the termination of a fan channel; (b) a complex, elongate, distributary system extending from the Ebro Slope and Fan, through the Valencia Valley and out onto the Valencia Fan; and (c) and a segment of the upper Rhone Fan Valley where a channel bifurcation has occurred. The studies were undertaken to learn about the construction of these sedimentary systems, emphasizing the relationship between morphologic expression and depositional processes. Submarine depositional and distributary systems have three basic components; unchanneled deposits, entrenched channels and leveed channels. These components control the overall shape of the system and the system's ability to transport sediment. Unchanneled deposits form at the base of the continental slope and beyond the mouths of slope canyons and distributary channels. These deposits are commonly succeeded by channeled systems. Two major forms of distributary channels are recognized, leveed and entrenched. They may occur in close proximity to one another even within the same channel. The two forms develop in response to changes in: (1) the seafloor and channel gradient, (2) the rate, volume, composition and duration of sediment supply, (3) the activity of any tributaries and (4) the time elapsed since the formation of the channel. With the exception of major instantaneous sediment inputs, the dominant influence on sediment distribution and morphology is the location of the channel. Hence, changes in the channel path affect the location of sedimentation. At least five mechanisms can potentially deflect the channel path: (1) blockage by a deposit from outside of the channel, (2) filling through deposition from intrachannel flows, (3) destruction of the channel wall by intrachannel flows (e.g. crevass splays), (4) cutting of the levees by cross-channel flows, and (5) slumping of the channel margin. Leveed-channel walls, being perched, are vulnerable to degradation. Thus they are more easily redirected to a new course than entrenched channels. The new course, down the former confining levee takes advantage of a gradient that is commonly steeper than that of the original channel. In this manner the locus of sedimentation changes and sediments are distributed to and deposited on new areas of the seafloor.

KEYWORDS: Geology; Deposition; Deep Sea Drilling Project.

**558.**
O'Sullivan, S.O. and K.D. Mullin. 1997. Killer whales (*Orcinus orca*) in the northern Gulf of Mexico. Marine Mammal Science 13(1):141-147.

ABSTRACT: Reliable historical records of killer whales in the Gulf of Mexico consist of few strandings and sightings. The paucity of these records, combined with their wide spatial and temporal distributions made it uclear as to whether killer whales are regular or irregular inhabitants of the Gulf. This paper presents details of historical sightings and recent sightings which were made during systematic shipboard and aerial survey programs which were conducted on the continental shelf and slope of the northern Gulf of Mexico, as well as some opportunistic sightings. All killer whale sightings, except one, occurred between May and September. The sightings were generally oceanic (the depth averaged 1,242 m and ranged from 256 m to 2,652 m) and clumped in distribution south of the Mississippi River delta in the central Gulf. Group sizes averaged 10 individuals and ranged from 1 to 12 individuals. Some individual killer whales which were identifiable from photographs have a wide temporal and spatial distribution in the Gulf. Six individuals have been sighted over a five-year period, with one animal being resighted over 10 years. Some individuals have been sighted in the extreme eastern and western Gulf, at distances of over 1,100 km apart. These sightings indicate that killer whales are not uncommon in the oceanic waters of the Gulf of Mexico. They appear to be, at least seasonally, regular inhabitants across the entire northern Gulf.

KEYWORDS: Endangered Species; Gulf of Mexico; Killer Whales; Sightings.

**559.**
Offshore Engineer. 1999. Lightened tethers give TLP's new life. Offshore Engineer September:31-33.

ABSTRACT: None.

KEYWORDS: Technology.

**560.**
Offshore Technology Research Center . 1999. Annual Report,A report prepared by the Offshore Technology Research Center. Texas A&M University.

ABSTRACT:None.

KEYWORDS:Technology.

**561.**
Offshore Technology Research Center . 1999. Summary of Research Activities,A report prepared for the Annual Industry Workshop by the Offshore Technology Research Center. Texas A&M University.

ABSTRACT:None.

KEYWORDS:Technology.

**562.**
Ortner, P.B., R.L. Ferguson, S.R. Piotrowicz, L. Chesal, G. Berberian, and A.V. Palumbo. 1984. Biological consequences of hydrographic and atmospheric advection within the Gulf Loop Intrusion. Deep-Sea Research 31(94):1101-1120.

ABSTRACT: Dramatic changes in plankton productivity, abundance, vertical distribution, and relative sensitivity to added copper occurred during an 8-day station within the Gulf Loop Intrusion in February 1981. Passage of an atmospheric front associated with a continental high temporarily deepened the mixed layer from 20-40 m to 110-120 m but did not measurably increase inorganic nutrients within it. Primary productivity increased from 14 to 62 mg C m super(-2) h super(-1) and bacterioplankton increased from 4.3 x 10 super(13) to 6.1 x 10 super(13) cells m super(-2). Vertical redistribution of biomass may have decoupled zooplankton grazing from primary production contributing to increases in phytoplankton and bacterioplankton standing stocks. Satellite thermal imagery indicated that the position was well removed from the active field of the Loop Current.

KEYWORDS: Physical Oceanography; biological surveys; vertical distribution; phytoplankton; primary production; abundance; copper; toxicity tests; hydrographic data; advection; atmospheric fronts; intrusions; Gulf Loop Intrusion; Gulf of Mexico.

**563.**
Ortner, P.B., L.C. Hill, and S.R. Cummings. 1989. Zooplankton community structure and copepod species composition in the northern Gulf of Mexico. Continental Shelf Research 9(4):387-402.

ABSTRACT: Zooplankton community structure and copepod species composition are analyzed in samples obtained during spring and winter from three areas of the northern Gulf of Mexico: near the Mississippi River outflow, off Cape San Blas, and in the central Gulf of Mexico. Samples from different regions were distinguishable in correspondence analysis of dominant species and/or functional groups. The near-surface communities of the Mississippi and central Gulf were particularly distinct while Cape San Blas was intermediate in both structure and specific character. Saltier waters directly beneath the Mississippi Plume yielded samples similar to those from near-surface waters well offshore.

KEYWORDS: Water column biology; zooplankton; community composition; species diversity; Gulf of Mexico.

**564.**
Otwell, W.S., J. Bellairs, and D. Sweat. 1984. Initial Development of a Deep-Sea Crab Fishery in the Gulf of Mexico,Florida Sea Grant College. Gainesville, FLNo. 61.

ABSTRACT:The Gulf and South Atlantic Fisheries Development Foundation, Inc. and the Florida Sea Grant College Program funded a one year study beginning May 1, 1982 to demonstrate potential for initiating a deep-sea crab fishery for golden crab (Geryon sp.) in the Gulf of Mexico. The work indicates that a fishery is feasible, yet the recommendations include many cautions unique to this deep-sea crab species.

KEYWORDS:Crabs; Fisheries; Gulf of Mexico; Feasibility; Equipment; Traps; Design; Sampling; Distribution(Property) ; Growth; Marine Biology; Food Habits; Harvesting; Food Storage; Discoloration; Tables(Data); Food Processing; Florida; Geryon; Golden Crabs; Sea Grant Program; Commercial Fisheries; Ntiscomnoa.

**565.**
Paine, W.R. and A.A. Meyerhoff. 1970. Gulf of Mexico Basin: Interactions among tectonics, sedimentation, and hydrocarbon accumulation. Transactions Gulf Coast Association of Geological Societies 20:5-44.

ABSTRACT: The eastern and western carbonate platforms of the Gulf of Mexico have subsided about 5,000 m since the middle part of the Late Jurassic time; about 7,000 m beneath the Isthmian (Isthmus of Tehuantepec) Cenozoic terrigenous clastic sequence south of the Bay of Campeche (in the Northern Central American orogen); and 15,000-16,000 m beneath the Jurassic through Holocene Gulf Coast geosyncline of the northern Gulf rim. Carbonate-platform sequences are present in eastern Mexico (Tamaulipas platform; includes Tampico-Tuxpan and Veracruz basins) and in Yucátan and Florida (Yucátan and Florida platforms), because terrigenous clastic provenances either were not available, or because barriers prevented the transport of terrigenous materials into these regions. In contrast, the terrigenous sedimentary piles of the Isthmian basin and Gulf Coast geosyncline regions had important provinces for terrigenous debris. The Isthmian section differs from that of the Gulf Coast geosyncline because (1) the provenance and, therefore, the sediment supply was smaller, and (2) the Cenozoic basin is part of an orogenic belt. In contrast to the Isthmian region, the provenance area for the Gulf Coast geosyncline is huge, and the basin is on a stable continental margin, well removed from active orogenic belts. The central orogenic plate of the Gulf of Mexico sank at the same time and at about the same rate as its margins. This conclusion is substantiated by several observations. (1) Seismic data suggest that the Mohorovièiæ discontinuity is at least 17-18 km below sea level. (2) The same seismic data show that a minimum thickness of 5,000 m of sedimentary strata is present beneath the Gulf of Mexico floor. This amount is 5 to 10 times the normal thickness of sediments on oceanic crust. (3) The "normal" depth of an oceanic abyssal plain is 5,000 m, yet the depth of the Sigsbee Abyssal Plain is only 3,500 m below s.l. Thus the base of the sedimentary column at the Gulf center is about 8,500 m below s.l. If the "normal" abyssal plain depth is assumed to have prevailed once in the Gulf, one may subtract the figure of 5,000 m from 8,500 m and arrive at a minimum pf about 3,500 m subsidence for the center of the Gulf. However, seismic data suggests that the average sediment thickness beneath the Gulf exceeds 6,500 m and locally reaches 9,000 m. If the 6,500-m figure is used, the Gulf has subsided at least 5,000 m, or about the same amount as the carbonate platform areas on the eastern and western margins of the deep basin. This amount of subsidence shows that the Gulf was an oceanic basin during Late Jurassic time. One must accept this choice, assume that the Gulf was 8,500-10,000 m deep during the Late Jurassic time, or adopt the position that its subsidence rate has been about twice that of the surrounding land areas. The simple geometric argument presented here to show that the Gulf most probably has been oceanic from Late Jurassic to the present time is supported strongly by the geology of the surrounding continental areas. Subsurface and surface data indicate that the Gulf is at least as old as Late Mississippian-Early Pennsylvanian. New data just obtained from the deep Gulf support this minimum date. The writers believe that the Gulf basin has been an oceanic plate since the beginning of earth history. The much greater subsidence of the Gulf's northern margin resulted from the huge accumulation of sediments along that margin. This much greater subsidence beneath the Gulf Coast geosyncline imparts to the Gulf oceanic plate and the Mohorovièiæ discontinuity an overall northward tilt. Yet the flanking Yucátan and Florida platforms on the east and Tamaulipas platform on the west show no conspicuous northward tilt. This fact indicates that a hinge-type, north-south-oriented, scissorslike, differential movement has taken place along the western and eastern flanks of the deep Gulf basin. This movement presumably is manifested now by the Florida scarp, the western Campeche scarp, DeSoto and Campeche Canyons, and the north-south belt of salt-anticline ridges along the western side of the Gulf. This same hypothesis and the predominance of clastic depostition explain the markedly different topography of the northern margin of the Gulf and along the southern side of the Bay of Campechethe two prominent "hummocky" topography zones of the Gulf Mexico. Very large and substantial petroleum reserves remain to be found and exploited in this region. Some of them are not exploitable at present, but ultimately the technology to drill commercial wells in very deep water will be developed, and the petroleum reserves of the continental slopes will be produced. Among the many trends which remain to be tested and exploited are the post-Ouachita facies Paleozoic marine strata of the northern Gulf and the area north of the Northern Central American orogen. Mesozoic reefs, atolls, and carbonate banks still are only partly tested. Late Tertiary and Quaternary reserves of the northern Gulf and the southern part of the Bay of Campeche still must be drilled and exploited. The two "hummocky" zones of the continental slope offer particular promise. Finally, the diapiric structures of the deep Gulf and the salt ridges of the western Gulf must be tested thoroughly, though at present they are not economic objectives.

KEYWORDS: Geology.

**566.**
Paine, W.R. and A.A. Meyerhoff. 1970. Gulf of mexico basin - interactions among tectonics, sedimentation, and hydrocarbon accumulation. American Association of Petroleum Geologists Bulletin 54(9):1788-1789.

ABSTRACT: None.

KEYWORDS: Geology; Atlantic Ocean; Basin; Basins; Economic Geology; Future Possibilities; Gulf of Mexico; Hydrocarbon Accumulation; Late Jurassic; North Atlantic; Oceanic; Petroleum; Sedimentation; Structural; Structural Geology; Subsidence.

**567.**
Paluszkiewicz, T., L.P. Atkinson, E.S. Posmentier, and C.R. McClain. 1983. Observations of a Loop Current frontal eddy intrusion onto the West Florida shelf. Journal of Geophysical Research 88(C14): 9639-9651.

ABSTRACT: Hydrographic and satellite data from the west Florida shelf between April 1-7, 1982 showed the intrusion of a Loop Current frontal eddy onto the shelf. Data were examined to describe the structure of this feature and study effects of its intrusion on water masses in the outer shelf region. A frontal eddy, consisting of a warm filament separated from the main current by a region of cooler water, propagated southeastward at 30 cm/s intruding onto the shelf near 26 degree N between April 4 and 6. Temperature-salinity (T-S) properties revealed that water in the filament was Loop Current water that had been contiguous with 80 m deeper Loop Current water in the main body of the current; water in the cold region was Continental Edge water, a transitional water mass with cooler, fresher T-S characteristics. Upwelling of deeper Loop Current water occurred under this region, and elevated nutrient concentrations were found in the upwelled dome under the cold region.

KEYWORDS: Physical Oceanography; oceanic eddies; ocean circulation; eddies; continental shelves; current observations; Gulf of Mexico.

**568.** Paskausky, D. F. 1971. Numerically predicted changes in the circulation of the Gulf of Mexico accompanying a simulated hurricane passage. Journal of Marine Research 29(3).

ABSTRACT: To obtain a quasi-state basic circulation pattern for the Gulf of Mexico, a barotropic prognostic numerical model, with no changes in input conditions and with sufficient friction, has been used. It has been found that a simulated hurricane that would theoretically pass across the Gulf of Mexico from the Yucatan Strait to a point just east of the Mississippi Delta would generate a two-centered cyclonic flow region in the western Gulf waters, with a remnant of the steady-state anticyclonic flow in the northwestern corner. The passage of such a hurricane would cause the loop current to extend into the region west of Florida, where a closed anticyclonic flow is generated. The planetary vorticity would cause a westward migration of the lows as well as a migration of the high from the Florida shelf into the loop current; subsequently, an anticyclonic eddy would break off from the loop and migrate westward. The friction and advection of vorticity through the Florida Strait dissipate the extra energy supplied by the storm; the flow would eventually return to the quasi-steady state.

KEYWORDS: Physical Oceanography.

**569.**
Pattison, M.L. 1977. Socioeconomic Impacts of Outer Continental Shelf Oil and Gas Development: a Bibliography,U.S. Department of the Interior, Geological Survey.

ABSTRACT:None.

KEYWORDS:Socioeconomics.

**570.**
Paull, C.K., J.R. Chanton, A.C. Neumann, J.A. Coston, and C.S. Martens. 1992. indicators of methane-derived carbonates and chemosynthetic organic carbon deposits: examples from the florida escarpment. Palaios 7(4): 361-375.

ABSTRACT: Abyssal chemosynthetic communities are supported by bacterial oxidation of reduced chemicals in brines which seep out through sediments at the base of the Florida Escarpment. They are surrounded by carbonate hardgrounds and sediments rich in fresh organic carbon that contain a record of the metabolic pathways and geochemical processes which are active at these sites. -from Authors.

KEYWORDS: Seep: Cold ; Methane ; Isotopic Indicator ; Chemosynthetic Communities; Organic Carbon; Gulf of Mexico; Florida Escarpment.

**571.**
Paull, C.K., B. Hecker, R. Commeau, R.P. Freeman-Lynde, C. Neumann, W. Corso, S. Golubic, J.E. Hook, E. Sikes, and J. Curray. 1984. Biological communities at the Florida Escarpment resemble hydrothermal vent taxa. Science 226(4677):965-967.

ABSTRACT: Dense biological communities of large epifaunal taxa similar to those found along ridge crest vents at the East Pacific Rise were discovered in the abyssal Gulf of Mexico. These assemblages occur on a passive continental margin at the base of the Florida Escarpment, the interface between the relatively impermeable hemipelagic clays of the distal Mississippi Fan and the jointed Cretaceous limestone of the Florida Platform. The fauna apparently is nourished by sulfide rich hypersaline waters seeping out at near ambient temperatures onto the sea floor.

KEYWORDS: epifauna; community structure; Gulf of Mexico, Florida Escarpment; hydrothermal vents; hydrothermal springs; marine organisms; ASW, Gulf of Mexico, Florida Escarpment; abyssal zone; community composition.

**572.**
Paull, C.K., A.J.T. Jull, L.J. Toolin, and T. Linick. 1985. Stable isotope evidence for chemosynthesis in an abyssal seep community. Nature 317(6039):709-711.

ABSTRACT: Organisms which surround saline seeps were analyzed to determine the origin of the local food chain. The tissues have extremely negative delta super(13)C (-42 to -77% PDB) and delta super(15)N N (-2.72 to -9.34ppt air) values. Such highly fractionated carbon and nitrogen isotopes are unknown in food chains based on photosynthesis, suggesting that these communities are chemosynthetic. The cause of this extreme fractionation is attributed either to assimilation from local supplies of isotopically depleted methane and ammonium or to biochemical fractionation. The tissues of these animals contain significant amounts of super(14)C ( similar to 60% modern), so the source of this fractionated carbon is not predominantly fossil methane. Communities of abundant organisms, similar to those which surround the hydrothermal vents of the East Pacific Rise (EPR), occur in 3,266 m of water in the Gulf of Mexico. They were discovered with the Alvin at 26 degree 02' N, 84 degree 55' W in an area where pore waters seep from the Cretaceous limestones of the adjacent platform at the contact between the Florida Escarpment and the Holocene hemipelagic sediments of the Abyssal Gulf. Because of the unusual abundance of organisms in this deep-sea environment, and the taxonomic similarities to the chemosynthetically based communities which surround the hydrothermal vents on the EPR, the seep communities are suspected to exist on a local non-photosynthetic food source. (DBO).

KEYWORDS: food chains; trophic relationships; biochemical composition; body organs; chemosynthesis; hydrothermal springs; marine organisms; ASW, Gulf of Mexico.

**573.**
Pequegnat, L.H. 1970. A study of deep-sea caridean shrimps (Crustacea: Decapoda: Natantia) of the Gulf of Mexico. Texas A&M University.

ABSTRACT: A taxonomic and zoogeographic study was made of deep-sea carideans (Crustacea: Decapoda: Natantia) from the Gulf of Mexico below 100 fathoms, excluding the family Oplophoridae. Specimens were examined from the Texas A&M University R/V ALAMINOS 1964-69 explorations in the Gulf of Mexico. Thirty-six species in eight families are covered. Of these, 29 species, representing 13 new records and six previously undescribed species, were collected during the Texas A&M University R/V ALAMINOS explorations in the Gulf of Mexico from 1964 to 1969. The new species described from this study are *Nematocarcinus acanthitelsonis*, *Bathypalaemonella serratipalma*, *B. texana*, *Parapandalus willisi*, *Plesionika polyacanthomerus*, and *Sabinea tridentata* (Pequegnat, 1970, in press). Synonyms, previous Gulf of Mexico records, ALAMINOS material, diagnosis, description, size, type specimen information, and distribution are presented for each species. Keys are provided for the identification of families, genera, and species of deep-sea Gulf of Mexico carideans.

KEYWORDS: Biology.

**574.**
Pequegnat, W.E. 1972. A deep bottom current on the Mississippi cone. Contributions on the physical oceanography of the Gulf of Mexico. 2. Texas A&M University Oceanographic Studies,

ABSTRACT: A preliminary study of a swift bottom current discovered from biological evidence in the eastern Gulf of Mexico has been carried out by means of cameras and current meters. Studies thus far have been confined to the Mississippi Cone at depths between 3000-3300 m. Short time series measurements made from an anchored vessel and an independently mounted current meter yield current speeds up to 19 cm/sec. These values are compared with ripple marks, lineations, scour and other manifestations of bottom currents in photographs. Observations were made in close geographical proximity from 1967 to 1969. It is proposed that this current be named the East Gulf Deep Bottom Current.

KEYWORDS: Physical Oceanography.

**575.**
Pequegnat, W.E., W.R. Bryant, A.D. Fredericks, T.R. McKee, and R. Spalding. 1972. Deep-Sea Ironstone Deposits in the Gulf of Mexico. Journal of Sedimentary Petrology 42:700-710.

ABSTRACT: A silty ironstone (up to 47 percent Fe by dry weight) of unique type was dredged by the Texas A+M University research vessel Alaminos from 16 locations in deep water of the Gulf of Mexico. The most extensive known development of this ironstone is on the eastern part of the Mississippi Fan at depths around 3,200 m. This development probably owes its existence to the concurrence here of a swift bottom current and high concentrations of dissolved oxygen. Present evidence indicates that undisturbed ironstone forms a crust at the water-sediment interface. (Author).

KEYWORDS: Geology; Ocean Bottom; Iron; Minerals; Mexico Gulf; Ocean Bottom Sampling; Sedimentation; Silt; Deep Water; Sea Water; Interfaces; Ocean Currents; Reprints; Ntisn.

**576.**
Pequegnat, W.E., R.M. Darnell, B.M. James, E.A. Kennedy, and L.H. Peguegnat. 1976. Ecological Aspects of the Upper Continental Slope of the Gulf of Mexico.

ABSTRACT:This report describes the faunal assemblages of the deep-water benthic communities associated with the upper continental slope of the northern Gulf of Mexico, primarily in the area between Brownsville, Texas, and Cape San Blas, Florida.

KEYWORDS:Chemistry; Ecology; Marine biology; Oceanographic data; Gulf of Mexico; Continental slopes; Benthos; Physical properties; Sea water; Distribution(Property); Abundance; Mathematical models; Fisheries; Nekton; Marine geology; Sedimentation; Geomorphology; Pelagic zone; Plankton; Zooplankton; Invertebrates; Marine fishes; Florida; Texas; Outer Continental Shelves; Species Diversity.

**577.**
Pequegnat, W.E., B.J. Gallaway, and L.H. Pequegnat. 1990. Aspects of the ecology of the deep-water fauna of the Gulf of Mexico. American Zoologist 30(1):45-64.

ABSTRACT: Recent transects across the continental slope off western Louisiana, the Mississippi River delta, and the Florida peninsula in the general depth range of 300-3,000 m have provided information on habitat variables and on faunal composition, density, and depth zonation. In the meiofauna (retained by 63 mu m screens) nematodes, harpacticoid copepods, nauplii, polychaetes, ostracods, and kinorynchs were numerically dominant, in that order, and together these groups made up 98% of the fauna. The macrofauna (retained by 0.3 mm screens) was dominated by polychaetes, ostracods, bivalves, tanaids, bryozoans, and isopods in that order, and together these made up 86% of the fauna. Densities of both groups were highest on the Central Transect, and densities of both tended to decrease with depth. Between the depths of 300 m and 3,000 m there was a threefold decrease in meiofaunal and a twofold decrease in macrofaunal density.

KEYWORDS: zoobenthos; marine fish; biocoenosis; vertical distribution; ASW, Gulf of Mexico; deep water; population density; zonation; meiofauna; macrofauna; deep sea; Gulf of Mexico; Community Composition.

**578.**
Pequegnat, W.E., B.M. James, A.H. Borma, W.R. Bryant, and A.D. Fredericks. 1972. Photographic study of deep-sea environments of the Gulf of Mexico., pp 67-75. In: Henry VJ, R. Rezak. Contributions on the Geological and Geophysical Oceanography of the Gulf of Mexico. Gulf Publishing Company, Houston, TX.

ABSTRACT: This chapter presents a series of bottom photographs taken aboard *Alaminos* in various geographic subdivisions of the Gulf of Mexico. The pictures were selected to portray similarities and differences existing within bathymetric limits and physiographic provinces of the Gulf and to document a variety of influences that animals have on sedimentary conditions. For the most part the photographs illustrate the deeper parts of the Gulf from the upper continental slope to the Sigsbee Abyssal Plain. The authors speculate on the causes of several ichnological phenomena observed in the photographs.

KEYWORDS: Biology.

**579.**
Pequegnat, W.E. and L.M. Jeffrey. 1979. Petroleum in Deep Benthic Ecosystems of the Gulf of Mexico and the Caribbean Sea. Contr.Ibutions in Marine Science 22:63-75.

ABSTRACT: From 1967-73, some 74 bottom samples of tar were collected in the Gulf of Mexico and in the Caribbean as part of Texas a&m Univ.'s biological sampling program. Gas chromatography analyses of the tar samples showed that there were no volatile hydrocarbons in the range of carbon10-carbon40. However, the tar samples were highly asphaltic, low in parafins, and unusually high in sulfur, vanadium, and nickel. These bottom tars are probably residues of a highly asphaltic petroleum or asphalt that may have been weathered by chemical and biological means over a long period of time. Biological utilization of the tar by bottom fauna was also examined.

KEYWORDS: Chemistry; Marine Pollution, Natural; Marine Organisms; Pelagic Zones; Pollution Benefits; Marine Plants; Sediment; Sulfur; Vanadium; Nickel; Hydrocarbons, Water; Benthic Communities; Gulf of Mexico; Caribbean Sea.

**580.**
Pequegnat, W.E.andL.H. Pequegnat. 1970. Station list for benthic and midwater samples taken by R/V Alaminos 1964 to 1969, pp 1-16. In: Pequegnat WE, F.A. Chace Jr, (Editors). Contributions to the biology of the Gulf of Mexico. Gulf Publishing Company, Houston, TX.

ABSTRACT: None.

KEYWORDS: Biology; skimmer; Benthos; midwater.

**581.**
Pequegnat, W.E., L.H. Pequegnat, J.A. Kleypas, B.M. James, and E.A. Kennedy. 1983. Ecological Communities of the Continental Slope and Adjacent Regimes of the Northern Gulf of Mexico., Executive Summary. Minerals Management Service, Metairie, LA. Gulf of Mexico OCS Regional Office.

ABSTRACT:This report presents a comprehensive overview of the deep sea benthic environment of the Gulf of Mexico from the continental slope to the abyssal plain. Interpretations of biological communities are based on the analysis of a series of deep sea macroinfaunal and megaepifaunal samples and accompanying photographic documentation taken in the period 1964-1973. Sampling emphasized such prominent Gulf features as the Desoto Canyon, Mississippi Trough, and Alaminos Canyon; much of Mississippi Fan; and the Sigsbee Abyssal Plain. As a part of this summary an assessment of the significance of potential impacts from oil and gas exploration and production on the macrobenthic communities was provided.

KEYWORDS:Marine biology; Animal ecology; Continental slopes; Gulf of Mexico; Deep water; Monitoring; Aquatic animals; Crustacea; Marine fishes; Echinodermata; Mollusca; Worms; Environmental impacts; Offshore drilling; Crude oil; Underwater photography; Food habits; Ntisdilmla.

**582.**
Pequegnat, W.E., L.H. Pequegnat, J.A. Kleypas, B.M. James, and E.A. Kennedy. 1983. Ecological Communities of the Continental Slope and Adjacent Regimes of the Northern Gulf of Mexico,Final Report: Text, Photographic Atlas, and Appendices. Minerals Management Service, Metairie, LA. Gulf of Mexico OCS Regional Office.

ABSTRACT:This report presents a comprehensive overview of the deep sea benthic environment of the Gulf of Mexico from the continental slope to the abyssal plain. Interpretations of biological communities are based on the analysis of a series of deep sea macroinfaunal and megaepifaunal samples and accompanying photographic documentation taken in the period 1964-1973. A description and discussion of the ecological nature and distribution of the macroepibenthic assemblages is presented. A photographic atlas provides photodocumentation of the nature of the benthic environment within which these assemblages exist. As a part of this summary an assessment of the significance of potential impacts from oil and gas exploration and production on the macrobenthic communities was provided.

KEYWORDS:*Animal ecology; Marine biology; Continental slopes; Gulf of Mexico; Atlases; Monitoring; Aquatic animals; Crustacea; Marine fishes; Echinodermata; Mollusca; Environmental impacts; Offshore drilling; Crude oil; Underwater photography; Distribution(Property); Abundance; Ntisdilmla.

**583.**
Perlmutter, M.A. 1985. Deep water clastic reservoirs in the Gulf of Mexico; a depositional model. Geo-Marine Letters 5(2):105-112.

ABSTRACT: Relates deposition of thick sand sequences to episodes of high volume Mississippi River discharge. Coarse sand units are deposited by turbidity currents as submarine fans on the lower slope and in the deep basin during periods of rapid glacial melting. These sands are predicted to be more extensive and cleaner than those deposited under glacial and interglacial conditions. -from Author.

KEYWORDS: Geology; Geology; sediments; turbidity currents.

**584.**
Peterson Jon C and W. Hoggard. 1996. First sperm whale (Physeter macrocephalus) record in Mississippi. Gulf Research Reports 9:215-217.

ABSTRACT: A sperm whale (Physeter macrocephalus) stranded on the south shore of Horn Island, Mississippi, represents the first record of this species in the state. The specimen, a neonate female, was euthanized at the stranding site. Tissue samples, blood samples, and stomach contents were analyzed following gross necropsy.

KEYWORDS: Endangered Species; Biogeography ; Gulf Of Mexico; Sightings; Marine Ecology; Physeter macrocephalus.

**585.**
Phleger, F.B. 1967. Some problems in marine geology, Gulf of Mexico. Transactions Gulf Coast Association of Geological Societies 17:173-178.

ABSTRACT: The geologic history, or paleoceanography, of a marine basin such as the Gulf of Mexico is interpreted primarily from the sedimentary record. Many basins research problems in sedimentology can be profitably studied in the Gulf because much descriptive work already has been done, and it is a relatively small marine basin which is easily accessible. Some problems in transport of detrital sediment are 1) possible by-passing of coastal lagoons and 2) the lack of modern cycle detrital sediment on much of the outer continental shelf. Is the modern sediment which reaches the open ocean being trapped in many places on the inner continental shelf? If so, how can the post-glacial deposits in the Sigsbee Deep be explained? Is this deep basin sediment by-passing the outer shelf, and if so, what is the mechanism of transport? The rate of supply of organic debris to the Gulf sediments depends on the rate of organic production. High organic production near river effluents and in hypersaline lagoons deserves further investigation. The rate of supply of organogenic calcium carbonate from planktonic organisms and the rate of solution of calcium carbonate are of special interest. An understanding of shelf-edge calcareous reefs may have far-reaching implications. An understanding of marine processes which affect the characteristics and distribution of sediments will require observations and analyses by new techniques.

KEYWORDS: Geology.

**586.**
Planning Center, I. 1982. Louisiana Impacts of Declining OCS Petroleum Production: a Scoping Study,Louisiana Geological Survey, Louisiana Department of Natural Resources.

ABSTRACT:None.

KEYWORDS:Socioeconomics.

**587.**
Plaquemines Parish Study Team. 1996. Plaquemines Parish Challenges and Opportunities: an Economic Development Assessment, Coastal Economic Strategy Series,Louisiana Sea Grant College Program , Louisiana State University. Baton Rouge, LA.

ABSTRACT:None.

KEYWORDS:Socioeconomics.

**588.**
Porier, N. and V. Alary. 1998. Flow enhancement methods for deep water risers. Conference Paper Presented at Deep Offshore Technology, New Orleans, LA 17-19 Novemeber 1998 .

ABSTRACT: None.

KEYWORDS: Technology.

**589.**
Posey, H.H. and J.R. Kyle. 1988. Fluid-rock interactions in the salt dome environment: an introduction and review. Chemical Geology 74(1-2):1-24.

ABSTRACT: Reviews some of the key and more current literature on salt dome geochemistry, fluid convection around salt domes, and fluid-rock interactions within salt and within the salt dome environment. -Authors.

KEYWORDS: Geology; Fluid-Rock Interactions; Salt Dome; Ecosystem; Terrestrial Food Web; Phylogeny; Bacteria; Protozoa; Fungi; Gulf of Mexico.

**590.**
Potts DT, J.S. Ramsey. 1987. A preliminary guide to demersal fishes of the Gulf of Mexico continental slope (100 to 600 fathoms). Mobile, AL: Alabama Sea Grant Extension, Alabama Cooperative Extension Service, Auburn University.
ABSTRACT: None.
KEYWORDS: Fisheries/ demersal fishes/ Gulf of Mexico.

**591.**
Powell, E.N. and H. Cummins. 1985. Are molluscan maximum life spans determined by long-term cycles in benthic communities? Oecologia 67(2):177-182.

ABSTRACT: A greater than average number of life spans coincide with the periods of long-term cycles in marine communities. Gastropods and bivalves are affected differently, longevities being determined by some cycles more than others in each group. There may be selection pressure for life spans slightly longer than the cycle controlling recruitment success and generational replacement.-from Authors.

KEYWORDS: Benthos; molluscs.

**592.**
Powell, E.N. and R.J. Stanton Jr. 1985. Estimating biomass and energy flow of molluscs in palaeo-communities. Palaeontology 28(1):1-34.

ABSTRACT: The reconstruction and interpretation of palaeo-community structure has been based largely on the taxonomic composition and relative abundance of the preserved species. An expanded and more precise understanding of some aspects of the palaeo-community can be deduced from information on the biomass and energy flow of its preserved components. The procedural steps to calculate energy flow in a palaeo-community require as input the size-frequency distribution of each species' population, the size-age relationship for each species, and certain parameters of energy flow that have been measured for living organisms. These parameters are used to: 1) estimate biomass from size, 2) convert biomass into its caloric equivalent, 3) estimate respiration from biomass and age, 4) estimate the energy cost of reproduction from respiration and size at maturity, and 5) calculate total assimilated energy from 2), 3), and 4) above. The quantity of food consumed by an individual or population can also be estimated because ingestion can be estimated from assimilation. These estimates must be summed over the individual's life span rather than evaluated on a yearly time scale, as is normally done in ecologic studies. Therefore, calculations of energy flow may differ substantially from those elucidated in studies of recent communities. The method is used to determine the energy flow in populations of four gastropods and one bivalve from the Stone City Formation (Eocene) of east-central Texas. The relative importance of species differs considerably.

**593.**

Powell, M.A. and G.N. Somero. 1986. Adaptations to sulfide by hydrothermal vent animals: Sites and mechanisms of detoxification and metabolism. Biological Bulletin 171(1):274-290.

ABSTRACT: The detoxification and metabolism of sulfide were studied in three symbiont-containing invertebrates from the deep-sea hydrothermal vents: the tube worm, Riftia pachyptila ; the clam, Calyptogena magnifica ; and the mussel, Bathymodiolus thermophilus . Sulfide oxidizing activities, due to specific sulfide oxidase enzymes, were found in all tissues, with the greatest activities occurring in the symbiont-containing tissues: the trophosome of the tube worm and the gills of the bivalves. Sulfide oxidase activity was correlated with the bacterial content of the tissues. The sulfide oxidases in the outer cell layer(s) of symbiont-free tissues, e.g., body wall muscle of Riftia and foot and mantle of the bivalves, may detoxify sulfide as soon as it enters the body. Sulfide entering the blood in Riftia and Calyptogena may be bound by sulfide-binding factors that transport sulfide to the symbionts and protect against sulfide inhibition of aerobic respiration (via effects on the cytochrome-c oxidase (Cytox) system).

KEYWORDS: animal metabolism; detoxification; sulphides; marine invertebrates; marine molluscs; symbionts; bacteria; Riftia pachyptila; Calyptogena magnifica; Bathymodiolus thermophilus; Hydrothermal Springs.

**594.**

Prager, M. and J. Browder. 1992. An exploratory dynamic surplus-production analysis of the Japanese, Mexican and U.S. longline fisheries for yellowfin tuna in the Gulf of Mexico. Collective Volume of Scientific Papers. International Commission for the Conservation of Atlantic Tunas 39(1):78-87.

ABSTRACT: Japan, Mexico, and the US have all pursued longline fisheries for yellowfin tuna (Thunnus albacares) in the Gulf of Mexico in the past 3 decades. Available catch and effort data were analyzed with a dynamic (non-equilibrium) logistic production model that estimates common parameters for the 3 fisheries and separate catchability coefficients. Statistical distributions of quantities of interest were derived from a bootstrap. The optimal solution estimated an intrinsic rate of increase for the stock of r = 0.52, which corresponds to a sustainable fishing mortality rate of F = 0.26. This appears too low for a dynamic species like yellowfin tuna. Further examination of the results suggested that the data by themselves cannot determine unique estimates of MSY and related quantities. The working hypothesis that r lies between 1.5 and 3; i.e., that the sustainable fishing mortality rate F sub(MSY) is between 0.75 and 1.5 (in biomass) per year was adopted. The corresponding range of estimates for MSY is 8,969 MT to 13,550 MT per year. Although of heuristic value, these estimates are extremely imprecise and must be considered exploratory.

KEYWORDS: Fisheries; tuna Fisheries; longlining; catch-effort; stock assessment; potential yield; mathematical models; Thunnus albacares; Gulf of Mexico.

**595.**
Prichard, R.M., K.P. DeJohn, P. Farrell, C. Baggs, and D. Harris. 1996. Pompano subsea development Production control system and umbilicals. Proceedings of the Annual Offshore Technology Conference 4:525-535.

ABSTRACT: BP Exploration's Pompano subsea development is a deepwater subsea production project in the Gulf of Mexico. There were various operational and technological challenges which had to be addressed to configure a subsea control system to operate effectively, to be installed and maintained effectively in deepwater, and to do so with the minimization of cost and risk. Through testing and analysis, benchmarks were developed, which were used to monitor the system performance and provide a powerful analytical tool for this remote system. Another significant feature of the program which greatly reduced risk on costs and time scale, was the contracting style adopted. The control system vendor (GEC-Marconi), as well as other key contractors, were involved at the early project definition phase. This provided assistance to BPX in optimizing their field development plan and enabled the key contractors to closely identify with BPX's needs, as well as developing an integrated working relationship. This enabled overall system optimization to occur, while minimizing risks at interfaces. The high-cost, detailed implementation phase of the project was extremely fast track.

KEYWORDS: Offshore oil well production; Oil field development; Offshore pipelines; Integrated control; Project management; Industrial relations; Cost effectiveness; Risk assessment; Optimization; Petroleum pipelines; Subsea control systems; Remotely operated vehicles (ROV).

**596.**
Prior, D.B. and Coleman J.M. 1980. Sonograph mosaics of submarine slope instabilities, Mississippi River Delta. Marine Geology 36(3-4):227-239.

ABSTRACT: New sonographs were acquired from an area of the Mississippi delta-front slope in water depths of 10-50m. The sonographs are free from scale distortions, and tonal and textural patterns indicate considerable topographic variety, including subparallel scarps, blocky areas enclosed by scarps, elongate sinuous channels, depositional lobes, and collapse depressions. These are interpreted as the results of various types of subaqueous mass movement. The first-ever composite sonograph mosaics of submarine slope instabilities represent both internal feature detail and spatial associations. -from Authors.

KEYWORDS: Geology.

**597.**
Prior, D.B., E.H. Doyle, and M.J. Kaluza. 1989. Evidence for sediment eruption on deep sea floor, Gulf of Mexico. Science 243(4890):517-519.

ABSTRACT: A large crater has been discovered on the sea floor, Gulf of Mexico, in a water depth of 2176 meters. Deep-tow high-resolution imagery shows that the crater is cut into a low hill surrounded by near-surface concentric faults. Approximately 2 million cubic meters of ejected sediment forms a peripheral debris field. The low hill and faults may be related to mud diapirism or intrusion of gas hydrates into near-surface sediments. A recent eruption evacuated sediments from the crater, apparently because of release of overpressured petrogenic gas.

KEYWORDS: submarine scarps; acoustic images; submarine volcanoes; ASW, Gulf of Mexico; sediment structure; mud; Bottom Topography.

**598.**
Prior, D.B. and J.N. Sushayda. 1979. Submarine mudslide morphology and development mechanisms, Mississippi delta. Proceedings of the 11th Annual Offshore Technology Conference 2: 1055-1061.

ABSTRACT: Continued data acquisition from the Mississippi delta-front slopes has allowed more detailed evaluation of mudslide morphology. Subsidence source bowl geometry appears consistent with a retrogression model, suggesting that they enlarge and develop upslope by a process of strain remolding following initial failure. Transport chutes have characteristics that suggest plug flow, and this is evaluated using a model developed for subaerial debris flows. Undrained loading in the down-slope depositional zones provides a mechanism to explain lobe progradation. A development sequence for mudslide evolution and elongation is outlined, consisting of three major stages: initial failure, retrogression and progradation, and loading and downslope propagation. The main implications for offshore engineering are that design criteria should acknowledge the site-specific characteristics of mudslides. 16 refs.

KEYWORDS: Geology; Ocean Engineering; Geology; Subsequeous; Offshore Structures; Soils; Mudslide Morphology; Marine Soils.

**599.**
Prior, D.B. and J.M. Coleman. 1978. Disintegrating retrogressive landslides on very-low-angle subaqueous slopes, Mississippi delta. Marine Geotechnology 3(1):37-60.

ABSTRACT: Side-scan sonar records from the interdistributary bay areas of the Mississippi delta have shown widespread subaqueous disturbance of the bottom sediments. These occur in shallow water and on slopes with very low inclinations (0. 01 DEGREE -0. 45 DEGREE ). The morphology of the features is indicative of mass movement processes involving subsidence and downslope translatory movements. The precise conditions under which failure occurs have not been fully documented, but a concptual model of potential factor interaction can be formulated. 22 refs.

KEYWORDS: Geology; Landslides; Mississippi; Rivers; Estuaries; Geology; Engineering.

**600.**
Prior, D.B. and J.M. Coleman. 1982. Active slides and flows in underconsolidated marine sediments on the slopes of the Mississippi delta. Marine Slides and Other Mass Movements (Proceedings of a NATO Workshop). NATO Conference Series, (Series) 4New York, Plenum Press.

ABSTRACT: None.

KEYWORDS: Geology/ Geology/ Subaqueous/ Rapid Progradation and Deposition/ Interstitial Methane Gas/ Sediment Instability Processes/ Geologic and Geophysical Surveys of Subaqueous Delta/ Bottom Morphology Mapping/ Collapse Depressions/ Bottleneck Slides, Shallow Rotational Slides/ Mudflow Gullies, Overlapping Mudflow Lobes Faults/ Deltaic Proceses/ Generation of Excess Pore Pressures by Rapid Sedimentation, Wave Induced Stresses, Slope Oversteepening.

**601.**
Radicioni, A., D'Alosio G., and A. Baker. 1998. CoSSP: A configurable Subsea Separation and Pumping System for Water Removal and Disposal. Proceedings of the 10th Deep Offshore Technology Conference .

ABSTRACT: None.

KEYWORDS: Technology.

**602.**
Rainwater, E.H. 1967. Resume of Jurassic to Recent sedimentation history of the Gulf of Mexico Basin, pp 179-210. Symposium on the geological history of the Gulf of Mexico, Antillean-Caribbean region. 17. Transactions - Gulf Coast Association of Geological Societies,

ABSTRACT: The Gulf of Mexico Basin extends about 1,100 miles east-west and 1,300 miles north-south. The oldest sediments which are part of the basin fill are probably of Triassic age. They are confined to narrow grabens which are present along the basin margin and also farther into the basin. These sediments lie on Precambrian and Paleozoic igneous and metamorphic rocks, and also on Paleozoic sedimentary rocks. It was during the Upper Jurassic that thick and extensive salt deposits were precipitated in the grabens which had limited connection to the sea. General subsidence brought a shallow sea over much of the basin shortly after the salt was formed, and Upper Jurassic limestone was deposited in all margins of the basin. Before the end of Jurassic, sediments from rising land masses reached the northern and western edge of the basin. The sea expanded even more during Lower Cretacceous time, and deposits of carbonates took place to and beyond the borders of the Gulf basin on the west and east. Much land-derived sediment was also deposited along the northern margin of the basin. The sea was restricted on the west but was expanded up the Mississippi Embayment and also across the western plains to connect with the Arctic Ocean during the Upper Cretaceous Period. Limestone, chalk and marl accumulated in this shallow epicontinental sea, and terrigenous clastics were, at times, deposited in coastal plain and shallow, near-shore environments along the northern and western margins of the basin. The ancient Gulf began to be restricted to the north and west at the end of the Cretaceous. The Laramide orogeny elevated much of the North american continent, and sediments from these land areas were brought to the Gulf Basin throughout the Tertiary and Quaternary. There were many pulses of uplift of the hinterland; the basin was continuously subsiding. The shoreline position in this clastic province fluctuated greatly so that there were many major transgressions and regressions of the sea. However, the sediment supply was greater than subsidence, with the result that each formation was deposited farther seaward than the preceding ones. The eustatic rise of sea level, at the end of the Pleistocene Period brought the northern Gulf over the continental shelf. In the shallow marine platforms of the southeastern Gulf, there was continuous deposition of limestone. Sedimentation is taking place today in many environments in the Gulf of Mexico Basin. Study of these Recent sediments and the associated faunas has provided criteria for determining the depositional history of the Gulf Basin and many other basins. The outcrop, thickness, generalized lithology and depositional environments are shown by maps and columnar sections for the Lower Cretaceous, Upper Cretaceous, Paleocene, Lower Eocene, Middle Eocene, Upper Eocene, Oligocene, and Miocene. The Upper Jurassic, Pliocene, Pleistocene and Recent sediments are illustrated with representive columnar sections.

KEYWORDS: Geology; Areal Geology; Atlantic Ocean; Cenozoic; Gulf of Mexico; Gulf of Mexico Basin; Jurassic-Recent History; Mesozoic; North Atlantic; Sedimentation History.

**603.**
Ramberg H. 1981. Gravity, deformation and the earth's crust. In theory, experiments and geological application, second edition. Academic Press London

ABSTRACT: Applies experiments and theory to a wide range of geological and geophysical phenomena in which gravity plays a significant role, ranging from deformation structures in unconsolidated sediments (load casts) to global scale convective processes in the Earth's mantle. Subjects considered include discussion of the theoretical base for the rise of buoyant layers, the spacing of salt diapirs and basement uplifts; the regular distance between volcanic islands in some island arcs; and the presentation of models simulating the rise of magmatic melts through the solid Earth's crust. Basement activation in the core of orogens and the creeping motion of orogenic nappes and thrust sheets, the evolution of continental and oceanic rift systems and the mechanisms of ocean floor spreading are other topics to which careful analysis is applied. Based on work done at the Uppsala Laboratory, the book contains many unique photographs of experimental models of geological structures. All geologists and geophysicists interested in the evolution of the Earth's crust - and particularly researchers and postgraduate students in the tectonics and geodynamics - will find this volume a welcome successor to the first edition. Oil geologists will be interested in many of the structures treated in the book, and planetologists, mechanical engineers, rock mechanics engineers and geological students should find it useful and informative.

KEYWORDS: Geology.

**604.**
Rass, T. 1968. Deep-waters fish of the Caribbean Sea and the Gulf of Mexico, pp 138-139. Symposium on Investigations and Resources of the Caribbean Sea and Adjacent Regions. 18-26 November 1968. Willemstad, Curacao, Netherlands Antilles.

ABSTRACT: The American Mediterranean region is defined as the Gulf of Mexico and the Caribbean Sea, and is extremely rich in abyssal fish species. Though separated from the Atlantic by chains of islands and submarine ridges, its water masses are greatly influenced by the western equatorial currents and are well oxygenated (5-6 ml/l at a depth of 2,500 m). Conditions of life are very different from those in the European Mediterranean Sea, which is more isolated from the Atlantic. The abyssal ichthyofauna is comparable to that in the Gulf of Guinea, which is fully open to the ocean. At these depths there are about 275 species: 203 in the Gulf of Mexico, 160 in the Caribbean and 88 common to both basins. Thirty percent of this ichthyofauna occurs in ratios similar to those of the same species to the total number of species in the Gulf of Guinea, and almost double the ratio in the European Mediterranean. Of the 62 teleost families, 13 predominate, accounting for 80 percent of all abyssal species. These are represented by the following groups: Stomiatidae (60 species), Myctophidae (34), Gadidae (28), Gonostomatidae (27), Ceratiidae (19), Brotulidae (17), Alepocephalidae (16), Alepisauridae (13) and Berycidae (12). The American Mediterranean region is characterized by a distinctive abundance of bathypelagic Melanostomiatidae (40 species, 37 percent) and Ceratiidae (19, 20 percent). Next in order are the families of the Alepociphalidae (14 species) and Brotulidae (15). Only 6 species of Melanostomiatidae, 13 of Ceratiidae, four of Alepocephalidae and four of Brotulidae are known in Guinea and , in the European Mediterranean, 1, 1, 2 and 3 species, respectively. However, there are fewer oceanic mesopelagic species of Myctophidae and benthic Macrouridae in the American Mediterranean than in Guinea (23 and 20 American species and 45 and 48 in the Gulf of Guinea respectively), but they are more numerous than in the European Mediterranean (15 and 6 species, respectively). The number of bathypelagic and mesopelagic Gonostomatidae (19 species), Paralepididae (10) and Melamphaidae (7) in the American Mediterranean is smaller than in the Gulf of Guinea (20, 13 and 10 species, respectively) but larger than in the European Mediterranean Sea, which has 7 species of Gonostomatidae, 6 of Paralepididae, and none of Melamphaidae. There is a considerable difference between the Caribbean Sea and the Gulf of Mexico in the composition of their abyssal ichthyofauna. The former has more species of Melanostomiatidae (37) and Ceratiidae (18) than the Gulf of Mexico (11 and 4 species, respectively), and most of the latter are also represented in the Caribbean Sea (8 of 11 species and 3 of 4, respectively). The proportions are reversed in the families of the Alepocephalidea, Gonostomatidae, Myctophidae, Macrouridae and Brotulidae. The Caribbean Sea is apparently poorer in these groups than the Gulf of Mexico. The American Mediterranean region appears to be a centre for Melanostomiatidae species differentiation. That of the Ceratiidae is probably located near the Caribbean region, in the Bay of Panama.
Further research may probably add to what is known about the zoogeography of the abyssal waters of the ocean.

KEYWORDS: Biology; mesopelagic fishes; midwater fishes; micronekton; demersal fishes.

**605.**
Ratcliff, D.W. 1993. New technologies improve seismic images of salt bodies. Oil and Gas Journal 91(39):41-49.

ABSTRACT: This article describes seismic tools that Amoco Production Co. has used successfully to image salt bodies and target drilling in the gulf. The technologies have application where salt occurs or, more generally, where significant lateral velocity variations are present. The new tools improve seismic imaging above, below, and on the sides of salt structures. They enable operators to optimize well locations associated with salt flank and subsalt wells and to determine updip limits of reservoir sands trapped against salt. -from Author.

KEYWORDS: Geology; Seismic Survey; Salt; Hydrocarbon Exploration; Gulf of Mexico.

**606.**
Ray, K. 1988. Lateral salt movement and associated traps on the continental slope of the Gulf of Mexico. Transactions Gulf Coast Association of Geological Societies 38:217-223.

ABSTRACT: Updip sediment loading on the Continental Shelf of the northern Gulf of Mexico produces lateral movement of the Jurassic salt at its frontal edge under the Continental Slope. Numerous salt tongues, salt scarps, and extensive concordant and discordant salt layers result from such movement of salt. Salt scarps bulge out seaward, ahead of the depocenter. In response to lateral shifting of the depocenter, the arcuate bulge shifts position while the older scarp is deactivated. New bulges form contiguously with an old one or in a new place. The Sigsbee Scarp represents a composite bulge-out formed as a result of Middle Miocene to Pleistocene shifting of depocenters. Several types of traps suitable for hydrocarbon accumulation form as a consequence of lateral salt movement. The genesis of the following types of traps is discussed with examples from the Continental Slope of the northern Gulf of Mexico: a) Stratigraphic traps associated with scarp margin basins; b) Truncation traps and other structural traps below salt tongue; c) Fault and faulted anticlinal traps near the frontal edge; d) Thrust faulted anticlinal traps between salt lobes.

KEYWORDS: Geology.

**607.**
Ray, P.K. 1998. U.S. gulf oil production could double as early as 2002. Offshore Magazine 58(6).

ABSTRACT: None.

KEYWORDS: Technology.

**608.**
Rayburn, R. 1975. Food of deep-sea demersal fishes of the northwestern Gulf of Mexico. Texas A&M UniversityA food item analysis was made on 7 species of fish inhabiting the continental slope of the Northwestern Gulf of Mexico. This paper reports on 378 specimens representing the 7 species collected on cruises from 1968 to 1972.

ABSTRACT: No record exists of the food contents of these species in this area of the Gulf of Mexico and no record of food analysis from any location has previously been recorded on 1 species chosen. In addition to analysis of gut contents, an estimate of fish biomass, expressed as ash free dry weight, is also given. This is the first recorded estimate of fish biomass on the continental slope of the Gulf of Mexico. Bathymetric distribution, food items frequency of occurrence and changes in food items with depth, are given for each species analyzed. The data substantiate various degrees of food changes as depth increases. Frequency of occurrence variations in food items were also noted in sympatric species. The data on biomass estimates indicate reduction of fish biomass with increase in depth. Possible areas of fish concentration are also indicated by the results.

KEYWORDS: Biology; demersal fishes; trophic ecology.

**609.**
Regg, J., A. Verret, M.A. Stair, and W. Hauser. 1996. Future of regulations for the deepwater GOM. Offshore Technology Conference, Annual Proceedings 4:829-834.

ABSTRACT: Deepwater oil and gas activities in the U.S. Gulf of Mexico Outer Continental Shelf (OCS) are regulated by the Minerals Management Service (MMS). The level of OCS deepwater activities in both the drilling and production arena has shown a steady increase, and the discoveries in the deepwater tracts have begun to stack up. Very high rates of production by prolific deepwater wells have convinced operators that the deepwater Gulf of Mexico is a sound economical investment, and the trend in this area is expected to increase. Regulatory concerns have been viewed by some as a potential barrier to deepwater development successes, and in fact, existing OCS operating regulations have largely been developed on the basis of the expansion of successful bay and inland estuary production activities. These regulations reflect mostly surface operations where daily access to the wellhead(s) is usually possible. One specific concern is that the existing regulations do not adequately address the technology associated with the new deepwater hardware and operating procedures.

KEYWORDS: Offshore oil well production; Offshore drilling; Laws and; legislation; Deepwater production systems.

**610.**
Reid, D.F. 1984. Radium variability produced by shelf-water transport and mixing in the western Gulf of Mexico. Deep-Sea Research 31(12):1501-1510.

ABSTRACT: Super(226)Ra and super(228)Ra exhibit significant temporal and spatial variability in the near-surface western Gulf of Mexico. Concentrations of both isotopes during March 1976 were on the order of 22 to 26% greater than those observed during February 1973. It is shown that analytical differences cannot account for this increase. Consideration of radium levels in the western Caribbean Sea indicates that there must be an internal source of radium that has a significant but temporally variable influence on near-surface radium concentrations in the western Gulf. Comparisons of radium, salinity, and temperature data from 1973 and 1976 provide evidence that advective transport and mixing of radium-rich shelf water with the interior water column of the western basin is responsible for the variability. By plotting super(228)Ra vs super(226)Ra from this region, estimates of the apparent shelf-water component in the upper water column can be made. The results indicate 36% over the northern slope, 10 to 18% in the central western Gulf, and 3 to 7% over Campeche Bank. In addition to explaining the observed short-term variations of radium in this region, this information should be useful for environmental impact assessments concerned with industrial discharges on the northern shelf. (DBO).

KEYWORDS: Physical Oceanography; continental shelves; radium isotopes; shelf dynamics; ocean circulation; mixing processes; Gulf of Mexico.

**611.**
Reid, R.O. 1969. A simple dynamic model of the Loop Current, pp 157. In: L.R.A. Capurro. Contributions on the Physical Oceanography of the Gulf of Mexico. Volume 2 Gulf Publishing, Houston, Texas.

ABSTRACT: When it is well developed in the Gulf of Mexico (north of Yucatan Shelf) the northern portion of the Loop current is confined entirely to the deep-water region where topographic control is absent. However, the dimensions (northern penetration and width) of the Loop Current can be explained in terms of the variation of Coriolis parameter with latitude and the current speed.

KEYWORDS: Physical Oceanography.

**612.**
Reid, R.O. and G.Z. Forristall. 1975. Comment on 'three dimensional structure of storm-generated currents' by G.Z. Forristall (and reply). Journal of Geophysical Research 80(9):1184-1187.

ABSTRACT: For the original paper see abstr. A64844 of 1974. The author corrects a statement concerning the reflective properties of the boundary conditions for the vertically integrated equations of motion at laterally open boundaries.

KEYWORDS: Physical Oceanography; Oceanography; Storms; Storm Generated Currents; Reflective Properties; Boundary Conditions; Equations of Motion; Laterally Open Boundaries; Gulf of Mexico.

**613.**
Reilly, J.F.I. 1995. Geological controls on the distribution of chemosynthetic communities in the Gulf of Mexico (seepage seafloor modification). The University of Texas . Dallas, TX.

ABSTRACT: Communities of chemoautotrophic organisms have been observed at multiple sites on the continental slope of the Gulf of Mexico where natural seepage of hydrocarbons has been recognized. Effects of this seepage are readily seen as modification of the seafloor in both remotely-sensed data and direct observation and sampling. Though faunal distribution within these sites displays a distinct clustering, indicating a likely external control on community siting, the mechanism affecting the uneven distribution of organisms within a seep site is poorly understood. This work examines geological controls likely to influence development of environments conducive to colonization within four regions on the continental slope where either chemoautotrophic fauna have been previously documented or where indications of active seepage and seafloor modification are known.^Distribution maps of organisms from submersible observations were merged with the surface and near-surface structure mapped from 3-D CDP-processed seismic data. Where organisms are present a first-order correlation of community occurrence with surface expression of faulting was noted. Complex communities containing vestimentiferan tubeworms were generally found to exist in areas where deeply-rooted faulting initiated in response to simple shear, is present. In general, biomass is concentrated along the surface traces of antithetic faults where extensive outcrops of authigenic calcium carbonate at the seafloor and evidence of active, continuous seepage is present. Other sites contain simple communities generally consisting of a single species and lacking a vestimentiferan component. These communities, containing either methanotrophic mytilids or calyptogenid or lucinid clams, exist in areas dominated by Coulomb shear either as the result of halokinesis or mass failure. The geochemical substrate at the mytilid sites is dominated by light, biogenic hydrocarbons and, at the clam sites, by highly degraded thermogenic components consisting almost exclusively of unresolved complex mixture (UCM) and lacking indicators of continued migration. Additional sites containing insignificant biomass while exhibiting indicators of extensive hydrocarbon seepage were also visited. Structure at these sites was dominated by shallow-piercement halokinesis whereas the geochemical substrates reflected spatial and temporal discontinuities in the seepage history, or recent initiation of seepage.^Based on these observations a model protocol for evaluating a probable seep site for the occurrence of significant chemosynthetic communities is proposed.

KEYWORDS: Geology ; Physical Oceanography ; Geochemistry ; Engineering, Petroleum ; Biology, Oceanography.

**614.**
Research and Planning Consultants, I. 1977. Offshore Oil: Its Impact on Texas Communities,Volume 1: Executive Summary. Texas Coastal Management Program, General Land Office of Texas. Austin, TX.

ABSTRACT:None.

KEYWORDS:Socioeconomics.

**615.**
Research and Planning Consultants, I. 1977. Offshore Oil: Its Impact on Texas Communities,Volume 2: Local Impact. Texas Coastal Management Program, General Land Office of Texas. Austin, TX.

ABSTRACT:None.

KEYWORDS:Socioeconomics.

**616.**
Research and Planning Consultants, I. 1977. Offshore Oil: Its Impact on Texas Communities,Volume 3-4: Aggregate State impacts/Appendices. Texas Coastal Management Program, General Land Office of Texas. Austin, TX.

ABSTRACT:None.

KEYWORDS:Socioeconomics.

**617.**
Resource Economics and Management Analysis, I. 1986. Analysis of Indicators for Socioeconomic Impacts due to OCS Oil and Gas Activities in the Gulf of Mexico, Year II,Volume 1: Executive Summary. Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LAMMS 87-0042.

ABSTRACT:None.

KEYWORDS:Socioeconomics.

**618.**
Resource Economics and Management Analysis, I. 1986. Analysis of Indicators for Socioeconomic Impacts due to OCS Oil and Gas Activities in the Gulf of Mexico, Year II,Volume 2: Technical Report. Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LAMMS 87-0042.

ABSTRACT:None.

KEYWORDS:Socioeconomics.

**619.**
Resource Economics and Management Analysis, I. 1986. Analysis of Indicators for Socioeconomic Impacts due to OCS Oil and Gas Activities in the Gulf of Mexico, Year II,Volume 3: Appendices to Volume 2. Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LAMMS 87-0042.

ABSTRACT:None.

KEYWORDS:Socioeconomics.

**620.**
Rezak, R., T.J. Bright, and D.W. McGrail. 1983. Reefs and Banks of the Northwestern Gulf of Mexico: Their Geological, Biological, and Physical Dynamics., Final Report. Minerals Management Service Gulf of Mexico OCS Region. MMS-GM-PT-83-015.

ABSTRACT:This report is a synthesis of data collected from reefs and banks on the Texas-Louisiana Outer Continental Shelf. The purpose of the studies was to geologically and biologically characterize the reefs and banks, provide information on which to base management decisions concerning regulation of oil and gas drilling production near them, and to monitor the environmental impact of oil and gas drilling at the Flower Garden Banks.

KEYWORDS:Geology; Marine Biology; Marine Geology; Oceanographic Data; Crude Oil; Water Pollution; Mexico Gulf; Bathymetry; Coral; Marine Fishes; Animal Ecology; Ocean Currents; Sediments; Submarine Faults; Offshore Drilling; Environmental Impacts; Mapping; Populations; Outer Continental Shelves; Flower Garden Banks; Ntisdilmla.

**621.**
Rezak, R.andG.S. Edwards. 1972. Carbonate sediments of the Gulf of Mexico,In: Rezak R, Henry VJ, (Editors). Contributions on the geological and geophysical oceanography of the Gulf of Mexico. Gulf Publishing Company, Houston, TX.

ABSTRACT: The carbonate deposits of the Gulf of Mexico may be grouped into four general catagories: 1) carbonate shelves, 2) coral-algal reefs, 30 lagoonal carbonates and evaporite muds and 4) deep-water carbonates. The West Florida Shelf and the Yucatan Shelf are examples of open, inclined shelves on which sediments of biogenic and nonbiogenic carbonates are accumulating. The distribution patterns of these sediments are to large degree relict Pleistocene and Holocene patterns. Coral-algal reefs occur on both carbonate and terrigenous shelves in the Gulf of Mexico. Reefs such as the Flower Gardens in the northwestern Gulf occur on prominences near the shelf edge. They differ from the emergent reefs in the southern Gulf in that they do not rise to levels shallower than 60 ft and are populated by the *Diploria-Montastrea-Porites* community. This is equivalent to Logan's submerged reefbank stage of development in his Reef Model 1. Lagoonal carbonates, including evaporite muds, occur in several areas of the southern and western Gulf. Laguna Madre, along the south Texas coast, typifies a terrigenous lagoonal environment that contains deposits of skeletal carbonates, oolites and nonbiogenic carbonate along with the evaporite minerals salt and gypsum. Deep-water carbonates are primarily pelagic oozes consisting of globigernids, coccolithophorids and pteropods. Deep-water coral "reefs" have been reported on the lower continental slope of the northern Gulf. Carbonate turbidites form an important part of the sediment column in the abyssal plain.

KEYWORDS: Geology; Atlantic Ocean; Geophysical Surveys; Gulf of Mexico; Marine Geology; North Atlantic; Oceanography; Regional; Surveys.

**622.**
Rice Center. 1983. Onshore Impacts of Offshore Oil and Gas Activities: Coastal Data Inventory.,Volume 1. Final Report.

ABSTRACT:This report presents the results of an inventory of economic, demographic and facilities data available to support the assessment of economic impacts of offshore oil and gas activities on Texas coastal communities. Several key items for the impact assessment activities of this project were available (when available at all) only from primary sources. Those items included employment data for the relevant portion of the petroleum industry, local government service provision and cost information, and expectations of future offshore oil and gas activity levels. Primary data collection was carried out for only a few selected case study areas, therefore, this document presents in almost all cases the information available from secondary sources, including data generated by combining information from multiple sources. Secondary source data were gathered primarily by telephone or mail request from public and university libraries, relevant state and federal agencies, from cooperating coastal communities, and from representatives of the oil and gas industry. (ERA citation 09:004787).

KEYWORDS:Socioeconomics; Coastal Regions; Natural Gas Deposits; Natural Gas Industry; Offshore Operations; Petroleum Deposits; Petroleum Industry; Economic Impact; Information; Leasing; Local Government; Numerical Data; Socio-Economic Factors; Texas; Erda; 290200; Ntisdee.

**623.**
Richards, W.J. 1985. Status of the identification of the early life stages of fishes. Bulletin of Marine Science 37(2):756-760.

ABSTRACT: An international symposium on the ontogeny and systematics of fishes was held in August 1983 and the results were published late in 1984 in a book entitled "Ontogeny and Systematics of Fishes." The material for the book was based on articles prepared by 78 authors from 10 countries and represents, in part, the state of knowledge on the identification of fish eggs, larvae and juveniles. The author summarized this knowledge to provide an overview of the areas where information is complete and where information is lacking. The results highlight are as of concern, especially the reef resources of the tropical areas of the oceans.

KEYWORDS: Water column biology; animal morphology; taxonomy; fish eggs; fish larvae; juveniles; developmental stages; fish; Pisces.

## 624.

Richards, W.J. 1990. List of the Fishes of the Western Central Atlantic and the Status of Early Life Stage Information,Technical memo. National Marine Fisheries Service. United States.

ABSTRACT:All the species known to occur in the western central Atlantic are listed by family. The status of the knowledge of the identification of their early life history stages is given with pertinent literature citations. Also included are 54 illustrations of various larvae and juveniles.

KEYWORDS:Water column biology; Marine Fishes; North Atlantic Ocean; Identifying; Life Cycles; Larvae; Eggs; Drawings; Anatomy; Sternoptychidae; Juveniles; Gempylidae.

## 625.

Richards, W.J., T. Leming, M.F. McGowan, J.T. Lamkin, and S. Kelley-Fraga. 1989. Distribution of fish larvae in relation to hydrographic features of the Loop Current boundary in the Gulf of Mexico. Rapp. P.-V. Reun. Ciem. 191:169-176.

ABSTRACT: As part of a Gulf-wide ichthyoplankton survey of the Gulf of Mexico, eight transects were made across the Loop Current boundary at different locations and times during April and May of 1987. On one transect along 86 degree W longitude *Thunnus thynnus* larvae were present in 8 of 11 bongo and 6 of 11 neuston tows in the boundary portion of the transect. The boundary stations had higher displacement volumes of plankton and higher densities of fish larvae. The eight bongo stations with *T. thynnus* larvae had one larva each and of the six neuston stations with *T. thynnus* larvae, one had 19 larvae, one had two, and the rest had one each. *T. thynnus* larvae are associated with the boundary of the Loop Current in surface water from 24 to 26 degree C with large numbers of myctophid larvae especially *Myctophum nitidulum* .

KEYWORDS: Water column biology; fish larvae; ichthyoplankton surveys; dispersion; Gulf of Mexico; Loop Current; fishery oceanography; water masses; *Thunnus thynnus*; Hydrography; Larvae; Pisces.

## 626.

Richards W.J., McGowan M.F., Leming T., Lamkin J.T., and S. Kelley. 1993. Larval fish assemblages at the Loop Current boundary in the Gulf of Mexico. Bulletin of Marine Science 53:475-537.

ABSTRACT: Taxonomic diversity of the ichthyoplankton was higher than previously reported for the Gulf of Mexico or Caribbean (100 families). Cluster analysis of families produced two major groups, oceanic and continental, but the hypothesized frontal assemblage is not coequal with the oceanic and shelf assemblages. Principal-components analysis found more than one-half of the variance in the data to be summarized by three independent patterns. The high diversity of larval fishes is due to the mix of faunas from tropical and warm temperate oceanic, mesopelagic, and coastal demersal and pelagic species which is enhanced by the dynamics of the oceanographic system of the Loop Current. -from Authors.

KEYWORDS: larval fish; fish assemblage; ichthyoplankton; Gulf of Mexico; Loop Current; Water column biology.

**627.**
Richards, W.J. and T. Potthoff. 1980. Distribution and abundance of bluefin tuna larvae in the Gulf of Mexico in 1977 and 1978. Collected Volumes of Scientific Papers International Comitee for the Conservation of Atlantic Tunas .

ABSTRACT: Ichthyoplankton surveys were made in the Gulf of Mexico and Straits of Florida during April and May, 1977 and May, 1978, by the FRV OREGON II . Results from the surveys delineated the distribution of bluefin tuna larvae in those areas. The distributions were similar to those found in previous years indicating that this is the major area for bluefin tuna spawning in the western North Atlantic Ocean. Bluefin tuna larvae were more abundant in 1978 and over 1,400 larvae were collected. Several estimates of the size of the bluefin tuna larvae population are made based on the larval capture data.

KEYWORDS: Water column biology; ichthyoplankton surveys; abundance; Gulf of Mexico; *Thunnus thynnus*; Fish Larvae; Scombridae; Pisces.

**628.**
Richards, W.J. and T. Potthoff. 1980. Larval distributions of scombrids (other than bluefin tuna) and swordfish in the Gulf of Mexico in the spring of 1977 and 1978. Collected Volumes of Scientific Papers International Comitee for the Conservation of Atlantic Tunas .

ABSTRACT: Based on ichthyoplankton surveys conducted in the Gulf of Mexico in the spring of 1977 and 1978, larval distributions for the following taxa are given. *Thunnus* spp, *Auxis* spp, *Katsuwonus pelamis*, *Euthynnus alletteratus* , *T. atlanticus* , and *Xiphias gladius*. K. pelamis and T. atlanticus larvae were the most abundant in these cruises which took place at the end of April and May in 1977 and in May of 1978. Both bongo nets and neuston nets were employed. Larvae were most abundant in the eastern Gulf and no X. gladius larvae were taken in the western Gulf.

KEYWORDS: Water column biology; ichthyoplankton surveys; fish larvae; Gulf of Mexico; Scombridae; *Xiphias gladius*; Pisces; Xiphiidae.

**629.**
Risotto, S.P. and J.H. Collins. 1986. Gulf of Mexico Summary Report/Index: Outer Continental Shelf Oil and Gas Activities in the Gulf of Mexico and their Onshore Impacts.,Minerals Management Service, Outer Continental Shelf Oil and Gas Information Program. MMS 86-0084.

ABSTRACT:None.

KEYWORDS:Socioeconomics.

**630.**
Roberts, H.H. 1980. Sediment charactersitics of Mississippi River delta-front mudflow deposits. Transactions, Gulf Coast Association of Geological Societies 30:485-496.

ABSTRACT: The complex mudflow system transports much of the upper and intermediate delta-front sediment to deeper shelf and upper slope environments. X-ray radiography of cores collected from various parts of mudflow systems has led to a better understanding of the distribution of minor sedimentary structures and inclusions in these deposits. Mudflow gully heads are characterized by slumps and very irregular bottom topography. Narrow chutes connect source areas along the sinuous mudflow tract and serve as channels through which sediments move downslope. During movement through the chutes large slump blocks disintegrate to smaller features. Abundant gas-related features, convolute bedding, inclined units, evidence of flowage, and completely reworked sediments can be found in mudflow-lobe deposits.-from Author.

KEYWORDS: Geology.

**631.**
Roberts, H.H. and P. Aharon. 1994. Hydrocarbon-derived carbonate buildups of the northern Gulf of Mexico continental slope: A review of submersible investigations. Geo-Marine Letters 14(2-3):135-148.

ABSTRACT: Hydrocarbon-derived and microbially mediated authigenic carbonates occur over the entire depth range of the northern Gulf of Mexico slope. These carbonates consist of nodules and incipient nodules in surface sediments, hardgrounds and isolated slabs, and moundlike buildups of up to 10-20 m relief above the surrounding seafloor. The authigenic carbonates are characterized by delta super(13)C negative values in the range -18ppt to -55ppt (PDB) suggesting mixing of seawater carbon with super(13)C-depleted carbon sources ranging from crude oil to biogenic methane. Near the shelf edge, carbonates are "diluted" with biogenic material produced by reefs-bioherms developed at low sea level stands. Fossil-poor carbonates over salt diapirs of the upper and middle slope formed in the shallow subsurface and have been exhumed by the combined processes of uplift and physical erosion. Middle and lower slope carbonates are generally rich in fossil shells of chemosynthetic organisms. Mg calcite pelloidal matrix and acicular to botryoidal aragonitic void-filling cements are common petrographic features of these hydrocarbon-derived carbonates. At two sites carbonates are mixed with barite.

KEYWORDS: ASW, Gulf of Mexico; continental slope; hydrocarbons; seepages; carbonate sediments; sedimentary structures; carbon isotope ratio.

**632.**
Roberts, H.H., P. Aharon, R. Carney, J. Larkin, and R. Sassen. 1990. Sea floor responses to hydrocarbon seeps, Louisiana continental slope. Geo-Marine Letters 10(4):232-243.

ABSTRACT: Observations and samples from research submersible dives confirm that brines, crude oil, fluid mud, and gases are common seep products. Through this mechanism a unique interplay of geochemical, geologic, and biological processes resulting in unusual sea floor features ranging from carbonate-rich nodular sediments to mounds with tens of meters relief. Stable carbon isotopes occluded in the carbonates provide a permanent imprint that links these authigenic carbonates to by-products of microbial breakdown of crude oil and gas. Recent DSV ALVIN dives confirm that hydrocarbon seeps and their accompanying chemosynthetic communities and authigenic carbonate mounds occur over the entire depth range of the slope. -Authors.

KEYWORDS: Geology; Hydrocarbon Seep; Seep Product; Chemosynthetic Community; Brine; Crude Oil; Fluid Mud; Gas; Sea Floor; Authigenic Carbonate; Gulf of Mexico, Louisiana Continental Slope.

**633.**

Roberts, H.H., A.H. Bouma, J.M. Coleman, R.H. Fillon, B. Kohl, R.E. Constans, and R.D. Winn. 1991. Sedimentology and lithostratigraphy of a late Wisconsinan outer shelf delta, research consortium boring in Main Pass Block 303, Mississippi Delta area. The American Association of Petroleum Geologists Bulletin 75(3):663.

ABSTRACT: A 92 m continuous boring was collected in Main Pass Area, Block 303, to better understand shelf-edge deltaic sedimentation and facies architecture in relationship to glacio-eustatic cycles. The boring was also used to calibrate sequence stratigraphy with lithology and chronostratigraphy. The boring spans six isotope stages, covering parts of the last three sea-level cycles. The basal part (92-81 m; glacial isotope Stage 6) is interpreted as a mudflow composed of a rapidly deposited shale with distorted bedding, gas-related structures, and C-13 depleted diagenetic carbonates. This glacial stage is overlain by transgressive systems tract shelf shales capped by a 4-m-thick nodular calcareous shale/shelly limestone, representing the interglacial isotope Stage 5 condensed section as well as part of an outer shelf high stand systems tract. Isotope Stage 4 (60 55 m), a lowstand, appears to be condensed or missing, according to benthic foraminifera and oxygen isotope data, possibly constituting a parasequence boundary. The ensuing early Stage 3 transgression (53 45 m) and maximum flooding surface at 43 m precede a distinct progradational deltaic event (43 18 m). There is no clear sedimentary record of the latter part of Stage 3. This midshelf delta has a fauna-poor, rapidly deposited prodelta shale at the base overlain by alternating thin clays, silts, and sands of the distal bar facies and topped by a thick distributary mouth bar sand with numerous layers of redistributed organics. The Stage 2 glacial maximum appears represented by an erosional contact between the fine deltaic sands and the coarse sandy and fine gravelly transgressive system tract channel deposits. There are about 3 m of Stage 1 bioturbated silts and shelly sands capping the section.

KEYWORDS: Geology.

**634.**

Roberts, H.H. and R.S. Carney. 1997. Evidence of episodic fluid, gas, and sediment venting on the northern Gulf of Mexico continental slope. Economic Geology 92(7-8):863-879.

ABSTRACT: Surficial sediments and sea-floor features of the northern Gulf of Mexico continental slope record dramatic episodic venting and slower seepage of formation fluids, brines, crude oil, gases, and fine-grained sediments. Faults, activated by massive sediment input during periods of Plio-Pleistocene falling to low sea levels accompanied by compensating salt movement, provide avenues of vertical transport to the continental slope surface. Many of these faults cut thick sedimentary sequences that frequently contain geopressured zones which provide the driving force for fluid and gas expulsion. Flux rate and fluid characteristics are interpreted as important determinants of modern sea-floor geology and biology, Qualitatively, under conditions of rapid flux of sediment-rich fluids, mud volcanoes (up to 1 km wide and 50 m high) and extensive sheets of extruded mud result. These sediments contain old and displaced microfaunas. Muds are frequently extruded with large volumes of crude oil and gas (both biogenic and thermogenic) . In water depths greater than 9a 500-m rapid to moderate vertical flux of hydrocarbon gases and fluids results in the construction of relief features composed of gas hydrates, ejected mud, and authigenic carbonates. Areas with near-surface hydrates frequently support complex chemosynthetic communities with associated hardgrounds containing calcareous remains of mussels, clams, and associated gastropods. Slow flux (seeps) promotes the formation of $^{13}C$-depleted carbonate hardgrounds, stacked carbonate slabs, and moundlike carbonate buildups (frequently 9U 20-m relief) . Barite along with carbonate has been found in areas where rapid flux of sediment-carrying fluids has waned in the recent past and mineral-rich brines are now being ejected. Crusts, chimneys, and cones of these minerals are found in such settings. Both recent numerical simulations of fluid release from geopressured zones and direct observations at the sea floor support a pattern of episodic venting. Short-term episodes of venting are probably regulated by fault movement, perhaps controlled by local salt adjustment. Destabilization of gas hydrates by oceanographic processes also causes short-term episodic gas expulsion. These events occur with interannual to intra-annual frequencies. Longer gas hydrate stabilization-destabilization cycles in continental margin settings are forced by hydrostatic loading and unloading at the frequency of sea-level change. Radiometric dating suggests that other long-term episodes of venting and major venting expulsion events are also probably modulated by sea level change, time scales of thousands of years in response to low-stand sedimentary loading. Results of this summary of vent-seep-related phenomena suggest that sediment input from the shelf margin associated with cyclic Plio-Pleistocene falling to low sea-level periods, followed by major listic fault and salt adjustments to a new sediment load have activated venting-seepage throughout this period and perhaps longer.

KEYWORDS: Chemistry; Gulf of Mexico ; Gas ; Marine Sediment ; Continental Slope ; Crude Oil ; Episodic Venting ; Gas ; Marine Sediment ; Continental Slope ; Crude Oil ; Episodic Venting.

**635.**

Roberts, H.H., D.J. Cook, and M.K. Sheedlo. 1992. Hydrocarbon seeps of the Louisiana continental slope: seismic amplitude signature and sea floor response. Transactions Gulf Coast Association of Geological Societies 42:349-361.

ABSTRACT: Processing of high quality 3-D seismic data from lease blocks in the Green Canyon Area (Blocks 53, 184, 185, 272) provided a data base for selecting hydrocarbon seeps to be further evaluated using a highly maneuverable research submersible. The digital seismic data were processed to enhance amplitude anomalies at the sea floor and in both the shallow and deep subsurface. Amplitude extraction maps of the surface and shallow and subsurface were extremely useful for identifying seep areas on the basis of the strength, size, and general configuration of the amplitude anomaly zone. These methods provided valuable insight into the relative importance and structural/depositional setting for active sea floor seeps. Although high resolution acoustic data were more useful for establishing details of sea floor features, the relative activities of seeps and distributions of subtle sea floor features were reflected in the amplitude anomaly data. On high resolution seismic data seeps are commonly correlated with "acoustic wipe-out zones" which are accepted as response to gas-charges sediments, hydrates, authigenic carbonates, or combinations of these conditions. Three-dimensional digital seismic data commonly image beneath these zones and provide information on underlying structure and lower limits of gas hydrate stability (a strong low impedance seismic event). In addition, surface and near-surface amplitude data enhance structural patterns and suggest a heirarchy of seep activity which can be tested by direct observation and sampling using a research submersible (e.g. Johnson Sea-Link). In general, the amplitude anomaly data reflected seep activity level. Low to moderate relative amplitude anomalies often correlated with mounded carbonates with evidence of microseepage or with patches of bacterial mats (*Beggiatoa sp.*) over dark, reducing sediment. Cores through the latter sites frequently indicated the presence of hydrocarbon gases, brine, and some traces of crude oil. Strong (low impedance) amplitude anomalies were characterized by thick and more extensive bacterial mats, hydrates, abundant macroscope chemosynthetic communities of tube worms (*Lamellibranchia sp.*) and mussels (*Bathymodiolus sp.*), widespread authigenic carbonates, and evidence of gas/mud venting. These seeps were also frequently rich in crude oil beneath the biologic membrane established by microbial mats. All extremely active seep sites were linked to well-defined fault-related pathways to the deep subsurface.

KEYWORDS: Geology.

**636.**
Roberts, H.H. and T.W. Neurauter. 1991. Direct observations of a large active mud vent on the Louisiana continental slope. The American Association of Petroleum Geologists Bulletin 75(3):663+.

ABSTRACT: High-resolution geophysical data taken in support of drilling offshore acreage frequently reveal impressive evidence for expulsion of fluids, gases, and sediments on Louisiana's continental slope. Features resulting from extrusion of sedimentary materials at the sea floor range from small pock marks and vents a few meters in diameter to mud diapirs and volcano-shaped cones of sediment that can be greater than 1 km diameter. In September 1989, the Johnson Sea-Link research submersible was used to study a large active mud vent in the Green Canyon Area, Blocks 143 144. This accretionary feature had a positive relief of approximately 70 m and a diameter of about 300 m. Flanks of the volcano-shaped mud vent were composed primarily of fine-grained sediment pocked by small burrows and grooved by gravity-driven downslope sediment transport. Lithification of the cone flanks was evident in isolated areas, many of which are undercut perhaps by escaping fluids and gas, along ridges oriented down the cone sides. These ridges of the cone flank and groove topography were found to have surface lithification. The lithified materials were composed of both host sediments (terrigenous muds) cemented with aragonite and Mg-calcite and isolated authigenic carbonate buildups (<1 m high). Analyses of both these carbonate features and cements in host sediments revealed that they were extremely C 13 depleted, suggesting an origin related to the microbial degradation of hydrocarbons. The crater at the apex of this feature was approximately 40 m in diameter and rimmed by levees <1 m high, which marked former levels of fluid mud in the crater. Bacterial mats composed of a giant bacterium, *Beggiatoa* (up to 200 µm diameter), covered the fluid mud surface within the crater. Gas escaping from the crater floor caused fine-grained sediments to be entrained in the water column. A turbid cloud was formed that subsequently cascaded down the crater flank. Sediments collected from the crater floor contained abundant crude oil and gas. Two dives were made on this mud vent. Gas was observed escaping from the crater only during the second dive. The conditions responsible for development of these impressive features and their frequencies of eruptions are not well known.

KEYWORDS: Geology.

**637.**
Roberts, H.H., R. Sassen, R. Carney, and P. Aharon. 1989. $^{13}C$- depleted authigenic carbonate buildups from hydrocarbon seeps, Louisiana continental slope. Transactions Gulf Coast Association of Geological Societies 39:523-530.

ABSTRACT: Geohazard and geochemical survey data consisting of high resolution profiles, side-scan sonographs, drop cores, dredge samples, and borings have substantiated the consistent association between carbonate buildups and hydrocarbon seeps on the Louisiana continental slope. Analyses of lithified bottom samples indicate a range of carbonate mineralogies, including aragonite, Mg-calcite, and dolomite, that are extremely depleted in the $^{13}C$ isotope (ä$^{13}C$ values to 53.9‰PDB). Microbial oxidation of methane (biogenic and thermogenic) and crude oil creates a source of pore water $CO_2$ containing isotopically light carbon that helps trigger carbonate precipitation. Geophysical and geochemical evidence suggests that both surface and subsurface lithification is taking place. Recent observations and samples collected using a Pisces II research submersible confirm the abundance of $^{13}C$-depleted sedimentary carbonates and massive authigenic buildups associated with the tops and flanks of shallow salt diapirs and gas hydrate hills. Although chemosynthetic communities (including tube worms and bivalves) with isotopically light carbon in their tissues have been described from gas seeps, bacterial mats sampled from several seep areas using a submersible have ä$^{13}C$ values of 28 to -31‰PDB, suggesting a crude oil contribution to microbial biomass. Lithoherms 50 ft (15 m) high are common to dome crests. These features dominate mesoscale seafloor topography on the slope and have important short-term impacts on platform locations as well as pipeline routing. They are of long-term importance as sites for low sea-level reefs. Moreover, these observations provide new insight into the earliest stages of salt-dome cap rock evolution.

KEYWORDS: Geology.

**638.**
Roberts, H.H., I.B. Singh, and J.M. Coleman. 1986. Distal Shelf and Upper Slope Sediments Deposited during Rising Sea Level, North-Central Gulf of Mexico:Research rept. 1983-1986. Louisiana State Univ., Baton Rouge. Coastal Studies Inst. TR-446.

ABSTRACT:Sediments of Louisiana's outer continental shelf and upper slope are generally fine grained but highly variable with regard to internal structures and inclusions. They spread over diverse shelf-to-slope topography resulting from rapid localized sedimentation, mass movement, salt tectionics, and sediment redistribution by marine agents. This variability has made development of concepts of sedimentation and typical depositional sequences difficult. Analysis of numerous recent sediment cores in conjunction with high-resolution seismic profiles have provided a data base for describing those sediments deposited during the last major rise in sea level. Major contrasts in sediment properties occur in two basic depositional settings: opposite a prograding delta lobe and beyond the reach of abundant sediment input from the Mississippi River. Sediments of the distal shelf/upper slope seaward of the active Balize delta lobe are comprised of wedges of mudflow deposits separated by thin, finely laminated units of more slowly deposited sediments containing calcareous microfauna tests, bioturbation features, and early diagenetic products. Mudflow sediments are generally remolded, commonly contain gas related features, flow structures, and soft-sediment deformation plus inclined bedding. Bioturbation features and diagentic products are generally missing, and calcareous microfauna tests are rare. Mudflows are acoustically amorophous, while thin interlobe deposits which separate successive mudflow lobes are usually strong nonparrallel reflectors. Mudflow units thin downslope, so that thin-graded beds of terrigeniys silts to clays alternate with thin hemipelagic units, creating tightly spaced parallel to subparallel high-resolution seismic reflectors.

KEYWORDS:Geology; Mexico Gulf; Sediments; Sedimentation; Continental Shelves; Continental Slopes; Deltas; Deposition; Mud; Sediment Transport; Salts; Silt; Clay; Seismic Reflection; High Resolution; Natural Gas; Micropaleontology; Perturbations; Lithology; Marine Geology; Louisiana; Ocean Bottom Topography; Tectonics; Reprints; Microfauna; Bioturbation; Mudflows; Calcareous Microfauna; Ntisdodxr.

**639.**
Roberts, H.H. and P. Aharon. 1993. Cold seep carbonates of the northern Gulf of Mexico continental slope; a synthesis of submersible investigations. Annual Meeting Abstracts - American Association of Petroleum Geologists and Society of Economic Paleontologists and Mineralogists New Orleans, LA., United States.

ABSTRACT: None.

KEYWORDS: Aliphatic Hydrocarbons/ Alkanes/ Atlantic Ocean/ Biodegradation/ C-13/ Carbon/ Carbonate Rocks/ Continental Slope/ Diapirs/ Faults/ Gulf of Mexico/ Hardground/ Hydrocarbons/ Isotopes/ Methane/ Mineral Composition/ North American Atlantic/ North Atlantic/ Northern Gulf of Mexico/ O-18/ Ocean Floors/ Oil Seeps/ Organic Materials/ Oxygen/ Petroleum/ Precipitation/ Salt Tectonics/ Sampling/ Sedimentary Rocks/ Siliciclastics/ Stable Isotopes/ Tectonics/ Topography.

**640.**
Roberts, H.H., D.J. Cook, and M.K. Sheedlo. 1992. Hydrocarbon seeps of the Louisiana continental slope; seismic amplitude signature and sea floor response. Transactions - Gulf Coast Association of Geological Societies 42: 349-361.

ABSTRACT: None.

KEYWORDS: Amplitude; Atlantic Ocean; Continental Slope; Elastic Waves; Geophysical Profiles; Geophysical Surveys; Green Canyon; Gulf of Mexico; Louisiana; North American Atlantic; North Atlantic; Ocean Floors; Offshore; Oil Seeps; Seismic Profiles; Seismic Surveys; Surveys; Three-Dimensional Models; United States.

**641.**
Roberts, H.H. and T.W. Neurauter. 1990. Direct observations of a large active mud vent on the Louisiana continental slope. Transactions - Gulf Coast Association of Geological Societies 40.

ABSTRACT: None.

KEYWORDS: Geology; Continental Slope; Green Canyon; Louisiana; Mud Volcanoes; Oceanography; Submarine Volcanoes; United States; Vents; Volcanoes.

**642.**
Roberts, H.H., R. Sassen, R. Carney, and P. Aharon. 1989. Super $^{13}$C-depleted authigenic carbonate buildups from hydrocarbon seeps, Louisiana continental slope. Transactions - Gulf Coast Association of Geological Societies 3:523-530.

ABSTRACT: None.

KEYWORDS: Atlantic Ocean; Authigenesis; C-13; C-12; Carbon; Carbonate Sediments; Continental Slope; Diagenesis; Economic Geology; Petroleum Exploration; Geochemistry; Gulf Coastal Plain; Gulf of Mexico; Isotopes; Louisiana; Materials; North American Atlantic; North Atlantic; Oceanography; Petroleum; Salt Domes; Salt Tectonics; Sediments; Stable Isotopes; Structural Geology; Tectonics; United States.

**643.**
Roberts, T.W. 1977. An analysis of deep-sea benthic communities in the northeast Gulf of Mexico. PhD. Dissertation. Texas A&M University. College Station, TX.

ABSTRACT: The abundance and distribution of 142 benthic species from 39 skimmer stations in the northeast Gulf of Mexico were analyzed using cluster analysis. Five deep-sea communities were defined: (1) Upper Continental Slope (203-476 m), (2) Middle Continental Slope (565-918 m), (3) Lower Continental Slope (1061-1829 m), (4) Lower Mississippi Cone (2103-2734 m), and (5) Abyssal Plain (2744-3256 m). The Bray-Curtis dissimilarity measure was used to group the stations in these communities, and these groups were checked for internal homogeneity by means of Horn's measure of overlap. Species diversity and equitability calculations for the four major taxa (Pisces, Crustacea, Mollusca, and Echinodermata) in each community indicated a general decrease in diversity with depth. The distribution of the benthos is compared to similar studies in the Gulf of Mexico. The results are comparable once allowances are made for differences in sampling and technique of analysis. The distribution of benthos in DeSoto Canyon is compared to the surrounding slope distributions, and no difference was found in either species composition of abundance. Food, hydrostatic pressure, and biological interaction are discussed as possible limiting factors for the deep-sea benthos. Sanders' Stability-Time hypothesis is not the entire answer to species diversity, but may be a prerequisite before other causes such as predation and environmental "grain-size matching" can take place.

KEYWORDS: Benthos; Demersal Fishes; Echinodermata; Mollusca; Crustacea; DeSoto Canyon; skimmer dredge.

**644.**
Rodvelt, S., D. Schanke, and P.E. Fosen. 1999. Offshore Gas to Liquids. Proceedings of the 31$^{th}$ Annual Offshore Technology Conference (OTC paper 10764).

ABSTRACT: This paper gives a technical description of two concepts for offshore conversion of associated gas to synthetic hydrocarbons (syncrude) by the Fischer-Tropsch process. The solution represents an alternative to flaring or injecting associated gas and thus provides a means to exploit new oil fields in an environmentally sound way. Two concepts are presented, a 4300 b/d syncrude plant on a Multipurpose Shuttle Tanker (MST) and 14500 b/d syncrude production on a dedicated ship. Both have been designed for the harsh weather conditions in the Norwegian Sea. Studies have shown that the concepts are technically feasible and indicate that the safety requirements for offshore installations can be met.

KEYWORDS: Technology.

**645.**
Roe, R. 1969. Distribution of Royal-red shrimp, *Hymenopenaeus robustus*, on three potential commercial grounds off the southeastern United States.

ABSTRACT:The royal-red shrimp is an underused species. This paper reports on their distribution of grounds east of St. Augustine, Florida; south-southwest of the Dry Tortugas, Florida; and southeast of the Mississippi River Delta. On these grounds, the shrimp live only on soft bottom types and in water temperatures of 8° to 12° C.; the densities of shrimp vary seasonally on all three grounds the depth distribution of shrimp also varies seasonally the shrimp move offshore in summer and inshore in winter.

KEYWORDS:Biology; royal red shrimp; exploratory fishing.

**646.**
Rosman, I., G.S. Boland, and J.S. Baker. 1987. Epifaunal aggregations of Vesicomyidae on the continental slope off Louisiana. Deep-Sea Research. 34(11):1811-1820.

ABSTRACT: Two species of the bivalve family Vesicomyidae living at a depth of 940 m in the central Gulf of Mexico were photographed, counted and measured. These species, which are related to bivalves in chemoautotrophic communities in the Gulf of Mexico and at hydrothermal vents in the Pacific Ocean, occurred here in two apparently distinct aggregations clearly visible on the sea floor surface. Living vesicomyids were generally found amid a scatter of dead shells and occurred in densities of 0.5-9.6 individuals per m super(2). Distribution of living individuals within the aggregations was patchy. Living clams appear to plow actively through a substrate of silty clay, leaving behind distinctive, curving furrows up to 205 cm in length. Estimates of density, size distribution and spatial distribution provide a basis for detection of change in the aggregations over time and for comparison with similar aggregations. (DBO).

KEYWORDS: ASW, USA, Louisiana; Vesicomyidae; marine molluscs; zoobenthos; population density; hydrothermal springs.

**647.**
Rowan, M.G. 1995. Structural styles and evolution of allochthonous salt, central Louisiana outer shelf and upper slope, pp 199-228. In: Jackson MA, Roberts DG, Snelson S, (editors). Salt Tectonics: A Global Perspective. The American Association of Petroleum Geologists Memoir 65

ABSTRACT: Seismic interpretation and section restoration are combined with recent models of salt deformation to describe the geometry and evolution of allochthonous salt from the central Louisiana outer shelf and upper slope. Scattered salt bodies are connected by a complex system of diachronous salt welds or remnant salt having two end-member geometries: (1) Regionally extensive, subhorizontal sheets bounded by north-dipping (counter-regional) feeders and characterized by common listric growth faults that may accommodate significant extension; and (2) elliptical depressions bounded by dipping salt welds and arcuate growth faults that accommodate little extension. Most salt bodies in the study area were emplaced at or near the sea floor and grew by downbuilding (passive diapirism). Reactive and active diapirs are rare. The former are confined to the updip margins of shallow salt sheets, and the latter may occur basinward of major salt-withdrawal minibasins. Many salt bodies along the downdip margins of sheets have been modified by contraction. Two end-member evolutionary models account for the range of observed structural styles. In "counter-regional" systems, which are more typical of the shelf, salt rises through south-leaning feeder stocks and flows both downdip and along strike to form allochthonous sheets. In "salt stock canopy" systems, which are more typical of the upper slope, bulb-shaped salt stocks expand outward and form salt canopies. Subsequent gravitational collapse and sedimentary loading from bowl-shaped minibasins, from which salt is displaced into allochthonous tongues and remnant salt bodies.

KEYWORDS: Geology.

**648.**
Rowan, M.G., M.P.A. Jackson, and B.D. Trudgill. 1999. Salt-related fault families and fault welds in the northern Gulf of Mexico. American Association of Petroleum Geologists Bulletin 83(9):1454-84.

ABSTRACT: A classification of salt-related faults and fault welds in the northern Gulf of Mexico is presented. The classification is based on the 3-D geometry of the faults or welds, deformed strata, and associated salt. Four classes are recognized; extensional faults, contractional faults, strike-slip faults, and fault welds, each with their associated families.

KEYWORDS: Geology; <Di2> Faults (Geology); Gulf of Mexico; Petroleum Geology; Gulf of Mexico.

**649.**
Rowe, G.T. 1966. A study of deep water benthos of the northwestern Gulf of Mexico. Masters Thesis. Texas A&M University. College Station, TX.

ABSTRACT: None.

KEYWORDS: Biology; Benthos.

**650.**
Rowe, G.T. 1969. Benthic biomass and surface productivity., pp 441-454. In: Costlow JD, (Editor). Symposium of Fertility of the Sea.

ABSTRACT: Benthic samples from the north temperate Atlantic, the Gulf of Mexico, the Atlantic off Brazil, and the Pacific off Peru provided data for a comparison of animal densities and biomass under varying ecological conditions. The relationships between the logarithm (base 10) of biomass (or animal density) and depth can be described by statistically significant least squares linear regressions. The average biomass and the different rates of decrease in life with depth in different regions can be used in infer the magnitude of effects of surface production on the bottom fauna. These averages are significantly higher in regions of high primary productivity (New England and Peru) than where productivity is low (Bermuda, Brazil, and the Gulf of Mexico). The regression coefficients or rates of decrease in animal density were greatest where surface productivity varied markedly in an offshore direction (Woods Hole and Brazil). Where productivity varied to a lesser degree (Peru, Gulf of Mexico, and Bermuda), the rates of decrease were reduced. These regressions suggest that while depth exerts the most stringent effects, surface productivity ranks second in controlling benthic biomass. In the upwelling region off Peru, the hydrography and associated high productivity have caused marked oxygen depletion in sediments and bottom water. The result is a numerically dense fauna of low biomass and diversity where the oxygen minimum zone impinges on the bottom, and a diverse community of high biomass in deeper water offshore. In this situation, the effects of productivity on benthic biomass are more pronounced than depth, and rather than ameliorating benthic production, have inhibited it.

KEYWORDS: Biology.

**651.** Rowe, G. T. and D. W. Menzel. 1971. Quantitative benthic samples from the deep Gulf of Mexico with some comments on the measurement of deep-sea biomass. Bulletin of Marine Science 21(2):556-66.

ABSTRACT: Anchor dredge samples and a photgraphic survey indicate that the benthic fauna of the deep Gulf of mexico is depauperate compared to other basins. Infaunal biomass (expressed in terms of wet weight, dry weight, animal numbers, and organic carbon) decreased logarithmically with depth (i.e., $\text{logarithm}_{10}$ mg $C/m^2 = 2\text{-}0.000522$ [depth]) suggesting considerable energy loss in the passage of food along a complex food "ladder" in the water column.

KEYWORDS: Biology.

**652.**

Rowe, G. T., P. T. Polloni, and S. G. Horner. 1974. Benthic biomass estimates from the northwestern Atlantic Ocean and the northern Gulf of Mexico. Deep-Sea Research 21:641-50.

ABSTRACT: Estimates have been made of the biomass and abundance of macrobenthic invertebrates off the Gulf of Mexico and Atlantic coasts of the United States. Based on these estimates, it is concluded that deep-sea life is more abundant in the Atlantic than in the Gulf. Regressions of the logarithm (base 10) of biomass and animal density against depth indicate that the abundance of life followed an exponential decline with depth, $Y = ae^{-bx}$, where Y is either density of individuals or biomass, $x$ is depth and $a$ is proportional to average surface-water phytoplankton production. The rate of decline (b) can be related to the rate of decrease in phytoplankton production in an offshore direction and the efficiency of water-column heterotrophs at utilizing sinking organic matter. The regressions also indicate, through comparison with the literature, that both benthos and zooplankton follow similar exponential decays in quantity of life with depth. The constants (a) both appear to be functions of surface productivity and it can be inferred that the sources of food for zooplankton and benthos in the deep sea are the same. The seemingly conservative nature of organic matter over depth ranges where there is an exponential decrease in life can probably be attributed to the increase in the relative abundance of the refractory organic compounds with depth.

KEYWORDS: Biology.

**653.**

Russell, S. 1983. Shark bycatch in the northern Gulf of Mexico tuna longline fishery, 1988-91, with observations on the nearshore directed shark fishery. NOAA Technical Report 115:19-30.

ABSTRACT: Observers aboard domestic tuna and shark longline vessels in the Gulf of Mexico from January 1988 to December 1991 recorded detailed catch and effort information from each set. A total of 87 tuna trips (302 sets) and 8 shark trips (53 sets) were surveyed, and 1,965 sharks of 18 species were recorded. The mean catch rate for the offshore tuna sets was 0.3 sharks/100 hooks, and the mean catch rate for the nearshore shark sets was 8.3 sharks/100 hooks. Shark mortality on tuna sets was 46.5% and 92.2% on shark sets. Silky sharks dominated the tuna bycatch, and substantial numbers of coastal species were caught over deep water in the vicinity of the Mississippi River Delta on tuna longlines. Dusky, thresher, and silky sharks tended to occur in deep water much farther from land (>150 km). In the combined tuna and shark set data, females predominated in the coastal species whereas males were more numerous in the pelagic species. The mean lengths of 11 species, were smaller than their reported sizes at maturity. Shark landings have declined in the Gulf since 1989 and fleet size has been reduced. A continuing observer program could be very useful to biologists conducting yearly stock assessments under the pending federal shark fishery management plan (DBO).

KEYWORDS: Fisheries; by catch; tuna Fisheries; mortality causes; longlining; fishery management; shark Fisheries; fishery protection; Gulf of Mexico.

**654.**
Sackett, W.M., J.M. Brooks, B.B. Bernard, C.R. Schwab, H. Chung, and R.A. Parker. 1979. A carbon inventory for Orca Basin brines and sediments. Earth and Planetery Science Letters 44(1):73-81.

ABSTRACT: Orca Basin, an intraslope depression at a depth of about 2400 m on the continental slope of the north-central Gulf of Mexico, contains an anoxic, hypersaline brine similar in composition to those reported in the Red Sea. Concentrations and stable carbon isotope compositions of various inorganic and organic carbon species have been determined on the brine and sediments in order to gain an understanding of the origin and cycling of carbon in this unique environment. $CO_2$ in the brine (55 mg C/l) is about twice seawater with $^{13}C_{PDB}$ = -16.4o/oo and $^{14}C$ = -501o/oo. CH SUB-4 has a concentration of 12 mg C/l and $^{13}C$ = -73.5o/oo. Dissolved and particulate organic carbon concentrations are seven times higher and have $^{13}C$ values several permil different than the overlying seawater. $CO_2$ and $CH_4$ in the interstitial waters are considerably higher in concentrations and isotopically lighter than the overlying brine. Solution of near-surface salt deposits by seawater with subsequent microbial production and consumption of methane can be used to explain most of the data.

KEYWORDS: Chemistry; carbon isotopes; brines; anoxic basins; carbon compounds; sediment analysis; , Gulf of Mexico, Orca Basin; Carbonates; Dissolved Organic Carbon; Particulate Organic Carbon; Interstitial Water; Salts.

**655.**
Salvador, A. 1991. Origin and development of the Gulf of Mexico Basin: pp 389-444. In: Salvador A. The geology of North America The Gulf of Mexico Basin. Geological Society of America, Boulder, CO.

ABSTRACT: None.

KEYWORDS: Geology; Atlantic Ocean; Basement; Cenozoic; Clastic Rocks; Cretaceous; Cycles; Dikes; Dnag; Evolution; Florida; Glaciation; Gulf Coastal Plain; Gulf of Mexico; Igneous Rocks; Intrusions; Jurassic; Mesozoic; North American Plate; North Atlantic; Paleozoic; Pangaea; Plate Tectonics; Platforms; Red Beds; Rifting; Sedimentary Rocks; Sediments; Tectonophysics; Triassic; United States; Volcanic Rocks; Yucatan Shelf.

**656.**
Sangree, J.B., D.C. Waylett, D.E. Frazier, G.B. Amery, and W.J. Fennessy. 1978. Recognition of continental-slope seismic facies, offshore Texas-Louisiana, pp 87-116. In: Bouma AH, Moore GT, Coleman JM. Framework, facies, and oil-trapping characteristics of the upper continental margin. American Association of Petroleum Geologists, Tulsa, OK.

ABSTRACT: From analysis of a high-resolution arcer survey of the young sediments in the western clastic region of the Gulf of Mexico continental slope, and study of 29 300-m core holes, six facies types have been defined from their appearance on seismic sections. The sedimentary facies that correspond to these seismic-facies types have been interpreted and some progress has been made in identifying the transportation deposition processes responsible for each facies. The six seismic facies and their sedimentary equivalents are: (1) divergent and parallel layered, a varied, deposited in uniform layers; (2) sheet drape--hemipelagic deposits; (3) onlapping fill--probably both high-energy and low-energy turbidites; (4) sigmoid progradational--varied, mainly low-energy submarine deposits formed by outbuilding from relatively shallow to relatively deep water; (5) oblique progradational--shelf margin deltas and related marine facies; (6) mounded chaotic--submarine creep-and-slump deposits, mass-transport facies.

KEYWORDS: Geology; Atlantic Ocean; Cenozoic; Clastic Sediments; Clay; Continental Slope; Cores; Deltas; Environment; Geophysical Surveys; Gulf of Mexico; Layered Materials; Lithofacies; Models; North; North Atlantic; Petrology; Pleistocene; Quaternary; Sedimentation; Sediments; Seism Ic Surveys; Silt; Slope Environment; Stratigraphy; Surveys; Transport; Unconformities.

**657.**
Sassen, R., J.M. Brooks, M.C.I. Kennicutt, I.R. MacDonald, and N.L.J. Guinasso. 1993. How oil seeps, discoveries relate in deepwater Gulf of Mexico. Oil and Gas Journal 91(16):64-68.

ABSTRACT: None.

KEYWORDS: oil seepages; crude oil; petroleum geology; oil reservoirs; oil and gas exploration; ASW, Gulf of Mexico.

**658.**
Sassen, R., J.M. Brooks, I.R. MacDonald, M.C. KennicutII, N.L. GuinassoJr., and A.G. Requejo. 1993. Association of oil seeps and chemosynthetic communities with oil discoveries, upper continental slope, Gulf of Mexico. Transactions Gulf Coast Association of Geological Societies 43:349-355.

ABSTRACT: Geochemical fingerprinting of many upper Gulf slope oils indicates an origin from deeply buried Mesozoic carbonate source rocks. Substantial vertical migration (>6 km; 19,680 ft) along salt and fault migration conduits must be invoked to explain the emplacement of Mesozoic-sourced oils in shallow Miocene to Pleistocene reservoirs. Gulf slope seeps provide evidence of oil and gas charge in a rapidly subsiding salt basin, where oil and gas migration is a geologically recent or ongoing event. Sea-floor oil and gas seeps, gas hydrates, chemosynthetic communities, authigenic carbonate derived from hydrocarbon oxidation, and natural oil slicks are diagnostic indicators of charge. There is a regional association between seeps and the upper Gulf slope oil province offshore Louisiana and Texas. There is also a subregional relationship between seeps and the localized charge systems that give rise to individual oil accumulations. Key case histories include Marquette Field, Jolliet Field, and the GC 228 discovery in northwest Green Canyon, as well as the Cooper and Auger discoveries in northeast Garden Banks.

KEYWORDS: Geology.

**659.**
Sassen, R. and I.R. MacDonald. 1994. Evidence of structure H hydrate, Gulf of Mexico continental slope. Organic Geochemistry 22(6):1029-1032.

ABSTRACT: A research submarine was used to sample an amber-colored gas hydrate exposed on the sea-floor at 540 m water depth in the Gulf of Mexico continental slope, offshore Louisiana. The hydrate composition is novel for a natural occurrence because i -C "SUB 5" comprises 41.1% of the total C "SUB 1" -C "SUB 5" hydrocarbon distribution. The relative abundance of i -C "SUB 5" is consistent with an hexagonal (H) lattice structure. Structure H hydrate coexists with structure II hydrate on the Gulf slope. -from Authors.

KEYWORDS: Continental Slope ; Gas Hydrate ; Structure H Hydrate; Gulf of Mexico.

**660.**
Sassen, R.andI.R. MacDonald. 1997. Thermogenic Gas Hydrates, Gulf of Mexico Continental Slope, pp 472-474. American Chemical Society, 213$^{TH}$ Meeting.

ABSTRACT: Thermogenic gas hydrates occur on the Gulf of Mexico continental slope because of active vertical migration of oil and gas to the sea floor within their stability zone. The Bush Hill seep site on the Gulf slope is an important case history. Massive thermogenic gas hydrates occur in association with the orifices of hydrocarbon vents. Both structure II and structure H hydrates appear to co-exist in this environment. Gas hydrate is also rapidly precipitated in sea-floor experiments using natural vent gas as the starting material. More sophisticated sampling and experiments from research submarine platforms could significantly enhance our understanding of thermogen gas hydrate formation in the deep sea.

KEYWORDS: Physical Oceanography.

**661.**

Sassen, R., I.R. MacDonald, A.G. Requejo, N.L.J. Guinasso, M.C.I. Kennicutt, S.T. Sweet, and J.M. Brooks. 1994. Organic geochemistry of sediments from chemosynthetic communities, Gulf of Mexico slope. Geo-Marine Letters 14(2-3):110-119.

ABSTRACT: We used a research submersible to obtain 33 sediment samples from chemosynthetic communities at 541-650 m water depths in the Green Canyon (GC) area of the Gulf of Mexico slope. Sediment samples from beneath an isolated mat of H sub(2)S-oxidizing bacteria at GC 234 contain oil (mean = 5650 ppm) and C sub(1)-C sub(5) hydrocarbons (mean = 12,979 ppm) that are altered by bacterial oxidation. Control cores away from the mat contain lower concentrations of oil (mean = 2966 ppm) and C sub(1)-C sub(5) hydrocarbons (mean = 83.6 ppm). Bacterial oxidation of hydrocarbons depletes O sub(2) in sediments and triggers bacterial sulfate reduction to produce the H sub(2)S required by the mats. Sediment samples from GC 185 (Bush Hill) contain high concentrations of oil (mean = 24,775 ppm) and C sub(1)-C sub(5) hydrocarbons (mean = 11,037 ppm) that are altered by bacterial oxidation. Tube worm communities requiring H sub(2)S occur at GC 185 where the sea floor has been greatly modified since the Pleistocene by accumulation of oil, thermogenic gas hydrates, and authigenic carbonate rock. Venting to the water column is suppressed by this sea-floor modification, enhancing bacterial activity in sediments. Sediments from an area with vesicomyid clams (GC 272) contain lower concentrations of oil altered by bacterial oxidation (mean = 1716 ppm) but C sub(1)-C sub(5) concentrations are high (mean = 28,766 ppm). In contrast to other sampling areas, a sediment associated with the methanotrophic Seep Mytilid I (GC 233) is characterized by low concentration of oil (82 ppm) but biogenic methane (C sub(1)) is present (8829 ppm).

KEYWORDS: <Super Taxa> Animals; Arthropods; Crustaceans; Invertebrates; *Calypto ponerossa* ; *Vesicomya cordata*; Behavior; Density; Size Distribution ; Spatial Distribution Chemoautotrophic Community ; Gulf of Mexico; Caribbean Sea; Distribution; Classification; Morphology(Biology); Reproduction(Physio logy); Physiology; ASW, Gulf of Mexico; bacteria; chemosynthesis; seepages; hydrocarbons; organic compounds; geochemistry; biogeochemistry; aquatic communities.

**662.**

Sassen, R., H.H. Roberts, P. Aharon, J. Larkin, E.W. Chinn, and R. Carney. 1993. Chemosynthetic bacterial mats at cold hydrocarbon seeps, Gulf of Mexico continental slope. Organic Geochemistry 20(1):77-89.

ABSTRACT: White and pigmented filamentous bacterial mats dominated by several undescribed species of Beggiatoa were sampled during research submersible dives to cold hydrocarbon seep sites on the upper continental slope off Louisiana (130-550 m). Mats occur at the interface between reducing sediments and the oxygenated water column. They are localized at sea floor features related to seepage of biogenic methane and crude oil, but there is little evidence that the organisms utilize the hydrocarbons directly. Granules of elemental sulfur (S super(0)) are visible within cells of Beggiatoa, and mat material is characterized by high contents of S super(0) (up to 193,940 ppm). The Beggiatoa biomass is isotopically light ( delta super(13)C = -27.9ppt PDB). Our geochemical data suggest that the Beggiatoa species are part of a complex bacterial assemblage in cold seep sediments. They oxidize H sub(2)S derived from the bacterial sulfate reduction that accompanies bacterial hydrocarbon oxidation when O sub(2) is depleted in sediments, and fix isotopically light carbon from CO sub(2) that is the result of bacterial hydrocarbon oxidation. Beggiatoa mats appear to retard loss of hydrocarbons to the water column by physically retaining fluids in sediments, a function that could enhance production by other bacteria of the H sub(2)S and CO sub(2) needed by Beggiatoa.

KEYWORDS: algal mats; continental shelves; sediment-water interface; methane; hydrocarbons; biogeochemical cycle; chemosynthesis; Beggiatoa; ASW, Gulf of Mexico; microbial mats.

**663.**
Sassen, R., J.M. Brooks, I.R. MacDonald, M.C.I. Kennicutt, N.L.Jr. Guinasso, and A.G. Requejo. 1993. Association of oil seeps and chemosynthetic communities with oil discoveries, upper continental slope, Gulf of Mexico. Transactions - Gulf Coast Association of Geological Societies 43:349-355.

ABSTRACT: None.

KEYWORDS: Atlantic Ocean; Basins; Case Studies; Cenozoic; Chemosynthesis; Continental Slope; Energy Sources; Gulf of Mexico; Louisiana; Mesozoic; Migration; Miocene; Neogene; North American Atlantic; North Atlantic; Offshore; Oil Seeps; Petroleum; Petroleum Accumulation; Petroleum Exploration; Pleistocene; Pliocene; Quaternary; Reservoir Rocks; Salt Tectonics; Source Rocks; Tectonics; Tertiary; Texas; United States.

**664.**
Sassen, R., P. Grayson, G. Cole, H.H. Roberts, and P. Aharon. 1991. Hydrocarbon seepage and salt-dome related carbonate reservoir rocks of the U.S. Gulf Coast. Transactions - Gulf Coast Association of Geological Societies 41:570-578.

ABSTRACT: None.

KEYWORDS: Anahuac Formation; C-13; C-12; Carbon; Carbonate Rocks; Cement; Cenozoic; Concretions; Continental Slope; Corals; Damon Mound Dome; Damon Quarry; Diapirs; Economic Geology; Gulf Coastal Plain; Invertebrates; Isotopes; Lithofacies; Natural Gas; Oil Seeps; Petroleum; Production; Reservoir Rocks; Salt Domes; Salt Tectonics; Secondary Structures; Sedimentary Rocks; Sedimentary Structures; Siliciclastics; Stable Isotopes; Structural Geology; Tectonics; Tertiary.

**665.**
Sassen, R. and I.R. MacDonald. 1997. Hydrocarbons of experimental and natural gas hydrates, Gulf of Mexico continental slope. Organic Geochemistry 26(3-4):289-293.

ABSTRACT: Gas hydrate was experimentally precipitated for the first time in the deep sea using natural starting materials. The experiments were performed using a research submarine on the Gulf of Mexico continental slope at a water depth of 540 m at 9.0-9.2 degree C. Starting materials were thermogenic hydrocarbon gases similar in composition to gases in underlying subsurface reservoirs. These gases vented to the water column in association with sea-floor mounds of natural yellow-orange gas hydrate (structure II). The vent gases were captured in transparent Lexan tubes at ambient conditions, and precipitation of white to yellow gas-hydrate dendrites and coatings was seen to occur within minutes. Experimental hydrates show delta **1**3C of methane and C//1-C//5 hydrocarbon compositions that are similar to the vent gases from which they precipitated. (Author abstract) 11 Refs.

KEYWORDS: Geochemistry; Hydrocarbons; Gas Hydrates; Natural Gas; Precipitation (Chemical); Methane; Composition; Surface Waters; Gulf of Mexico; Gas Vents.

**666.**
Sasson, R., P. Grayson, and G. Cole. 1991. Hydrocarbon seepage and salt dome-related carbonate reservoir rocks of the U.S. Gulf Coast. American Association of Petroleum Geologists Bulletin 75:1537-1538.

ABSTRACT: Although most salt-dome related oil production in the Gulf Coast is from clastic reservoirs, oil has been produced from Tertiary carbonate reservoir facies within (1) carbonate cap rocks over salt domes and (2) the *Heterostegina* zone coral reef facies of the Anahuac Formation. The only known surface exposure of both carbonates occurs over the Damon Mound salt dome, near Houston, where oil and thermogenic gas have been produced from early Oligocene to early Miocene reservoirs flanking the dome crest. The origin of carbonate cap rock with extremely light ä$^{13}$C values at Damon Mound is related to long-term microbial oxidation of crude oil and thermogenic gas that commenced during or prior to the early Oligocene. Exposure of the salt dome cap rock by erosion offered a shallow-water carbonate hardground that favored localized development of the late Oligocene-early Miocene *Heterostegina* coral reef facies. Carbonate cements with extremely light ä$^{13}$C values in the reef facies suggest that hydrocarbon migration continued during reef development, simultaneous with downward development of the carbonate cap rock by replacemenet of anhydrite. Processes similar to those that operated at Damon Mound appear to explain the origin of carbonates in cold hydrocarbon seeps of the Gulf continental slope. Generalization of these observations suggests that intense hydrocarbon seepage could result in development of carbonate reservoir facies in other oil basins characterized by siliciclastic sediments and shallow salt.

KEYWORDS: Geology.

**667.**
Scafe, D.W. 1968. A clay mineral investigation of six cores from the Gulf of Mexico. Ph.D. Dissertation. Texas A&M University. College Station, TX.

ABSTRACT: Samples were studied from each color change along six gravity cores from nearshore to deep-sea areas in the Gulf of Mexico. Sieve and pipette analyses, fractionation of the clay-size fraction into a 2-0.2u and <0.2u fraction using a supercentrifuge, X-ray diffraction, differential thermal analysis, thermogravimetric analysis, infrared, and cation exchange capacity were the analytical methods used. Fractionation of clay-size material expedites clay mineral identification and semi-quantitative estimates of abundance. A five gram, clay size sample passed five times through a supercentrifuge should have the <0.2u fraction removed when the outlined sample preparation method is employed. Duplicate fractionations usually agree within three percent and fractionation efficiency is unaffected by the mineral suite. The clay minerals and semi-quantitative estimates of their abundance suggest that the sum of the source conditions has remained constant since and during Pleistocene time. Montmorillonite and kaolinite are not more abundant in warm water sediments and illite and chlorite are not more abundant in cold water sediments from the Gulf of Mexico. Sand-size material is usually a small weight percent of a sample. Silt and clay-size materials are approximately equal except for the cores farthest from the Mississippi delta where clay-size material dominates. In the clay-size fraction, montimorillonite is generally more abundant than illite, while kaolinite is <20 percent and chlorite is <7 percent. Quartz is <15 percent of the fraction. Quartz and feldspar exist only in the 2-0.2u portion of the clay-size fraction. No mixed-layer clay minerals were detected. The effects of differential settling of clay minerals have not been recognized.

KEYWORDS: Geology.

**668.**
Schlitz, R.J. 1970. Net total transport and net transport by water mass categories for Yucatan Channel, based on data for April 1970. Texas A&M UniversityA series of measurements were made from the R/V Alaminos in April, 1970 in order to define the volume transport and transport by water mass categories through Yucatan Channel. The measurements included density fields inferred from five cross sections of Yucatan Channel, a cross section from Cabo Catoche, Mexico to Dry Tortugas, a cross section from Dry Tortugas to Cuba, and a cross section along 85° W from Cuba to Honduras. Also attempts were made to measure current speeds and directions from four bottom-mounted current meters, and current trajectories from parachute drogues tracked in shallow water. However only sparce data were obtained from the current meters that were recovered. Net volume transport and transport by water mass categories were calculated through the geostrophic equation relative to the deepest common sampling depth between each station pair. The mean contribution to the Gulf of Mexico, 21 x $10^6$ $m^3$/sec, was bi-modal as shown from the results of temperature and density histograms. The primary mode occurs at about 23.4 gm/liter (440-460 cl/ton) and a temperature of 26-27° C while a secondary peak occurs at 26.6-26.8 gm/liter (100-140 cl/ton) and temperature of 16° C, the latter not being well defined. In order to avoid some of the problems associated with the above geostrophic calculations, a method was developed whereby the ocean bottom was identified as the reference level throughout any cross section. When this method was applied to the data from three sections not only was the reference level more realistic since it avoids artificial discontinuities in the deduced velocity structure, but also the current structure was intensified toward the west and approached the drogue speeds. However, there was still a net outflow from the Gulf of Mexico of water with temperature of less than 5.5° C. A barotropic component was estimated for the area below 900 m depth, the approximate level of the 5.5° C isotherm, so that the net transport vanished in this region. The total barotropic flow for each section was then obtained from the ratio of the area below 900 m depth to the total area of the cross section. The values of total transport through Yucatan Channel were 30.0, 28.5, and 33.2 x $10^6$ $m^3$/sec for three sections. These transport values are within the random fluctuations about the annual variation calculated by Niiler and Richardson, 1972.

KEYWORDS: Physical Oceanography.

**669.**
Schmidly, D.J. 1981. Marine mammals of the southeastern United States coast and Gulf of Mexico,Office of Biological Services, Fish and Wildlife Service. Washington, D.C.FWS/OBS-80/41.

ABSTRACT:None.

KEYWORDS:Endangered Species; Mammals; Gulf of Mexico.

**670.**
Schmitz, J.E. and A.C. Vastano. 1976. On entrainment and diffusion in a Gulf of Mexico anticyclonic ring. Journal of Physical Oceanography 6(3):399-402.

ABSTRACT: The parametric model used by Schmitz and Vastano (1975) to investigate a Gulf Stream cyclonic ring has been applied to successive observations of a Gulf of Mexico anticyclonic ring. Coefficients for a polynomial representation of the transverse streamfunction psi (r,z) were determined for pairs of eddy diffusivity coefficients. Using the minimum least-squares error residual as a criterion, the best flow pattern for the ring occurred for $K_h$ $K_z$ $10^6$ $cm^2$ $s^{-1}$. The total transverse transport through the ring was found to be an order of magnitude larger than that found in the Gulf Stream cyclonic ring.

KEYWORDS: Physical Oceanography; Oceanography; Parametric Model; Transverse Streamfunction; Eddy Diffusivity; Anticyclonic Current Ring; Ocean Circulation; Gulf of Mexico.

**671.**
Schneider, M.J. 1969. A description of the physical oceanographic features of the eastern Gulf of Mexico, August 1968. M.S. Thesis. Texas A&M University. College Station, TX.

ABSTRACT: A three week cruise in the Gulf of Mexico in the late summer of 1968 provides the basis for a report on water masses, circulation, geostrophic transport, sea surface temperature data, and sound velocity conditions found there. The Caribbean water is the source of water flowing north through the Yucatan Strait and into the Gulf. Two distinct T-S relationships are found in the eastern Gulf for the upper layers above 17°C. Water characterized by the T-S curve similar to that of the Caribbean water is termed right-hand water and the water identified by the other T-S curve is called left-hand water. These names are consistent with the location of these waters in respect to the side of the current on which they are found. Water flowing north through Yucatan Strait becomes a loop circulation pattern that exits through Florida Straits. This current carries 46.7 million $m^3$/sec of water into the Gulf and forms a large anticyclonic eddy centered near 25.5°N and 87.0°W. The values of geostrophic transport computed are among the highest ever reported here. The sea surface temperature field is found to have sharp gradients near each side of the loop current. A band surface water about 40 kilometers wide lying at the surface of the loop current is 0.3 to 1.1°C colder than the surrounding water. The two distinct T-S curves found in the eastern Gulf result in sound velocity conditions that are significantly different for the right- and left-hand water. The nature of these differences is discussed as well as daily and seasonal variations in the sound velocity profile.

KEYWORDS: Physical Oceanography.

**672.**
Schroeder, W.W., L. Berner, and W.D. Nowlin. 1973. The Oceanic Waters of the Gulf of Mexico and Yucatan Strait during July 1969. Bulletin of Marine Science 24(1):1-19.

ABSTRACT: The summer hydrography of the Gulf of Mexico is examined on the basis of R/V ALAMINOS Cruise 69-A-10 during July 1969, and 127 stations occupied by the USNS KANE during that same summer. The T-S relationships observed indicate three water masses: (1) a single uniform deep-water system; (2) inflowing warmer water of Caribbean type with a high salinity maximum at the Subtropical Underwater core; and (3) Gulf water with a reduced salinity maximum. The waters of the surface mixed layer showed spatial differences reflecting local conditions of inflow and runoff. The horizontal current pattern has been inferred from the depth distribution of the 22 C isothermal surface, from the lateral distribution of salinity at the Subtropical Underwater core, and from the dynamic topography of the sea surface relative to the 750-db surface. During July, two detached rings, a young ring in the north central gulf and the remnant of an older ring in the far western gulf, were present. (Author)

KEYWORDS: Physical Oceanography; Sea Water; Salinity; Temperature; Ocean Currents; Hydrodynamics; Deep Water; Flow Fields; Reprints; Yukatan Strait; Ntisdodn; Gulf of Mexico.

**673.**
Schroeder, W.W., S.P. Dinnel, W.J.J. Wiseman, and W.J.J. Merrell. 1987. Circulation patterns inferred from the movement of detached buoys in the eastern Gulf of Mexico. Continental Shelf Research 7(8):883-894.

ABSTRACT: The release times of five buoys, which broke free of moorings on the Alabama inner shelf, are known. The locations of subsequent sightings or recoveries of the buoys gave estimated trajectories of the buoys. These results show that the inner-shelf circulation is strongly wind-driven. When the Loop Current penetrates deeply into the northeastern Gulf of Mexico, outer shelf waters are often entrained by the Loop Current.

KEYWORDS: Physical Oceanography; wind-driven circulation; drifting data buoys; water circulation; shelf dynamics; Loop Current; Gulf of Mexico.

**674.**
Science Applications International Corporation. 1986. Gulf of Mexico Physical Oceanography Program Final Report: Years 1 and 2., Volume 1. Executive Summary. Minerals Management Service, Metairie, LA. Gulf of Mexico OCS Regional Office.

ABSTRACT:In 1982, Minerals Management Service (MMS) initiated a multi-year program under contract with Science Applications International Corp. (SAIC) to study the physical oceanography of the Gulf of Mexico as part of its outer continental shelf environmental studies programs. This particular program, called the Gulf of Mexico Physical Oceanography Program (GOMPOP), has two primary goals: (1) develop a better understanding and description of conditions and processes governing Gulf circulation; and (2) establish a data base which could be used as initial and boundary conditions by a companion MMS-funded numerical circulation modeling program. The report presents results from the first two of three years of observations in the eastern Gulf.

KEYWORDS:Physical Oceanography; Offshore drilling; Oceanographic data; Water pollution; Ocean currents; Circulation; Ocean temperature; Depth; Remote sensing; Florida; Crude oil; Outer Continental Shelves; Ntisdimms; Gulf of Mexico.

**675.**
Science Applications International Corporation. 1986. Gulf of Mexico Physical Oceanography Program Final Report: Years 1 and 2,Volume 2. Technical Report. Minerals Management Service, Metairie, LA. Gulf of Mexico OCS Regional Office.

ABSTRACT:In 1982, Minerals Management Service (MMS) initiated a multi-year program under contract with Science Applications International Corp. (SAIC) to study the physical oceanography of the Gulf of Mexico as part of its outer continental shelf environmental studies program. The program has two primary goals: (1) develop a better understanding and description of conditions and processes governing Gulf circulation; and (2) establish a data base which could be used as initial and boundary conditions by a companion MMS-funded numerical circulation modeling program. The report presents results from the first two of three years of observations in the eastern Gulf.

KEYWORDS:Physical Oceanography; Offshore drilling; Oceanographic data; Oceanographic surveys; Mooring; Ocean currents; Ocean temperature; Hydrographic surveying; Depth; Bathymetry; Trajectories; Salinity; Nutrients; Chlorophyll; Oxygen; Dissolved gases; Tables(Data); Graphs(Charts); Outer Continental Shelves; Loop Current; Ntisdimms; Gulf of Mexico.

**676.**
Science Applications International Corporation. 1987. Gulf of Mexico Physical Oceanography Program Final Report: Year 4., Volume 1. Executive Summary. Minerals Management Service, Metairie, LA. Gulf of Mexico OCS Regional Office.

ABSTRACT:The particular program, the Gulf of Mexico Physical Oceanography Program, has two primary goals: (1) develop a better understanding and description of conditions and processes governing Gulf circulation; and, (2) establish a data base which could be used as initial and boundary conditions by a companion MMS-funded numerical circulation modeling program. The area to be studied emphasizes the deeper Gulf and those shallower regions where conditions may be directly or indirectly affected by patterns associated with or originating in the deeper Gulf. The multi-year, phased program will investigate the eastern and western Gulf separately. The report presents results from 3 years of observations in the eastern Gulf.

KEYWORDS:Physical Oceanography; Offshore drilling; Oceanographic data; Water pollution; Ocean currents; Eddies; Boundaries; Bathymetry; Maps; Buoys; Ocean temperature; Kinematics; Loop Current; Ntisdimms; Gulf of Mexico.

**677.**
Science Applications International Corporation. 1987. Gulf of Mexico Physical Oceanography Program Final Report: Year 4.,Volume 2. Technical Report. Minerals Management Service, Metairie, LA. Gulf of Mexico OCS Regional Office.

ABSTRACT:The particular program, the Gulf of Mexico Physical Oceanography Program, has two primary goals: (1) develop a better understanding and description of conditions and processes governing Gulf circulation; and, (2) establish a data base which could be used as initial and boundary conditions by a companion MMS-funded numerical circulation modeling program. The program participants undertook the following primary scientific efforts during Program Year 4: (1) kinematic and hydrographic characterizations of Loop Current boundary features, e.g., waves, filaments, or perturbations; (2) comparative kinematics and dynamics of the Loop Current and a Loop Current eddy as indicated by drifting buoy trajectories; and (3) further discrimination and characterization of West Florida Shelf circulation patterns, e.g., inertial currents, wind, and Loop Current forced currents.

KEYWORDS:Physical Oceanography; Offshore drilling; Oceanographic data; Water pollution; Ocean currents; Circulation; Kinematics; Buoys; Trajectories; Ocean temperature; Wind(Meteorology); Ntisdimms; Gulf of Mexico.

**678.**
Science Applications International Corporation. 1988. Gulf of Mexico Physical Oceanography Program: Final Report. Year 3. Volume 1: Executive Summary. Minerals Management Service, Metairie, LA. Gulf of Mexico OCS Regional Office.

ABSTRACT:The objective of the Gulf of Mexico Physical Oceanography Program is the development of an improved understanding of primary Gulf circulation patterns and the mechanisms producing these patterns. It is expected that insights from the program will provide an expanded basis for making informed management decisions related to Outer Continental Shelf oil and gas exploration, production, and transportation in the Gulf of Mexico. The area studied emphasizes the deep Gulf and shallow regions where conditions may be directly or indirectly affected by patterns associated with or originating in the deep Gulf. The phased, multi-year program investigates the eastern and western Gulf separately, with the report presenting the results of Program Year 3 in the western Gulf.

KEYWORDS:Physical Oceanography; Oceanographic surveys; Ocean currents; Circulation; Winds(Meteorology); Temperature; Pressure; Continenta l shelves; Hydrographic surveys; Natural gas wells; Offshore drilling; Oil recovery; Satellite Observation; Ntisdimms; Gulf of Mexico.

**679.**
Science Applications International Corporation. 1988. Gulf of Mexico Physical Oceanography Program, Final Report: Year 3. Volume 2: Technical Report. Minerals Management Service, Metairie, LA. Gulf of Mexico OCS Regional Office.

ABSTRACT:The objective of the Gulf of Mexico Physical Oceanography Program is the development of an improved understanding of primary Gulf circulation patterns and the mechanisms producing these patterns. It is expected that insights from the program will provide an expanded basis for making informed management decisions related to Outer Continental Shelf oil and gas exploration, production, and transportation in the Gulf of Mexico. In 1982 a multiyear investigation into the physical oceanographic conditions related to or resulting from deep circulation patterns in the Gulf of Mexico was begun. The report describes measurements made during Program Year 3 in the central and western Gulf. Primary measurements included (1) subsurface currents/temperature and pressure along and across isobaths in the west central and northwestern Gulf, (2) a sequence of hydrographic surveys (ship- and plane-based) to document the 3-dimensional character and evolution of a LC eddy as it moved into the western Gulf, (3) satellite-tracked drifters to provide information concerning the circulation patterns in and around eddies, and (4) regular, periodic, and one-time ship-of-opportunity platforms used to release expendable temperature probes. These data were, as appropriate, combined with marine winds and coastal winds and water level data. However, because the features and patterns of interest remained off the shelf and over the slope or in the deep Gulf, the effect on and utility of coastal data were often limited.

KEYWORDS:Physical Oceanography; Oceanographic surveys; Ocean currents; Circulation; Winds(Meteorology); Temperature; Pressure; Continenta l shelves; Hydrographic surveys; Natural gas wells; Offshore drilling; Oil recovery; Satellite Observation; Ntisdimms; Gulf of Mexico.

**680.**
Science Applications International Corporation. 1989. Gulf of Mexico Physical Oceanography Program Final Report: Year 5., Volume 1. Executive Summary. Minerals Management Service, Metairie, LA. Gulf of Mexico OCS Regional Office.

ABSTRACT:In October 1982, the Minerals Management Service (MMS) initiated a multiyear, regionally-phased physical oceanographic field program with the long-term goal of developing an improved understanding of the characteristics and influence of circulation patterns and processes in and adjacent to the deeper regions of the Gulf of Mexico. In the Year 5 Program, the objective was to look at physical oceanographic conditions along a transect normal to the north-central slope and shelf (92 deg W) extending from the inner shelf to the deep Gulf offshore Louisiana. As reflected in the experimental design and the suite of observations, Year 5 involved documenting and developing an improved understanding of circulation on the Louisiana shelf just west of the major estuaries, identifying the characteristics and causes of adjacent slope circulation, continuing multiyear documentation of Loop Current eddy dynamics and kinematics during evolution and westward translation, and initiating documentation of optical properties of the west Louisiana shelf waters. Measurements made to support the above objectives included moored current/temperature arrays, periodic hydrographic CTD/XBT/AXBT surveys, satellite thermal imagery, Lagrangian drifters, inverted echo sounders, and a suite of measurements characterizing the optical absorption and transmission characteristics of the shelf water.

KEYWORDS:Physical Oceanography; Continental shelves; Continental slopes; Ocean currents; Optical properties; Deep water; Hydrographic surveys; Echo sounding; Eddies; Ocean Circulation; Satellite Observations; Ocean Temperature; Long Term Effects; Satellite Imagery; Ntisdimms; Gulf of Mexico.

**681.**
Science Applications International Corporation. 1989. Gulf of Mexico Physical Oceanography Program Final Report: Year 5. Volume 2. Technical Report. Minerals Management Service, Metairie, LA. Gulf of Mexico OCS Regional Office.

ABSTRACT:In Volume II (Technical Report), the content of the various chapters is structured to make available the level of detail which each reader may require. Chapter 1 provides an overview of the program and its relation to overall program objectives; Chapter 2 describes topics relating to data acquisition such as where, when, how, and how good; Chapter 3 describes important analyses which were applied to the observations (because some of these techniques have been described in detail in prior reports, those will not be repeated but will be identified and the appropriate reference given); and Chapter 4 provides a discussion of the data interpretation and synthesis. By separating Chapter 4 from the previous sections, the reader can focus on insights without being diverted by other information.

KEYWORDS:Physical Oceanography; Continental shelves; Continental slopes; Ocean currents; Optical properties; Deep water; Data processing; Hydrographic surveys; Echo sounding; Eddies; Ocean Circulation; Satellite Observations; Ocean Temperature; Technology Utilization; Long Term Effects; Satellite Imagery; Ntisdimms; Gulf of Mexico.

**682.**
Science Applications International Corporation. 1994. Louisiana/Texas Shelf Physical Oceanography Program: Eddy Circulation Study. Annual Report: Year 1. Minerals Management Service, New Orleans, LA. Gulf of Mexico OCS Region.

ABSTRACT:The report describes data collection and data quality control efforts during the first field year year of the Gulf of Mexico Eddy Circulation Study. This program uses airborne expendable temperature and current probes and drifting buoys to monitor Loop Current eddies and smaller cyclonic and anticyclonic eddies in water deeper than 200m in the north western Gulf of Mexico. Seven aerial surveys were conducted during year 1 in the study region. Representative data products for each survey are presented.

KEYWORDS:Physical Oceanography; Eddies; Oceanic circulation; Continental shelves; Oceanographic data; Data collections; Quality control; Aerial surveys; Louisiana; Texas; Monitoring; Buoys; Latex Program; Ntisdilmla; Gulf of Mexico.

**683.**
Scott, L.C. 1981. The Louisiana Economy in the 1970's: a Decade of Growth and Internal Shifts. Louisiana Business Review (Spring).

ABSTRACT: None.

KEYWORDS: Socioeconomics.

**684.**
Scruton, P.C. 1960. Delta building and the deltaic sequence, pp 82-102. In: Shepard FP. Recent sediments, northwest Gulf of Mexico. American Association of Petroleum Geologists, Tulsa, Okla.

ABSTRACT: Study of the Mississippi Delta and several others shows that there are order and pattern in delta building. The characteristic stratigraphic sequences form during a delta cycle which consists of constructional and destructional phases. Marine deltas are seaward-thickening embankments of sediments deposited during the constructional phase and modified by the destructional phase. Sediments of the embankments are mostly land-derived clastics deposited in orderly sequence on the sea floor about distributary mouths. They make up the top-set, fore-set, and bottom-set beds of classical delta literature. Because of the way deltas grow, sediments change vertically in completed deltas in the same way they change sea-ward during construction; definite similarities between different deltaic sequences can be seen when they are compared. Changing sediment properties are produced by seaward-changing depositional environments. Sedimentary environments of modern deltas, and ancient ones as well, are complicated when studied in detail, but the general relationships now are well known. The environments are defined by (1) sediment sources, (2) processes and their intensities, and (3) rates of deposition. Source areas determine the raw materials, and these differ from delta to delta. Similar marine and fluviatile processes, similar distributions of process intensity, and relatively high rates of deposition are the environmental properties that cause deltaic sequences to be similar. Relatively rapid deposition is the fundamental characteristic of deltas. Deltas rarely build indefinitely on one direction; rather, the river shifts for a shorter route to the sea when it becomes over-elongated. The recently built delta is abandoned and modified by compaction coupled with marine wave and current action. This is the destructional phase, the time of winnowing of fine sediment and concentration of coarse material into thin veneers, beach ridges, and barrier islands. Large alluvial plains at river mouths are built up in a step-by-step manner. Local delta construction is followed by partial destruction, and later, by another constructional phase. A large alluvial plain consists of several imbricating deltas, each lying partly on the toes of earlier deltas and partly on the surface that existed prior to any delta building. The stratigraphic components of younger deltas become seaward extensions of their older counterparts. When the beds are buried beneath still younger ones, their full history can be understood only by recognizing their deltaic origin and by knowing how deltas are built.

KEYWORDS: Geology; Construction; Deltas; Mississippi River; United States.

**685.**
Seni, S.J. and M.P.A. Jackson. 1989. Counter-regional growth faults and salt sheet emplacement, northern Gulf of Mexico. Gulf Coast Section. Society of Economic Paleontologists and Mineralogists. Program and Abstracts 10:116-121.

ABSTRACT: None.

KEYWORDS: Geology.

**686.**
Seydlitz, R. and P. Jenkins. 1995. Future offshore extraction and impacts on communities: lessons from Louisiana. Society for the Study of Social Problems .

ABSTRACT: Argues that natural resource extraction is a seductive yet dangerous way to improve a community's economy. Time-series regression is employed to examine the impacts of petroleum development on lethal violence (suicide & homicide), economics (average income, unemployment rates, transfer payments, net migration, & sales taxes collected), & education (high school completion & enrolling in college) across three types of communities in LA: those highly involved in extraction, those highly involved in related activities (eg, refining, manufacturing, wholesale trade, & contract supply work), & those minimally involved. Findings demonstrate that many impacts are negative, although some are initially positive. In addition, extraction parishes experience more impacts than do either parishes with related activities or minimally involved parishes. Policy implications for coastal communities around the world are discussed. Particular emphasis is placed on the responsibilities of local communities, state-level governments, national governments, & corporations to monitor & mitigate the diverse impacts of resource extraction. (Copyright 1995, Sociological Abstracts, Inc., all rights reserved.).

KEYWORDS: Socioeconomics; Louisiana ; Natural Resources ; Petroleum Industry ; Social Indicators (D788700); Economic Development; Educational Attainment; Violence ; Community Development; Suicide; Homicide; Unemployment .

**687.**
Seydlitz, R. and S. Laska. 1994. Social and Economic Impacts of Petroleum 'Boom and Bust' Cycles,Final rept. Minerals Management Service, New Orleans, LA. Gulf of Mexico OCS Region.

ABSTRACT:This report focuses on the effect of petroleum production in the Gulf of Mexico on social problems, educational attainment and strain, and community economic health on parishes in Louisiana. The parishes studies vary in degree of involvement (highly or minimally involved) and type of involvement (extraction or related activities such as refining, metal fabrication and wholesaling) in petroleum production. The findings suggest that petroleum production in the Gulf of Mexico affects social problems, educational attainment, educational strain, and community economic health, In addition, the influence depends on both the degree and type of involvement. Mitigation recommendations include data collection, impact monitoring, sharing of information about potential impacts with community residents, counseling and treatment programs, and the expansion of government assistance and programs that help citizens cope with impacts.

KEYWORDS:Socioeconomics; Offshore drilling; Petroleum industry; Exploration; Mexico Gulf; Economic impact; Social welfare; Education; Production; Mitigation; Regional planning; Communities; Government policies; Louisiana; Monitoring; Economic assistance; Ntisdilmla.

**688.**
Seydlitz, R., J. Sutherlin, S. Smith, E.M. Bergman, and T.R. Hammer. 1995. Characteristics and possible impacts of restructured ocs oil and gas industry in the Gulf of Mexico,Final rept. Minerals Management Service, New Orleans, LA. Gulf of Mexico OCS Region.

ABSTRACT:The study describes the business characteristics, environment, and practices of companies involved in offshore oil and gas exploration and production in the Gulf of Mexico. The changes in the characteristics, environment, and practices since 1986 are examined to understand the restructuring in the oil and gas industry in the Gulf. Five types of companies operating offshore in the Gulf are studied - major corporations, large integrated independent businesses, small integrated independent concerns, large nonintegrated independent enterprises, and small nonintegrated independent firms.

KEYWORDS:Socioeconomics; Offshore oil industry; Offshore gas industry; Mexico Gulf; Commercial development; Production; Exploration; Corporations; Joint ventures; Louisiana.

**689.**
Seydlitz, R., S. Laska, D. Spain, E.W. Triche, and K.L. Bishop. 1993. Development and social problems: the impact of the offshore oil industry on suicide and homicide rates. Rural Sociology 58(1):93-110.

ABSTRACT: Statistical data from various federal & state government sources from the mid-1950s to mid-1980s are drawn on to explore the impact of offshore oil & gas extraction (as indicators of economic development) on 64 La counties (parishes). Results support hypotheses derived from social disorganization & relative deprivation theories by demonstrating that higher levels of & rapid changes in development are associated with higher homicide & suicide rates, especially in communities that are more involved in resource extraction. The utility of the methods & the implications of the results for theory & future research are discussed. 2 Tables, 88 References. Adapted from the source document. (Copyright 1993, Sociological Abstracts, Inc., all rights reserved.).

KEYWORDS: Socioeconomics; Suicide; Homicide; Petroleum Industry; Louisiana; Rates; suicide; homicide rates; offshore oil industry; Louisiana; 1950s-1980s; government statistical data.

**690.**
Seydlitz, R.P.J.a.S.H. 1995. The Impact of Energy Development on Education. Impact Assessment 13:31-46.

ABSTRACT: None.

KEYWORDS: Socioeconomics.

**691.**
Shaub, F.J., R.T. Buffler, and J.G. Parsons. 1984. Seismic stratigraphic framework of deep central Gulf of Mexico basin. American Association of Petroleum Geologists Bulletin 68(11):1790-1802.

ABSTRACT: The multichannel reflection seismic record from the deep Gulf of Mexico was divided into six seismic stratigraphic units for study of the geologic history of this accumulation. The basal Challenger unit (Jurassic(? ) to middle Cretaceous) is considered coeval with early basin formation. This is interpreted as a deep marine sequence overlying oceanic crust in the central basin and as continental and shallow through deep marine rocks, including thick evaporites, over adjacent transitional crust. The next three units, Campeche, Lower Mexican Ridges and Upper Mexican Ridges, indicate that from the Late Cretaceous through middle Miocene the basin filled progressively from the west and north. The late Miocene to Pliocene Cinco de Mayo unit represents a relatively starved interval. In contrast, the uppermost, or Sigsbee unit, includes the Mississippi Fan, an accumulation up to 3 km thick of mainly mass-transported deposits that bypassed the shelf and slope and were deposited directly onto the abyssal plain. In the western and southwestern portions of the deep basin, the Pleistocene section is largely a continuation of the Pliocene suspension deposits. Refs.

KEYWORDS: Geology; Geology; Subaqueous; Geological Surveys; Geophysics; Seismic; Gulf of Mexico Basin; Seismic Stratigraphic Framework.

**692.**
Shengyu, W., P.R. Vail, and C. Cramez. 1990. Allochthonous salt, structure and stratigraphy of the north-eastern Gulf of Mexico. I. Stratigraphy. Marine and Petroleum Geology 7(4):318-333.

ABSTRACT: Major sequence boundaries associated with eustatic sea level changes are correlated to the general stratigraphy of the north-eastern Gulf of Mexico. The details of a Middle Cretaceous flooding surface, marking a major break in sedimentation, are documented. The sequence stratigraphic work provides an example of the 'stratigraphic signature of the Neogene'. Three major episodes of sediment accumulation are represented by: (1) Late Jurassic (150.5 Ma) to Middle Cretaceous (94 Ma) aggregation and progradation of sediments with significant sediment accumulation in the present shelf and slope areas; (2) an extended period of starved sedimentation during 94-30 Ma corresponding to Middle Cretaceous flooding events (93.5 and 91.5 Ma) and the lack of sediment supply; and (3) since Late Oligocene time, unusually rapid sedimentation rates that characterize the deep water study area. These patterns of sediment accumulation directly affect the formation of allochthonous salt in the study area.

KEYWORDS: Geology; Geology; Oceanic Crust; Sediments; Seafloor Geology; Crust; Allochthonous Salt; Neogene; Tertiary; Structure; Stratigraphy; Gulf of Mexico; Cretaceous Flooding Surface; Sedimentation; Sediment Accumulation; Jurassic; Aggregation; Progradation; Oligocene.

**693.**
Shepard, F.P. 1959. Sediment environments of the northwest Gulf of Mexico. Eclogae Geologicae Helvetiae 51(3):598-608.

ABSTRACT: Study of a large suite of samples from the shallow water areas of the northwest Gulf of Mexico has provided criteria which should be helpful in determining the environments of deposition of many ancient sediments. Among the criteria which have proven most useful for identifying bays are the oyster reefs, the interfingering silty clays and clayey sands, and the small number of species compared to the open shelf. The barrier islands are characterized by their high sand content and their mixture of open shelf and bay faunas. The continental shelf sediments are distinguished by their content of glauconite, echinoid fragments, and planktonic Foraminifera (outer shelf), all of which are very scarce in the bays. The deposits around the mouths of rivers are characterized by their high wood content, their abundance of mica, and their good lamination.

KEYWORDS: Geology; Atlantic Ocean; Bays and Barrier Islands; Continental Shelf; Criteria; Depositional Environment; Depositional Environments; Environments; Gulf of Mexico; Louisiana; Marginal Sediments; Mississippi Delta; North Atlantic; Northwestern; Petrology; Sediments; Texas; United States.

**694.**
Shideler, G.L. 1979. Regional surface tubridity and hydrographic variability on the south Texas continental shelf. Journal of Sedimentary Petrology 49(4):1195-1208.

ABSTRACT: Regional surface-water turbidity patterns and associated hydrography were monitored on the South Texas Continental Shelf during an 18-month period (November 1975-May 1977). On six monitoring cruises, quasi-synoptic measurements were made of water transmissivity, suspended-sediment concentrations, temperature, salinity, and drifter trajectories. Time-sequence patterns of these parameters illustrate substantial spatial and temporal variability; temporal variations take place at both the seasonal and annual time scales. Turbidity and hydrographic patterns suggest a surface-sediment dispersal system regulated by a lateral shelf-water exchange process, driven by both wind and thermohaline forcing agents. Relatively turbid inner-shelf waters reflect the offshore and alongshore transport of sediment derived from coastal sources. Turbidity patterns along the inner shelf are characterized by a regional gradient of shoreward-increasing turbidity with superimposed local gradients established at major tidal inlets that serve as prominent sediment point sources and dispersal centers. Turbidity variability along the inner shelf is jointly attributed to variations in coastal runoff, wind-driven currents, and relative flux from individual tidal inlets. Relatively nonturbid outer-shelf waters suggest the shelfward incursion of an open-ocean water mass regulated by deep-Gulf circulation; the extent of incursion appears to vary spatially and temporally, resulting in outer-shelf turbidity variations. The overall shelf turbidity patterns reflect the degree of lateral interchange between the gulfward movement of turbid inner-shelf waters and the shelfward incursion of clear open-ocean waters.

KEYWORDS: Physical Oceanography; surface water; turbidity; hydrography; suspended sediment; wind-driven circulation; thermohaline circulation; Texas Continental Shelf; Continental Shelves; Temperature; Salinity; Time Series Analysis; Seasonal Variation; Long Term Changes; Sediment Transport; Gulf of Mexico.

**695.**
Shideler, G.L. 1981. Development of the Benthic Nepheloid Layer on the South Texas Continental Shelf, Western Gulf of Mexico. Marine Geology 41(1-2):37-61.

ABSTRACT: A monitoring study of suspended sediment on the South Texas Continental Shelf indicates that a turbid benthic nepheloid layer is regionally persistent. Substantial spatial and temporal variability in nepheloid-layer characteristics is indicated. Regionally, the thickness of the shelf nepheloid layer increases both seaward and in a convergent along shelf direction. Mean concentrations of suspended particulate matter ranged from $49x10^4$ to $111x10^4$particle counts/cc; concentrations persistently increase shoreward throughout the region. Bottom particulate matter is predominantly composed of inorganic detritus. The variability in nepheloid-layer characteristics indicates a highly dynamic shelf feature. The relationship of nepheloid-layer characteristics to hydrographic and substrate conditions suggests a conceptual model whereby nepheloid-layer development and maintenance are the results of the resuspension of sea-floor sediment. Bottom turbulence is attributed primarily to vertical shear and shoaling progressive internal waves generated by migrating shelf-water masses, expecially oceanic frontal systems, and secondarily to shoaling surface gravity waves.

KEYWORDS: Physical Oceanography; nepheloid layer; turbidity; benthic environment; continental shelves; suspended sediment; suspended particulate matter; detritus; resuspension; benthic boundary layer; shear; Texas; Turbulence; Internal Waves; Gulf of Mexico.

**696.**
Shideler, G.L. 1981. A sediment-dispersal model for the South Texas continental shelf, northwest Gulf of Mexico. Marine Geology 26(3-4):289-313.

ABSTRACT: Textural-distribution patterns of sea-floor sediments on the South Texas continental shelf between Matagorda Bay and the US-Mexico international boundary were evaluated as part of a regional environmental-studies program. Sediment textural gradients support a conceptual model for the regional sediment-dispersal system, which is characterized by both net offshore transport and net south-trending coastwise transport components on a wind-dominated shelf. Coastwise transport results in the net southward migration of both palimpsest sandy mud composing the ancestral Brazos-Colorado delta flank in the northern sector, and modern mud composing the central sector; these migrating sediments are encroaching southward onto immobile relict muddy sands composing the ancestral Rio Grande delta in the southern sector. In the proposed model, the suspension transport of modern silt-enriched mud derived mainly from coastal sources is the dominant dispersal mechanism. Net offshore transport is attributed both to diffusion, and to the advective ebb-tide discharge of turbid lagoonal-estuarine waters from coastal inlets. Net southward transport is attributed mainly to advection by seasonally residual coastwise drift currents reflecting a winter-dominated hydraulic regime. Frequent winter storms characterized by relatively high-speed northerly winds that accompany the passage of cold fronts appear to be dominant regional dispersal agents.

KEYWORDS: Physical Oceanography; sediment distribution; sediment texture; models; Sediment Transport; Continental Shelves; Gulf of Mexico.

**697.**
Shih, T.-C., J.L. Worzel, and J.S. Watkins. 1977. Northeastern extension of Sigsbee Scarp, Gulf of Mexico. American Association of Petroleum Geologists Bulletin 61(11 pt 1):1962-1978.

ABSTRACT: The northeastern extension is divided into three segments on the basis of differing topographic and structural character. The western segment (1) is the continuation of the well-developed Sigsbee scarp west of 90 DEGREE W. The central segment (II) comprises over three-fourths of the northeastern extension. Its topography and structure are concealed by the sedimentation of the Mississippi Cone. The eastern segment (III) is a transition before the scarp termination. 23 refs.

KEYWORDS: Geology; Petroleum Geology; Subaqueous; Natural Gas Deposits.

**698.**
Shinn, A.D. 1971. Possible Future Petroleum Potential of Upper Miocene and Pliocene, Western Gulf Basin. American Association of Petroleum Geologists Memoir 15:824-835.

ABSTRACT: Synergetic depositional and deformational phenomena have resulted in large concentrations of oil and gas in the upper Miocene and Pliocene sections of the Gulf Coast geosyncline. Most of these accumulations have been found trapped in the sandstone and sandstone-shale magnafacies. The gulfward limit of future exploitation can be determined reasonably from present date, and should extend to water depths of 600 ft. (180 m). Any significant future discoveries are most likely to be in the offshore. Development of these facies in Louisiana is approaching maturity, but there should be limited extensions gulfward and eastward of present production. Offshore Texas is largely unexplored, but results of drilling have been disappointing. Exploration for turbidites in the shale magnafacies gulfward of present trends is a challenge both to explorationists and to management. Turbidites will be difficult to locate and drilling will be expensive. They must be thick and prolific reservoirs in order to be commercial but it is possible that such thick sequences are present. A possible future source exists in the shale magnafacies where turbidite sandstone reasonably can be expected on the updip flanks of salt structures and in the lows between them. The search for reservoirs of this type, particularly in the younger sections, will involve operations beyond the continental shelf in water depths that increase abruptly from 600-ft. (180 m) depth. Exploration in the older beds will require increasingly deeper drilling. Exploration for turbidites requires complex seismic techniques and the best efforts of geologists, paleontologists, and geophysicists. No realistic estimate of favorable sedimentary-rock volume in the shale magnafacies is possible at this time. Present economics barely have justified the oil industry's exploration of the sandstone and sandstone-shale magnafacies in the water less than 600 ft. dee Thus, more costly exploration in the deeper waters beyond the continental shelf will depend on increased incentives. Otherwise, economic considerations may jeopardize all future exploration in the Gulf of Mexico.

KEYWORDS: Geology.

**699.**
Shinn, A.D. 1971. Possible Future Petroleum Potential of Upper Miocene and Pliocene, Western Gulf Basin. Memoir - American Association of Petroleum Geologists 2(15):824-835.

ABSTRACT: Synergetic depositional and deformational phenomena have resulted in large concentrations of oil and gas in the upper Miocene and Pliocene sections of the Gulf Coast geosyncline. Most of these accumulations have been found trapped in the sandstone and sandstone-shale magnafacies. The gulfward limit of future exploitation can be determined reasonably from present date, and should extend to water depths of 600 ft. (180 m). Any significant future discoveries are most likely to be in the offshore. Development of these facies in Louisiana is approaching maturity, but there should be limited extensions gulfward and eastward of present production. Offshore Texas is largely unexplored, but results of drilling have been disappointing. Exploration for turbidites in the shale magnafacies gulfward of present trends is a challenge both to explorationists and to management. Turbidites will be difficult to locate and drilling will be expensive. They must be thick and prolific reservoirs in order to be commercial but it is possible that such thick sequences are present. A possible future source exists in the shale magnafacies where turbidite sandstone reasonably can be expected on the updip flanks of salt structures and in the lows between them. The search for reservoirs of this type, particularly in the younger sections, will involve operations beyond the continental shelf in water depths that increase abruptly from 600-ft. (180 m) depth. Exploration in the older beds will require increasingly deeper drilling. Exploration for turbidites requires complex seismic techniques and the best efforts of geologists, paleontologists, and geophysicists. No realistic estimate of favorable sedimentary-rock volume in the shale magnafacies is possible at this time. Present economics barely have justified the oil industry's exploration of the sandstone and sandstone-shale magnafacies in the water less than 600 ft. dee Thus, more costly exploration in the deeper waters beyond the continental shelf will depend on increased incentives. Otherwise, economic considerations may jeopardize all future exploration in the Gulf of Mexico.

KEYWORDS: Geology; Atlantic Ocean; Cenozoic; Clastic Rocks; Economic Geology; Gas; Gulf of Mexico; Lithostratigraphy; Miocene; Natural Gas; Neogene; North Atlantic; Petroleum; Pliocene; Possibilities; Possiblilities; Sedimentary Rocks; Structural Complexes; Structure; Tectonics; Tertiary; Texas; United States.

**700.**
Shipley, T.H., M.H. Houston, R.T. Buffler, F.J. Shaub, K.J. McMillen, J.W. Ladd, and J.L. Worzel. 1979. Seismic evidence for widespread possible gas hydrate horizons on continental slopes and rises. American Association of Petroleum Geologists Bulletin 63(12):2204-2213.

ABSTRACT: Anomalous reflections in marine seismic reflection data from continental slopes are often correlated with the base of gas hydrated sedimentary rocks. Examination of University of Texas Marine Science Institute reflection data reveals the possible presence of such gas hydrates along the east coast of the United States, the western Gulf of Mexico, the coasts of northern Colombia and northern Panama, and along the Pacific side of Central America in areas extending from Panama to near Acapulco, Mexico. Geometric relations, reflection coefficients, reflection polarity, and pressure-temperature relations all support the identification of the anomalous reflections as the base of gas hydrated sediments. 31 refs.

KEYWORDS: Geology; Natural Gas Deposits; United States; Geophysics; Seismic; Petroleum Geology; Subaqueous; Gas Hydrate.

**701.**
Shokes, R.F., P.K. Trabant, B.J. Presley, and D.F. Reid. 1977. Anoxic, hypersaline basin in the northern Gulf of Mexico. Science 196(4297):1443-6.

ABSTRACT: A 400-square-kilometer depression in the continental slope of the northern Gulf of Mexico (approximately 27 degrees N, 91 degrees W) has been found to contain anoxic, hypersaline ( approximately 250 grams per kilogram) water in the bottom 200 meters. The interface between the brine and overlying seawater acts as a midwater seismic reflector similar to those seen in the Red Sea. The bulk chemical composition of the brine is similar to that from the Red Sea, but differences between the two in both heat content and geomorphological setting indicate different modes of origin.

KEYWORDS: Geology; Oceanography; Seawater; Sediments; Continental Slope; Midwater Seismic Reflector; Chemical Composition; Heat Content; Geomorphological Setting; Origin; Anoxic Hypersaline Basin; N.gulf Of Mexico; Red Sea Comparison; Brine-Seawater Interface.

**702.**
Sibuet, M. and K. Olu. 1998. Biogeography, biodiversity and fluid dependence of deep-sea cold-seep communities at active and passive margins. Deep-Sea Research 45(1-3):517-567.

ABSTRACT: To date, several cold-seep areas which fuel chemosynthesis-based benthic communities have been explored, mainly by deployment of manned submersibles. They are located in the Atlantic and in the Eastern and Western Pacific oceans and in the Mediterranean Sea, in depths ranging between 400 and 6000 m in different geological contexts in passive and active margins. Our study is based on a review of the existent literature on 24 deep cold seeps. The geographic distribution of seeps, the variations of origin and composition of fluids, and rates of fluid flow are presented as they are important factors which explain the spatial heterogeneity and the biomass of biological communities. Methane-rich fluid of thermogenic and/or biogenic origin is the principal source of energy for high-productive communities^ however, production of sulphide by sulphate reduction in the sediment also has a major role. The dominant seep species are large bivalves belonging to the families Vesicomyidae or Mytilidae. Other symbiont-containing species occur belonging to Solemyidae, Thyasiridae, Lucinidae bivalves, Pogonophora worms, Cladorhizidae and Hymedesmiidae sponges. Most of the symbiont-containing cold-seep species are new to science. Different symbiont-containing species rely on sulphide or methane oxidation, or both, via chemoautotrophic endosymbiotic bacteria. A total of 211 species, from which 64 are symbiont-containing species, have been inventoried. Patterns in biodiversity and biogeography are proposed. A large majority of the species are endemic to a seep area and the symbiont-containing species are mainly endemic to the cold-seep ecosystem. A comparison of species found in other deep chemosynthesis-based ecosystems, hydrothermal vents, whale carcass and shipwreck reduced habitats, reveals from the existing data, that only 13 species, of which five are symbiont-containing species occur, at both seeps and hydrothermal vents. The species richness of cold-seep communities decreases with depth. High diversity compared to that on hydrothermal vent sites is found at several seeps. This may be explained by the duration of fluid flow, the sediment substrate which may favour long-term conditions with accumulation of sulphide and the evolution of cold seeps.

KEYWORDS: Geochemistry; Active Margins; Passive Margins; Biogeography; Symbionts; Sulphate Reduction; Sediment Chemistry; Hydrothermal Springs; Species Diversity; Seepages; Methane; Sulphides; Deep Sea; Benthos; Biomass; Hydrothermal Vents; Cladorhizidae; Solemyidae; Thyasiridae; Lucinidae; Hymedesmiidae; Pogo Nophora; Vesicomyidae; Mytilidae; World Oceans; <Identifier> Marine Molluscs; Cold Seeps; Bacteria; Beard Worms.

**703.**
Sidner, B.R. 1977. Late pleistocene geologic history of the outer continental shelf and upper continental slope, northwest Gulf of Mexico,Texas A&M University. Technical Report 77-5-T.

ABSTRACT:Integrated high resolution seismic and core data from the Texas outer continental shelf and upper continental slope were used to reconstruct the late Pleistocene geologic history of the area. Seismically aided correlation of paleoclimatic fluctuations determined with foraminifers indicates that the late Pleistocene-Holcene sequence was deposited during five cool-warm fluctuations. Correlation of these fluctuations with dated oxygen isotope curves serves as a basis for placing both paleoclimatic and sedimentary events into a time framework. Seismic profiles over the core sites allow the dating of seismic reflecting horizons and extension of the chronologic framework over most of the area. It appears that two major phases of shelf edge outbuilding occurred during the late Pleistocene. Both phases began with the development of shelf margin deltas during low stands of sea level. The deposition of these relatively coarse-grained sediments within the shelf-slope transition zone was accompanied by active growth faulting. Subsidence of the shelf edge also appears to have triggered uplift of elongate diapiric structures on the upper continental slope. Where the progradation of shelf margin deltas extended beyond the previously existing shelf break, large slide masses are present on the adjacent continental slope. These slide masses appear to have associated with them active gas generation. Migration of gas into the surrounding sediments can greatly alter their seismic character. Sediment textural variations and fluctuations in the sediment accumulation rate also affect the character of individual reflecting horizons.

KEYWORDS:Geology; Seismic data; sea level stands.

**704.**

Sidner, B.R., S. Gartner, and W.R. Bryant. 1978. Late Pleistocene geologic history of Texas outer continental shelf and upper continental slope, pp 243-266. In: Bouma AH, Moore GT, Coleman JM, (Editor). Framework, facies, and oil-trapping characteristics of the upper continental margin. American Association of Petroleum Geologists, Tulsa, OK.

ABSTRACT: Integrated high-resolution seismic and core data from the Texas outer continental shelf and upper continental slope were used to reconstruct the late Pleistocene geologic history of the area. Paleoclimatic fluctuations, determined with foraminifers and correlated with the aid of seismic data, indicate that the late PleistoceneHolocene sequence represents five cool/warm fluctuations. Correlation of these fluctuations with the generalized paleotemperature curve generated from oxygen isotope data serves as a basis for placing both paleoclimatic and sedimentary events into a time framework. Seismic profiles over core sites allow the dating of seismic reflecting horizons and extension of the chronologic framework over most of the area. Two major phases of shelf-edge outbuilding occurred during the late Pleistocene. Both phases began with the development of shelf-margin deltas during lowstands of sea level. The deposition of these shallow-water clays and sandy clays within the shelf-slope transition zone was accompanied by active growth faulting. Large slide masses are present on the adjacent continental slope where the progradation of shelf-margin deltas extended beyond the previously existing shelf break. Active gas generation appears to be associated with the slide masses and greatly alters the seismic character of the surrounding sediments.

KEYWORDS: Geology; Atlantic Ocean; Bathymetry; Cenozoic; Continental Margin; Continental Shelf; Continental Slope; Cores; Correlation; Environmental Analysis; Foraminifera; Foraminifers; Geophysical Surveys; Gulf of Mexico; Inner Slope; Invertebrata; Invertebrates; Microfossils; North Atlantic; Outer Shelf; Paleogeography; Physiography; Planktonic Taxa; Pleistocene; Protista; Quaternary; Reconstruction; Sedimentation; Sedim Ents; Seismic Surveys; Sparker Surveys; Stratigraphy; Surveys; Texas; Textures; United States; Upper Pleistocene.

**705.**

Signorini, S.R., J.S. Wei, and C.D. Miller. 1992. Hurricane-induced surge and currents on the Texas-Louisiana shelf. Journal of Geophysical Research 97(C2):2229-2242.

ABSTRACT: This study consists of numerical model simulations of hurricane-induced surge and currents on the Texas-Louisiana shelf. The numerical experiment includes the simulation of multiple hurricane tracks with landfalling points along the Texas-Louisiana coast. A parallel storm that traverses the entire Texas-Louisiana coastline is also modeled to assess the difference in shelf response between landfalling and parallel storms. The grid extends from the Texas-Mexico border to the Gulf Coast of Florida, with the ocean open boundary seaward of the shelf break. Along-shelf and cross-shelf surge and current variability are assessed as a function of shoreline geometry and bottom topography. A complementary one-dimensional mixed layer model is used to evaluate the vertical structure of the currents and the maximum depth of hurricane influence. The choice of landfalling storm tracks is based principally on historical storm tracks for the Texas-Louisiana area. Storm intensity, i.e., central pressure depression, for all storms is set equal to the 10-year recurrence interval central pressure.

KEYWORDS: Physical Oceanography; Texas; Louisiana; hurricane waves; storm surges; continental shelves; water currents; topographic effects; water level; winds; hurricanes; Landfall Angle; Gulf of Mexico.

**706.**
Simmons, G.R. 1992. The regional distribution of salt in the northwestern Gulf of Mexico: styles of emplacement and implications for early tectonic history. PhD. Dissertation. Texas A&M University. College Station, TX.

ABSTRACT: The regional distribution of salt in the northwestern Gulf of Mexico reflects a complex interplay between tectonic basin architecture and subsequent salt kinematics. Persistent northwest-southeast structural trends across the Texas-Louisiana margin are attributed to a structural fabric of the transitional crust upon which the Louann Salt was deposited, and which formed during the Late Triassic to Middle Jurassic as the Yucatan block moved southeast out of the northwestern Gulf. Major transfer faults divide the Gulf Coast into segments characterized by markedly different salt abundances and structural styles. Complimentary asymmetry in salt volumes between the Louann and Campeche provinces is consistent with a reversal in the dip direction of crystal detachment faulting over a narrow corridor characterized by an abundance of northwest-southeast oriented salt structures and greater than 100 km of right-lateral offset between the Perdido and Mississippi Fan foldbelts. Separation of the Louann and Campeche provinces suggests a possible counterclockwise rotation of the Yucatan block during Late Jurassic seafloor spreading.^Major depocenters developed above susidiary basins containing thicker accumulations of Louann Salt. Expansion of stratigraphic intervals was accommodated by the mobilization of salt into a variety of structural styles. The Perdido and Mississippi Fan foldbelts formed in response to compressional forces transmitted via shelf margin growth faults to the basinward limit of Louann Salt. Associated salt wedges are overthrust on the order of one to 10 km. Salt wedges of the Sigsbee Bulge are overthrust up to 60 km or more, and possibly away from an abrupt limit of Louann Salt against right-lateral offsets of the continent/ocean boundary.^The Sigsbee Escarpment represents the basinward limit of allochthonous salt deformed away from the Pleistocene depocenter. Isolated supralobal basins are subsiding into a nearly continuous substrate of overthrusting salt wedges across the lower slope. Across the upper to middle slope numerous lateral intrusions of allochthonous salt are spreading from the crests of isolated domes and massifs forming distinct interlobal basin margins. As the lateral intrusions converge interlobal areas are reduced. Eventually source layers are almost completely evacuated and the salt redistributed in the shallow subsurface as allochthonous canopies.

KEYWORDS: Geology; Geology; Geophysics.

**707.**
Smith, D.C.I. 1986. A numerical study of Loop Current eddy interaction with topography in the western Gulf of Mexico. Journal of Physical Oceanography 16(7):1260-1272.

ABSTRACT: Anticyclones originating from the Loop Current are known to propagate into the western Gulf of Mexico. Their frequency of generation, their long lifetimes, and satellite data suggest that at any one time one or more eddies may occupy the Gulf. Given the eddy sizes (100-200 km) and geometric confinement of the Gulf, it would appear that there may be significant interactions of individual eddies and/or interactions of the eddies with bottom topography. These possibilities are explored through the use of a two-layer primitive equation model. Variable parameters in this model study are eddy strength, vertical structure, lateral friction, and initial location relative to topography. Results indicate that eddy motion is governed by two dynamical regimes depending on its lower layer rotational strength.

KEYWORDS: Physical Oceanography; oceanic eddies; topographic effects; Loop Current; Interactions; Mathematical Models; Gulf of Mexico.

**708.**
Smith, E.T. and Jr. L. G. Hecht. 1981. Modeling the Cumulative Onshore Effects of Offshore Oil and Gas Development, U.S. Geological Service, Research Planning Analysis Office. Reston, VA USGS Open-file report; 81-317.

ABSTRACT:None.

KEYWORDS:Socioeconomics.

**709.**
Smith, J. 1999. Ursa A-7 well produces 50,150 boe/d for Shell. Offshore Magazine November .

ABSTRACT: None.

KEYWORDS: Technology.

**710.**
Smith, K.L.J.andG.A. White. 1982. Ecological energetic studies in the deep-sea benthic boundary layer: In situ respiration studies., pp p. 279-300. In: Ernst WG, Morin JG. The Environment of the Deep Sea. Rubey Volume II.

ABSTRACT: The consumer populations of the soft-bottom benthic boundary layer are arbitrarily divided into four components: the sediment community, the epibenthic megafauna, the benthopelagic animals, and the plankton. The study of carbon flow through this system, as estimated from respiration rates, is currently underway using described in situ instrumentation including the free vehicle grab respirometer (sediment community respiration), the fish trap respirometer (benthopelagic animal respiration), and the slurp gun respirometer (plankton respiration). Crude estimates of the respiration rates for three components were as follows: sediment community (0.96 g C m super(-2) y super(-1)), behthopelagic animals (0.04 g C m super(-2) y super(-1)), and plankton (0.18 g C m super(-2) y super(-1)). The epibenthic megafauna were not considered because of unavailable data. Combined respiration is equivalent to 28% of the particulate organic flux to the benthic boundary layer as measured by sedimentation traps.

KEYWORDS: benthos; deep sea; energetics; trophic levels; respiration; deep water; respiration; bioenergetics.

**711.**
Smith, M., E. Lowe, and C. Coull. 1997. Deepwater remotely actuated completions for the 21st century. Proceedings - SPE Annual Technical Conference and Exhibition : 69-84.

ABSTRACT: : With deepwater rig rates as high as dollar 190,000 per day, the ability to minimize well completion time without compromising reliability or safety can substantially reduce operating expense. In the Gulf of Mexico, Atlantic Frontier and North Sea, a pressure pulse remote actuation system for setting completion tools has significantly reduced rig time. Previous SPE papers on pressure pulse remote actuation of completion tools served to introduce this new technology to the industry. This paper, by examination of eighteen deepwater completion case histories, will illustrate the challenges faced, milestones reached, efficiencies achieved, and the promising future of remotely actuated completions. This paper should be read in conjunction with the referenced OTC papers to fully appreciate the many challenges of subsea deepwater completions. This paper will not attempt to prove the technology by case study, but rather will examine the successes, failures and subsequent lessons learned that prove the service companies' and the industry's commitment to making remote actuation of completion tools a viable 21.

**712.**
Smith, N.P. 1977. Near-bottom cross-shelf currents in the northwestern Gulf of Mexico: a response to wind forcing. Journal of Physical Oceanography 7(4):615-620.

ABSTRACT: Recording current meter data from two near-bottom levels on the inner shelf of the northwestern Gulf of Mexico are presented with wind data from November and December 1975. Four periods of predominantly cross-shelf motion are discussed, involving both onshore and offshore motion. Coherence spectra relating cross-shelf motion with the longshore and cross-shelf components of the computed wind stress show statistically significant values at both levels. Cross-shelf motion past the upper current meter, 3.7 m above the bottom in 13.5 m of water, is more responsive to the cross-shelf component of the wind stress and indicates that near-bottom cross-shelf motion occurs as a simple return flow. At the lower level, 0.9 m above the bottom, cross-shelf currents are more coherent with the longshore component of the wind stress, suggesting a response to Ekman transport in the surface layer. A coherence spectrum of cross-shelf motion from these two levels indicates low values except over the very longest time scales.

KEYWORDS: Physical Oceanography; Oceanography; Wind; Wind Forcing; Wind Stress; Ekman Transport; Nw; Near Bottom Cross Shelf Currents; 1975 November to December; Coherence Spectra; Gulf of Mexico.

## 713.

Smith, P.L., S.B. Hodges, K.A. Digre, B.A. Sarwono, and H. Schipper. 1999. Ursa TLP Hull Design, Fabrication and Transportation. Proceedings of the 31th Annual Offshore Technology Conference (OTC paper 10754).

ABSTRACT: This paper describes the design, fabrication and transportation of the 28,500mt Ursa TLP hull. The process involved a fast track design performed in the USA while fabrication of the hull was underway in Italy. Highlights of major decisions or events will be presented. Unique concerns include: 1) interface with the TLP deck module designers, fabricators and installers, 2) loadout of the hull onto the H-851 transport barge, 3) grillage support for transportation of the hull as a dry tow from Italy to the Gulf of Mexico, later changed to Aruba, and 4) ballasting and float-off of the hull from the H-851 in 40m of water.

KEYWORDS: Technology.

## 714.

Snyder, D.B., L. Lagera, P. Arnold, L. de Wit, and G. H. Burgess . 1999. Potential conflicts between deepwater fishing and oil and gas operations in the Gulf of Mexico. 52nd Annual Gulf and Caribbean Fisheries Institute-Abstracts :56.

ABSTRACT: The fishing and offshore energy industries have coexisted and developed amicably for many years in shelf waters of the northern Gulf of Mexico. Recently, the offshore energy industry in the Gulf has shifted its interest beyond the shelf and into deep waters (>200 m). This is evidenced by over 3,000 active leases and about 50 development/production facilities in water depths greater than 200 m. Existing and future structures represent new and evolving technology which could interact with existing deepwater fishing practices. All phases of the deepwater offshore energy industry--geophysical surveys, exploratory drilling, development/production, and abandonment could conflict with current deepwater fishing practices. Current deepwater fishing practices in the northern Gulf of Mexico include trapping for golden crab, trawling for royal red shrimp, bottom longlining for groupers and tilefishes, and surface longlining for sharks and tunas. Of these gear types, the pelagic longline presents the greatest possibility for interactions or space-use conflicts. Our analysis of potential conflicts in the Gulf of Mexico includes experience from domestic and international waters.

KEYWORDS: Fisheries; Gulf of Mexico; pelagic fishes; royal red shrimp; tuna Fisheries; longlining.

## 715.

Spies, R.B. and P.H. Davis. 1979. The infaunal benthos of a natural oil seep in the Santa Barbara Channel. Marine Biology 50(3):227-237.

ABSTRACT: A diverse infaunal benthic community in the fine sand sediments of a shallow (16 m) natural oil seep near Santa Barbara is being studied. The study area and sampling methods are described. Data presented indicate the adequacy of sampling in revealing horizontal patchiness and vertical faunal distributions. The infauna of the seep and of a nearby comparison area, without seepage but of similar depth and sediment type, are compared. The data indicate a consistently larger but fluctuating density of organisms at the seep station. However, Shannon-Weaver diversity (H=1.6 to 1.7), Peilou's evenness (J=0.80 to 0.81), and measures of dominance-diversity with estimates of graphical skewness (0.66 to 0.68) and kurtosis (1.2 to 1.4) are similar for the 2 stations. The rank correlation of common species at the stations is significant according to Spearman's rho. Species common to both stations account for 85 to 95% of the individuals, further indicating the high degree of similarity between stations. Denser populations of oligochaetes and the maldanid polychaete Praxillella affinis pacifica suggest some advantages for deposit feeders at the seep station. Mats of the bacterium Beggiatoa sp. are associated with localized intense oil seepage. Hypotheses suggesting trophic enrichment and biochemical adaptation at the seep are presented.

KEYWORDS: California Coast; Santa Barbara Channel; Spatial Distribution; Benthic Zones; Infauna; Petroleum; Marine Organisms; Sediments; Ecology; Natural Oil Seep; Trophic Enrichment.

**716.**
Springer, S. 1957. Some observations on the behavior of schools of fishes in the Gulf of Mexico and adjacent waters. Ecology 38(1):166-171.

ABSTRACT: None.

KEYWORDS: pelagic fishes; Gulf of Mexico.

**717.**
Springer, S. and B.Jr. H.R. 1956. Collections made by the OREGON in the Gulf of Mexico. Special Scientific Report Fisheries (196):1-134.

ABSTRACT: This report provides the raw data from exploratory fishing efforts made by the U.S. Fish and Wildlife Service vessel OREGON from 1950 to 1955 in the Gulf of Mexico. Exploratory fishing was conducted with shrimp trawls, tuna longline gear, handlines, trap lift nets, and dip nets. Shrimp trawls were used in two depth strata: 20 to 75 fathoms and 175 to 300 fathoms. Tuna longline gear was deployed offshore of the shelf break, handlines and dipnets were used opportunistically while the vessel was drifting in all water depths. Lift nets were used to capture small surface schooling species. Extensive phyolgenetic lists of invertebrates and fishes collected are given with station numbers. These station numbers can be cross-referenced with collection data such as position (Latitude/Longitude), date, time, water depth, bottom type, air temperature, water temperature (surface and bottom), and gear type used.

KEYWORDS: Fisheries; Gulf of Mexico; demersal fishes; pelagic fishes; exploratory fishing.

**718.**
Staff, G., E.N. Powell, R.J.J. Stanton, and H. Cummins. 1985. Biomass: Is it a useful tool in paleocommunity reconstruction?. Lethaia. 18(3):209-232.

ABSTRACT: In general, more of the biomass of the community is preserved than is its numerical abundance. Thus, the paleontologist, on the average, works with more of the community when biomass is used. Community characteristics such as taxon dominance nad habitat proportions are at least as accurately derived from biomass as numerical abundance. The use of biomass is clearly more appropriate in describing energy flow and trophic proportions. Whenever possible, biomass should be used as a complement to numerical abundance in future paleoecologic reconstructions.

KEYWORDS: paleoecology; biomass; community composition; marine organisms; species diversity; fossils; methodology; USA, Texas; Asw, Usa, Texas; Use.

**719.**
Stallings, E.F. 1984. Development of OCS techniques. pp 1-26. In: Gramling RB, S. Brabant. The Role of Outer Continental Shelf Oil and Gas Activities in the Growth and Modification of Louisiana's Coastal Zone. U.S. Department of Commerce, National Oceanic and Atmospheric Administration; Louisiana Department of Natural Resources, Lafayette, Louisiana.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana.

**720.**
Stallings, E.F. 1984. Modification and Consuption of Scarce Coastal Resources, pp 117-125. In: Gramling RB, S. Brabant. The Role of Outer Continental Shelf Oil and Gas Activities in the Growth and Modification of Louisiana's Coastal Zone. U.S. Department of Commerce, National Oceanic and Atmospheric Administration; Louisiana Department of Natural Resources, Lafayette, Louisiana.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana.

**721**. Stallings EF, T. F. Reilly, R. B. Gramling, D. P. Manuel. 1977. Outer Continental Shelf Impacts: Morgan City, Louisiana. Louisiana: University of Southwest Louisiana Lafayette, LA

ABSTRACT: None.

KEYWORDS: Socioeconomics.

**722**.
Stallings, E.F.andT.F. Rielly. 1980. Transportation--East St. Mary Parish. pp 278-287. In: Gramling RB, (Editor). East St. Mary Parish, Economic Growth and Stabilization Strategies. Louisiana Department of Natural Resources,

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana.

**723**.
Stallings, E.F. 1980. Natural Resource Base, pp 17-20. In: Gramling RB. East St. Mary Parish, Economic Growth and Stabilization Strategies. Louisiana Department of Natural Resources, Baton Rouge, LA.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana.

**724**. Stewart, H.B.Jr. 1978. Cooperative investigations of the Caribbean and adjacent regions-II. Symposium on progress in marine research in the Caribbean and adjacent regions. Food and Agriculture Organization of the United NationsCaracas, Venezuela.

ABSTRACT: The velocity of sound has been determined on the basis of oceanographic data collected during 3 CICAR cruises of the Mexican Navy research vessel VIRGILIO URIBE in the southwestern Gulf of Mexico. Computations were carried out by means of the Wilson formula. A recent formula proposed by Del Grosso was also used for comparison, giving very similar results. A procedure for detection of the depth of the velocity minimum (deep sound channel) based on the Wilson formula, is presented as well as the topography of this layer, normally found in this area between 800 and 1000m. The recent and specific oceanographic data are also used for an echo sounding corrections table that can be applied to the two scales commonly used on commercial echo sounders (1500 m/s and 800 fm/s). Those corrections differ only slightly from those given by D.J. Matthews in 1939 for this region.

KEYWORDS: Geology.

**725.**
Stuart, C.J. and C.A. Caughey. 1976. Form and composition of the Mississippi Fan. Transactions Gulf Coast Association of Geological Societies 26:333-343.

ABSTRACT: The Mississippi Fan is a lobe-shaped prism of muddy Quaternary sediments extending for about 600 km. from near the present Mississippi River Delta to the Sigsbee Abyssal Plain. The Mississippi Trough notches the shelf edge near the fan apex. The trough apparently channeled detritus across the outer shelf and upper slope and acted as a point source of fan sediment. Upper, middle, and lower regions of the fan are identified on the basis of sea floor gradient and relative smoothness, seismic character, and influence of salt structures. The upper fan occurs in water depths from about 1,300 to 2,500 meters and has irregular, hummocky topography with an average surface gradient of about 1°. Structural and topographic complexities in this part of the fan have resulted from salt diapirism, slumping and possibly current scour. Core lithologies consist of clay; silt, and scattered, very fine grained sand. The middle part of the fan is characterized by a low gradient (<0.25°), moderately smooth surface, and complex internal structures as shown by seismic profiles. Mid-fan deposits thin from 1,300 to 800 meters toward the southwest and southeast, and near-surface sediments are clay and silts. Widespread intervals of chaotic seismic response interpreted as slump and slide deposits occur adjacent to the depositional loci of the fan. Interbedded units of continuous reflectors probably are turbidites, hemipelagites, and possibly contourites. The lower fan is very smooth, nearly flat, and grades into the Florida and Sigsbee abyssal plains. Quaternary silt and clay in the lower fan are interpreted as turbidites and pelagites. Associated seismic reflections are continuous and converge toward abyssal plain areas.

KEYWORDS: Geology.

**726.**
Sturges, W. 1992. The spectrum of loop current variability from gappy data. Journal of Physical Oceanography 22(11):1245-1256.

ABSTRACT: The goal of this work was to understand the rate at which large anticyclonic rings are shed from the Loop Current in the Gulf of Mexico. The northward penetration of the Loop Current is used here as a surrogate variable. Data are primarily from satellite IR maps and are supplemented with XBT sections and older hydrographic data. The IR data have gaps from poor summertime visibility, bad weather, and the ambiguity of not knowing exactly when a ring separates. A least-squares method is developed for computing the spectrum. The computations are performed in the time domain to avoid problems with explicit calculation of the Fourier transform. The slightly smoothed spectrum can be recovered to high accuracy at low frequencies for the case of long segments of continuous data separated by large gaps. The method requires choosing an appropriate smooth data window to widen the spectral window, determining the effective Nyquist frequency of the method, filtering the continuous data segments to remove power at frequencies higher than the Nyquist, and inverting a matrix for the cosine and sine terms of the traditional Fourier frequencies. The spectrum of Loop Current variability has several broad peaks. The primary one near 8.5 months appears to be the fundamental rate at which rings would be shed with constant inflow. Others, near 6, 13.4, and 25 months, can be understood as interactions between the fundamental and various forcing frequencies. At periods shorter than similar to 4 months the spectrum falls away toward high frequencies as f super(-2.5). Although there is a substantial peak near 13.4 months, the power at exactly 12.0 months does not rise above the background level.

KEYWORDS: Physical Oceanography; Loop Current; current meandering; satellite sensing; temporal variations; spectral analysis; data processing; Missing Data; Gulf of Mexico.

**727.**
Sturges, W. 1993. The annual cycle of the western boundary current in the Gulf of Mexico. Journal of Geophysical Research 98(C10):18053-18068.

ABSTRACT: It has been known for decades that the mean circulation in the western Gulf of Mexico is a large anticyclone. This flow is driven both by wind stress curl and detached rings from the Loop Current. This paper is an attempt to examine their relative importance by focusing on the annual cycle of the observed flow. A new compilation of ship drift data shows that the flow along the western boundary is strongest in July and weakest in October. It appears physically plausible that the annual variation of this western boundary current is driven by the annual variation in wind curl augmented by Ekman pumping over the western gulf. Because the maximum in wind curl is so close to the western boundary, the phase delay between the annual cycles of curl and current is only approximately 1 month. The magnitudes of the curl and resulting current seem physically plausible. The response is baroclinic and penetrates to approximately 1000 m, the bottom of the main thermocline. The change in velocity at the sea surface is consistent with the cross-stream pressure gradient as determined by the changes in sea level at the coast and dynamic height changes offshore. The annual cycle is relatively large. This flow could be driven by wind curl. Consequently, the contribution of Loop Current rings turns out to be relatively small. The reason for this is that when rings reach the western wall, the steep bottom topography intersects the sloping fluid contours of the rings. The rings decay slowly by normal deepwater processes until they reach the edge of the continental shelf.

KEYWORDS: Physical Oceanography; Oceanographic Regions; Upper Ocean; Dynamics; Annual Cycle; Western Boundary Current; Circulation; Anticyclone; Wind Stress Curl; Detached Ring; Loop Current; Annual Variation; Ekman Pumping; Gulf of Mexico.

**728.**
Sturges, W. 1994. The frequency of ring separations from the loop current. Journal of Physical Oceanography 24(7):1647-1651.

ABSTRACT: In two recent papers, the frequency of separation of rings from the Loop Current in the Gulf of Mexico was studied; the authors used similar data but obtained remarkably different results for the primary rate of ring shedding. In this paper the time between successive rings for the last 22 known ring events since 1973 are examined. Using a histogramlike technique that does not involve a surrogate variable but deals directly with the ring events themselves, two primary modes are found. The one at a period near 8-9 mo has slightly (but not significantly) more power than the one near 13-14 mo. The uncertainty in the periods of these peaks is estimated to be similar to 0.3 mo from measurement uncertainties and an additional similar to 0.3 mo from the natural variability of the process. If the high resolution available from a 20-year record were not maintained, it would be possible to smooth the present result heavily (in frequency space) and obtain the similar to 11 mo peak reported by Maul and Vukovich.

KEYWORDS: Physical Oceanography; Loop Current; oceanic eddies; current meandering; statistical analysis; Gulf of Mexico.

**729.**
Sturges, W. and J.P. Blaha. 1975. A Western Boundary Current in the Gulf of Mexico. Science 192(4237):367-369.

ABSTRACT: The curl of the wind stress over the Gulf of Mexico, during the winter and again in the summer, is similar to that over the central North Atlantic Ocean. An anticyclonic gyre is nearly always found in the western gulf, and we suggest that there is a typical western boundary current, similar in many important respects to the Gulf Stream. The flow appears to be strongest in winter and summer, in phase with the wind curl forcing, and there is evidence that this response is at least partially baroclinic. The deep baroclinic gyre persists when the wind curl vanishes. The winter transport is roughly half that of the Florida Current. (Author).

KEYWORDS: Physical Oceanography; Ocean Currents; Anticyclones; Boundaries; Coriolis Effect; Wind; Reprints; Western Boundary Currents; Boundary Currents; Baroclinic Flow; Wind Stress Curls; Ntisdodxr; Ntisdodn; Gulf of Mexico.

**730.**
Sturges, W. and J.C. Evans. 1983. On the variability of the Loop Current in the Gulf of Mexico. Journal of Marine Research 41(4):639-653.

ABSTRACT: The authors used the northernmost position of the Loop Current, from hydrographic data, to piece together a time series 13 years long. This record samples the lowest frequencies well but undersamples the amplitude of variations with periods of similar to 8 months by a factor of 2. The "annual" variation of the Loop Current appears to be a relatively broad spectral peak rather than a sharp spectral line. They found as much power at periods near 30 months as at periods near a year; this was a new result. Both bands seem to be, at least in part, wind forced. There are also fluctuations having periods near 8 months, and this may be a beat frequency. As the 30-month and annual signals drift in and out of phase over similar to 5 years, the envelope of the 8-month signal varies from zero to a maximum of similar to 2.5 degrees of latitude, peak-to-peak, which is the same as the range of the 30-month signal. The authors' primary finding is that the north-south fluctuations in Loop Current position are correlated with sea level at the coast and presumably with coastal currents.

KEYWORDS: Physical Oceanography; hydrographic sections; current observations; Loop Current; variability; time series analysis; Gulf of Mexico.

**731.**
Sturges, W., J.C. Evans, S. Welsh, and W. Holland. 1993. Separation of warm-core rings in the Gulf of Mexico. Journal of Physical Oceanography 23(2):250-268.

ABSTRACT: This is the first modeling study focusing on the Gulf of Mexico that resolves the vertical structure of the currents with more than two degrees of freedom and the first that includes the sills at the Yucatan and Florida straits in a realistic way. The model velocities are lower than those observed in the ocean, but the fundamental idea of the ring-shedding process seems realistic. These results suggest an unexpected complexity in the circulation patterns. The flow in the deeper levels of the model consists of a rich field of vortexlike and wavelike features that travel in company with the upper anticyclone. They travel to the west at a greater speed than the upper anticyclone, and they have substantial north-south motions. They fill the deep basin and interact with the bottom topography. The ring behavior is completely consistent with the observations of Lewis and Kirwan; the deep flow is in keeping with the analysis of Hamilton.

KEYWORDS: Physical Oceanography; modelling; ocean circulation; current velocity; oceanic eddies; vortex shedding; bottom topography; Ring Formation; Gulf of Mexico.

**732.**
Sturges, W. and C. Horton. 1981. Circulation in the Gulf of Mexico. Proceedings of a Symposium on Environmental Research Needs in the Gulf of Mexico (GOMEX). IIA:41-48.

ABSTRACT: The strongest single feature in the Gulf of Mexico is the Loop Current. This flow enters the Caribbean and eventually becomes the Gulf Stream. The path that it takes, however, is highly time-dependent, and this portion of the pre-Florida Current is known as the Loop Current. This current is important, not only in its own regard, but also in that it injects pinched-off rings to the interior of the Gulf. These rings carry with them momentum, salt, and nutrients, which are major contributions to the balances of the interior and western portions of the Gulf. The Loop Current and its variability is likely to be important to understanding the exchange of deep water between the Gulf and the Caribbean. The Loop Current also may act as a significant external driving mechanism for adjacent areas of the west Florida shelf. It is not well known what forcing mechanisms control the position, growth, or decay of the Loop Current. But the information required for a real understanding of Loop Current variability is enormous. A summary is provided on recent and ongoing programs in which the data is not yet in the open literature.

KEYWORDS: Physical Oceanography; ocean circulation; rings; water currents; Loop Current; Mathematical Models; Gulf of Mexico.

**733.**
Sturges, W. and S. Welsh. 1990. Wind-driven response of ocean surface infrared signals. Journal of Physical Oceanography 20(12):1842-1848.

ABSTRACT: In the course of archiving positions of the edge of the Loop Current from satellite infrared (IR) data, we have found a substantial amount of energy at periods in the "wind-driven band." Using a technique patterned after that of Price et al., we constructed a series of new datasets of IR positions at a variety of angles relative to the daily wind. Using data for a period of November-May, we find that the IR fluctuations are coherent with wind, and are at an angle of 80 degree to the right. Our IR data do not resolve periods shorter than similar to 10 days reliably, but motions of similar to 12-16 days are well resolved. These findings show that the wind-coherent motion of the surface IR signal is associated with the Ekman transport of the upper mixed layer.

KEYWORDS: Physical Oceanography; air-sea interaction; wind-driven currents; wind stress; oceanic response; current observations; satellite sensing; infrared imagery; Loop Current; Dynamical Oceanography; Gulf of Mexico.

**734.**
Sugimoto, T. and T. Ichiye. 1988. On seasonal and year-to-year variations of the Loop Current and eddy formation in the Gulf of Mexico based on rotating model experiments. Deep-Sea Research 35(4):569-593.

ABSTRACT: A series of experiments were carried out by use of a source-sink flow in a tank on a rotating table to study behavior of the Loop Current and eddy formation in the Gulf of Mexico. The bottom and coastal topography were reproduced with simple geometrical configurations. The flow was barotropic, and the planetary beta-effect was simulated by a topographic beta-effect caused by a sloping bottom. To apply the criteria thus determined from the experiment to the observations in the Gulf of Mexico, variations of the path of the Loop Current are correlated to time-series data of mean sea-level difference between Key West and Miami. The latter is an indicator of the current speed. Separation of the eddy occurs usually in summer and during larger values of monthly mean sea-level difference. The separation latitudes are lower for smaller sea-level differences than for larger ones. (DBO).

KEYWORDS: Physical Oceanography; Loop Current; ocean currents; ocean circulation; current observations; seasonal variations; annual variations; modelling; rotating fluids; Gulf of Mexico.

**735.**
Suhayda, J.N. and D.B. Prior. 1978. Explanation of submarine landslide morphology by stability analysis and rheological models. Offshore Technol Conf 10th Annu, Proc. 2(OTC 3171):1075-1082.

ABSTRACT: A theoretical study of mass movement on the Mississippi River delta front has been made using recently acquired field data and a simple rheological model. Recent measurements of sediment properties include cohesion, bulk density, pore pressure, and internal friction angle. Also, the geometry of a typical type of instability feature, an elongate slide, is examined in detail. A rheological model describing a Coulomb-viscous plastic in effective stress terms is proposed to describe certain features of the mass movement process. 18 refs.

KEYWORDS: Geology; Geological Surveys; Subaqueous; Sedimentation; Offshore Technology.

**736.**
Suter, J.R. and H.L.Jr. Berryhill. 1985. Late quaternary shelf-margin deltas, northwest Gulf of Mexico. American Association of Petroleum Geologists Bulletin 69(1):77-91.

ABSTRACT: Interpretations of 35,000 km of single-channel, high-resolution, seismic profiles traversing the continental shelf and upper continental slope of the northwest Gulf of Mexico indicate the existence of five late Wisconsinan shelf margin deltas, including the Rio Grande and Mississippi deltas. The deltas were recognized by geomorphic pattern, high-angle clinoform seismic reflections, and association with buried river systems. The deposits are elongate parallel with depositional strike, indicating subsidence of the shelf margin as a whole. Internal reflection patterns show the deltas to be fluvially dominated. The late Quaternary shelf-margin deltas provide models for analogous deposits in the ancient record. They are primary indicators of the position of ancient shelf margins, and are important for predicting sand occurrence in that environment as well as farther downslope. Refs.

KEYWORDS: Geology; Petroleum Geology; Pattern Recognition; Geology; Geomorphology; Geophysics; Seismic; Late Quaternary; Shelf-Margin Deltas.

**737.**

Sutton, T.T. and T.L. Hopkins. 1996. Species composition, abundance, and vertical distribution of the stomiid (Pisces: Stomiiformes) fish assemblage of the Gulf of Mexico. Bulletin of Marine Science 59(3):530-542.

ABSTRACT: Species composition, abundance, and vertical distribution of the stomiid fish assemblage were investigated in the eastern Gulf of Mexico, a low-latitude, oligotrophic oceanic ecosystem. Seventy-two described species, representing 18 genera, and one undescribed species were identified from 1155 trawl samples. With an additional 10 species reported elsewhere, the stomiid species number now known equals 83, making the Stomiidae the most diverse fish family in the Gulf of Mexico. The assemblage was dominated by three species, Photostomias guernei, *Chauliodus sloani* and *Stomias affinis*. These species, as well as four other common species, exhibited an asynchronous diel vertical migration pattern (450-900 m during day; 20-300, 550-900 m at night). The percentage of the populations of the three dominant species migrating daily ranged from 50-70%. Two other patterns occurred in less abundant species: synchronous migration (400-700 m during the day, 0-200 m at night); and, possible migration from the bathypelagial (>1000 m during day; 50-300 m at night). Minimum abundance and biomass estimates for the entire assemblage were $1.86 \times 10^5$ individuals and 35.3 kg DW/km$^2$ in the upper 1000 m. Stomiids comprised approximately 10% of the micronekton standing stock in the eastern Gulf. Extrapolating eastern Gulf data to the world warm-water mesopelagial, abundance results suggest that stomiids are the dominant mesopelagic upper-trophic level predatory fishes, and as such may serve as key trophic mediators in the transfer of energy in these ecosystems.

KEYWORDS: Water column biology; Atlantic; Gulf of Mexico; check lists; community composition; vertical distribution; marine fish; *Photostomias guernei*; *Chauliodus sloani*; *Stomias affinis*; Pisces.

**738.**

Sutton, T.T. and T.L. Hopkins. 1996. Trophic ecology of the stomiid (Pisces: Stomiidae) fish assemblage of the eastern Gulf of Mexico: Strategies, selectivity and impact of a top mesopelagic predator group. Marine Biology. 127(2):179-192.

ABSTRACT: The trophic ecology of the stomiid assemblage (Pisces, Stomiiformes, Stomiidae) in the eastern Gulf of Mexico, a region with physical and biological characteristics typical of oligotrophic low-latitude regimes, was investigated. Over 1400 specimens representing 69 species and 17 genera were examined. Four patterns of feeding were evident among the abundant stomiids: (1) myctophid predation; (2) zooplankton/small micronekton predation; (3) penaeidean shrimp predation; and (4) copepod/micronekton predation. One rare species preyed on cephalopods. It was concluded that stomiids exhibited a high level of prey-selectivity, particularly considering the broad range of prey types available in the eastern Gulf of Mexico. The absence of numerically dominant potential prey (e.g. *Cyclothone*,sternoptychids) in the diets of piscivorous stomiids is possibly a function of feeding periodicity coupled with stomiid vertical migration. Stomiids may feed at night in the upper 200 m on vertically migrating myctophids while disregarding co-occurring nonmigrating prey during the daytime. Integration of stomiid abundance and diet data suggests that: ( 1 ) stomiids are the dominant upper trophic-level predators of the Gulf of Mexico mesopelagial; (2) stomiids inflict the highest predation impact on myctophids in low-latitude midwater ecosystems; and (3) the historic use of predation-avoidance arguments to explain certain mesopelagic phenomena (e.g. vertical migration, ventral photophores) appears to be substantiated by estimates of stomiid predation-impact. The stomiids may serve as key trophic mediators in the transfer of energy from the mesopelagial to the bathy- and benthopelagial.

KEYWORDS: Water column biology; food consumption; vertical distribution; Mytophidae; mesopelagic fishes.

**739.**
Tanner, W.F. 1965. The origin of the Gulf of Mexico. Transactions Gulf Coast Association of Geological Societies 15:41-44.

ABSTRACT: The Gulf of Mexico dates from approximately the Paleozoic-Mesozoic time boundary. From structural considerations, the hypothesis is developed that the present Gulf is the result of a slowly-widening rift, or tension gap, between North America (east of the Rocky Mountains) and Central America and the Caribbean block. Such an hypothesis, if correct, offers possible explanations for several puzzling questions: How should the Southern Appalachians be extended southward from central Alabama? What were the geologic and climatic conditions during the deposition of Mesozoic evaporites in the Gulf region? How is it that the major delta-complex of North America is located in the vicinity of the Texas-Louisiana border? What structural deformation is taking place in the area today?
A general program of investigation, designed to test or at least explore the hypothesis, is outlined.

KEYWORDS: Geology.

**740.**
Tanner, W.F. 1968. Origin of the Gulf of Mexico, II; Additional data. Transactions Gulf Coast Association of Geological Societies 18:98-107.

ABSTRACT: Paleomagnetic data indicate that North America has been moving northward from the late Paleozoic to the present. The Gulf of Mexico is thought to have formed as a tensional feature in the wake of continental migration. The present paper consists primarily of a review of evidence bearing on this. The evidence includes the following: earthquake epicenter alignments, first-motion data, new offset information on a major fault, migration rates from paleomagnetic data, an additional east-west graben, the apparently tensional nature of features such as the Mexico and Cayman trenches, Appalachian (?) type strata recently described from Mexico, tensional effects in the central Mississippi valley, tensional indications along the St. Lawrence valley, long term subsidence of the Plateau, the tapered shape of the Atlantic coastal plain, diapirism in the coastal plain, and several well-known items such as the general east-west orientation of grabens in Louisiana and southeastern Mexico. The rate of north-south widening during Mesozoic and Cenozoic time has been roughly two centimeters per year. This should have produced a Gulf 1,000 2,000 km wide in the north-south direction. A time-summary of 12 specific deformational events shows that the southeastern part of North America underwent an important change in tectonic during the Pennsylvanian-Permian-Triassic interval. The "Paleozoic style" can be in terms of compression and left-lateral displacement along the Southern Appalachian trend; The Mesozoic-Cenozoic can be characterized in terms of north-south tension (and its corollary, right-lateral displacement along the same trend). Part of the difficulty inherent in understanding the tectonic history of the southern and southwestern part of North America arises from this major reversal. The northward migration of the continent in Mesozoic and Cenozoic time appears to have had the second-order results of thinning from east to west; this thinning may have been responsible for a gentle widening (over a period of roughly 100 million years) of the North Atlantic basin. The proposed widening was not, however, nearly as great as that envisaged in the Wegener-du toit theory of continental drift.

KEYWORDS: Geology.

**741.**
Tashiro, J.E. and S.E. Coleman. 1977. The Cuban grouper and snapper fishery in the Gulf of Mexico. Marine Fisheries Review 39(10):1-6.

ABSTRACT: The history and development of the Cuban grouper and snapper fishing in the Gulf of Mexico are reviewed. Included is information concerning fishing grounds, catch composition, fishing fleet, and operations and catches. The implications of extended fisheries jurisdictions for Cuba are briefly discussed.

KEYWORDS: Fisheries; Epinephelus morio; Gulf of Mexico; demersal fishes.

## 742.

Tatum, T.E.Jr. 1977. Shallow geologic features of the upper continental slope, northwestern Gulf of Mexico. Master's Thesis. Texas A&M University. College Station, TX.

ABSTRACT: High resolution seismic profiles collected by the U.S. Geological Survey from the upper continental slope of the northwest Gulf of Mexico were analyzed for the purpose of describing and mapping shallow geologic features. The northwest Gulf of Mexico is divided into two subareas on the basis of the distribution of geologic features and differences in bottom morphology. Subarea 1, the southwest portion of the study area, is characterized by isolated diapiric uplifts. Subarea 2 has a very hummocky topography; the surface expression of the semicontinuous diapirs which occur in this portion of the Gulf of Mexico. Further distinguishing Subarea 1 from Subarea 2 are the accumulations of reefal fauna that are found on outer shelf and upper slope banks in Subarea 2. Most of the shallow geologic features in the northwestern Gulf of Mexico are results of the great amounts of sediment that have poured into the basin, building the continental margin outward and upward. The most recent outbuilding of the continental margin is seen on seismic profiles as oblique progradational seismic facies in the shelf-slope transition area. The sedimentary loading initiated and maintained salt and shale movement which has apparently continued up to very recent times. Salt and shale movements have caused various types of sediment deformation including arching and humping of sedimentary layers, piercing of beds, downslope creep of sediment, and periodic sediment slides from the flanks of uplifts. The systems of growth faults which are found in the study area seem to be results of adjustment of the sediments to the huge sediment loads and the flowage of salt away from the shelf edge. Chaotic seismic facies were observed throughout the study area both in near surface deposits and in deeper subsurface deposits. These chaotic seismic facies have been associated with deposits of displaced sediment. Unstable conditions at the shelf edge due to high sedimentation rates caused masses of sediment to slide down slope, leaving detachment scars at the shelf edge and erode channels on the upper slope. Chaotic seismic facies are also seen in the many basins which are bordered by diapiric uplifts in the northeastern portion of the study area. These chaotic seismic facies probably represent deposits which resulted from gravitational slides off of the flanks of these uplifts.

KEYWORDS: Geology; Atlantic Ocean; Continental Slope; Faults; Geophysical Surveys; Gulf of Mexico; North Atlantic; Oceanography; Seismic Surveys; Surveys.

## 743.

Templeton, J.S.I., J.D. Murff, R.H. Goodwin, and L.W. Klejbuk. 1985. Evaluating soils and hazards in the Mississippi Canyon. Proceedings - Offshore Technology Conference 3(OTC 4964):63-72^.

ABSTRACT: During the period 1979-1984 a comprehensive program was conducted to study the surface and near surface seafloor conditions in the Gulf of Mexico's Mississippi Canyon. Included were a high resolution geophysical survey, a deep soil boring, studies of ongoing consolidation settlement and downslope creep and a long-term program of acoustic position measurements to detect seafloor movements. This paper presents an overview of the entire program, which indicated the feasibility of placing petroleum development structures and systems within a certain region of the canyon seafloor.

KEYWORDS: Geology; Acoustical Surveys; Atlantic Ocean; Bathymetry; Consolidation; Creep; Geophysical Surveys; Grand Isle; Gulf of Mexico; Louisiana; Mathematical Models; Mississippi Canyon; North Atlantic; Ocean Floors; Oceanography; Offshore; Seismic Surveys; Soils; Strain; Surveys; United States.

## 744.

Texas Energy and Natural Resources Advisory Council. 1983. Onshore Impacts of Offshore Oil and Gas Activities: Coastal Data Inventory:Volume II-A. Texas Energy and Natural resources Advisory Council, Energy Development Fund. Rice Center, Austin TXEDF 085.

ABSTRACT:None.

KEYWORDS:Socioeconomics.

**745.**
Thompson, J.D., G.H. Born, and G.A. Maul. 1983. Collinear-track altimetry in the Gulf of Mexico from SEASAT: Measurements, models, and surface truth. Journal of Geophysical Research 88(C3):1625-1636.

ABSTRACT: From September 17 to October 10, 1978, SEASAT made collinear passes over the Gulf of Mexico. Altimeter data for eight three-day repeat passes over the eastern Gulf were examined by using an arc segment fitting technique to determine the mesoscale temporal variability of the sea surface. The pattern of sea height variability was then compared with sea height data generated by a numerical model of the Gulf from the simulation of a complete cycle of Loop Current intrusion and shedding of an anticyclonic eddy. The model data was found to match that from the SEASAT, altimeter when an anticyclonic eddy separated from the Loop Current and the Loop began to repenetrate into the eastern Gulf.

KEYWORDS: Physical Oceanography; satellite altimetry; sea level variations; oceanic eddies; Loop Current; simulation; Ground Truth Data; Seasat; Gulf of Mexico.

**746.**
Tolbert, C.M. 1995. Oil and Gas Development and Coastal Income Inequality: A Comparative Analysis.,Minerals Management Service, Gulf of Mexico Region OCS Region. New Orleans, LAMMS 94-0052.

ABSTRACT:None.

KEYWORDS:Socioeconomics.

**747.**
Trefry, J.H. 1977. The transport of heavy metals by the Mississippi River and their fate in the Gulf of Mexico. PhD. Dissertation. Texas A&M University. College Station, TX.

ABSTRACT: Significant differences in total and leachable concentrations of some metals were observed between Mississippi River suspended matter and Gulf of Mexico sediments. These variations are related to diversity in Gulf sediment redox conditions, accumulation rates and grain-size distribution. Suspended particulates transport >90% of the Mississippi River metal load. Hydrous oxides and aluminosilicate lattices are the primary phases of particulate metal transport. In general, total and leachable metal concentrations in river suspended matter are seasonally and spatially uniform. During low river flow, an eight-fold increase in the organic content of the suspended matter brought about a decrease in particulate Fe and Al values and a marked increase in Mn, Zn, Cu and Cd concentrations. Average $SiO_2$ , $Al_20_3$ and $K_20$ concentrations in Mississippi River particulates are similar to crustal abundances. Particulate $Na_20$, CaO and MgO values are 60 - 80% below crustal levels; however a high river dissolved load of these elements offsets the low particulate levels. No significant change in the total or leachable heavy metal concentrations of river suspended matter was found across the freshwater-seawater interface. Mississippi Delta sediments have 20 40% lower Mn, Cu, Co, Ni and Zn concentrations and metal/Al ratios than river particulates which is the direct result of a decrease in oxide-phase metal content. Iron, Cr, V and Al concentrations and grain-size distribution in suspended matter and sediments are similar. Lead and Cd concentrations in delta sediments are 70 and 200% respectively above natural levels. The onset of this Pb and Cd pollutant input is traced to the late 1800's. Reducing conditions in delta sediments induce a loss of oxide-phase Mn, Fe and perhaps other metals via reduction-diffusion. Interstitial water Mn gradients, in particular, support such a mechanism. Calculated fluxes of dissolved Mn from the sediments to the overlying seawater range from 200 to >1000 μg Mn $cm^{-2} y^{-1}$. This process occurs over at least 1000 km of the delta where sedimentation rates are >0.5 g $cm^{-2} y^{-1}$ as determined by Pb 210 dating (SHOKES, 1976). Gulf of Mexico outer shelf and slope sediments which accumulate at <0.5 g $cm^{-2} y^{-1}$ are characterized by surficial Mn-rich zones (2000-8000 μg Mn/g) and complementary interstitial Mn profiles. Manganese, Cu and Ni concentrations are high deep Gulf sediments relative to river particulates. Observed metal enrichment is most striking in the strictly pelagic Sigsbee Knoll sediment where Cu, and Ni concentrations ( ratioed to Al ) are ~50% above river particulate levels and Mn concentrations are almost triple river values. Little change in average Fe, Zn, Pb, and V concentrations occurs between nearshore and abyssal environments. Evidence of post-depositional remobilization of Mn, and to a lesser degree Ni, Fe, Cu and Co, is found throughout the deep Gulf. For example, surface layers of 1.5% Mn show up in slope cores. In abyssal areas, metal maxima are found at depth as a relict of past environmental conditions.

KEYWORDS: Chemistry; metals; Mississippi River.

**748.**
Trefry, J.H., K.L. Naito, R.P. Trocine, and S. Metz. 1995. Distribution and bioaccumulation of heavy metals from produced water discharges to the Gulf of Mexico. Water Science & Technology 32(2):31-36.

ABSTRACT: Produced water, the largest volume waste generated during production of offshore gas and oil, is typically discharged into the ocean at the sea surface. Concentrations of some heavy metals, such as Cd, Pb, Fe and Ba, are enriched in produced water from the Gulf of Mexico relative to ambient seawater by factors of about 10 to >10,000. In contrast, concentrations of other metals in produced water, including Hg, Ni and V, are generally close to or less than those in seawater. Concern for enhanced bioaccumulation of metals from water surrounding oil platforms was addressed by analyzing mollusks collected within 10 m of the discharge pipe. No statistically significant differences in tissue levels of Ba, Cd, Hg, Ni, Pb or V were identified for clams (Chama macerophylla) or oysters (Crassostrea virginica) collected from production platforms with variable loadings of heavy metals. Sediment in discharge areas from the Gulf of Mexico often had elevated levels of Pb and Ba relative to Al; however, such enhancement is unlikely to be solely related to produced water.

KEYWORDS: Chemistry; Gulf of Mexico; Heavy Metals; Bioaccumulation; Oil Industry; Mollusks; Ocean Dumping; Offshore Platforms; Tissue Analysis; Marine Pollution; Crassostrea Virginica; Marine Molluscs; Oil and Gas Industry; Chama Macerophylla; , Gulf of Mexico; Mollusca; Offshore Operations; Wastewater Discharges; Produced Water.

**749.**
Trigg, C., H. Perry, and W. Brehm. 1997. Size and weight relationships for the golden crab, *Chaceon fenneri*, and the red crab, *Chaceon quinquedens*, from the eastern Gulf of Mexico. Gulf Research Reports 9(4):339-343.

ABSTRACT: Carapace length, carapace width, and weight relationships are discussed for the golden crab, Chaceon fenneri, and the red crab, Chaceon quinquedens, from the eastern Gulf of Mexico. Males of both species were significantly larger than females in comparisons of means of all measured parameters. Relationships between carapace length and carapace width, carapace length and weight, and carapace width and weight were similar between Atlantic and Gulf of Mexico populations for both species.

KEYWORDS: ASW, Atlantic, Gulf of Mexico; body size; length-weight relationships; *Chaceon quinquedens*; *Chaceon fenneri*; marine crustaceans; Geryonidae.

**750.**
Trusheim, F. 1960. Mechanism of salt migration in northern Germany. Bulletin of the American Association of Petroleum Geologists 44(9).

ABSTRACT: The object of this paper is to describe and explain the formation of salt structures in Northern Germany and to contribute in this way to a better understanding of similar phenomena in other parts of the world. The majority of the structures in the North German basin can be directly or indirectly attributed to "halokinesis". This term, proposed by the writer (1957), designates the formation of salt structures, and their structural and stratigraphic implications, which are essentially the result of the autonomous movements of salt under the influence of gravity. Phase-bound tectonic forces play only a minor part. The Permian salt structures of Northern Germany are classified into salt pillows, salt stocks, salt walls, and extrusions along fissures. They are accompanied by primary, secondary, and third-order peripheral sinks. The halokinetic movements have taken place in an essentially continuous and autonomous fashion from the Triassic to the present day. Reckoned throughout long periods of geological time, the absolute rate of flow of the salt averages 0.3 mm. per year.

KEYWORDS: Geology; salt; Germany.

**751.**
Tucker & Associates. Inc. 1990. Sea Turtles and Marine Mammals of the Gulf of Mexico, Proceedings of a Workshop. Held in New Orleans, Louisiana on August 1-3, 1989. Sea Turtles and Marine Mammals of the Gulf of Mexico, Proceedings of a WorkshopNew Orleans, Louisiana. Minerals Management Service, New Orleans, LA. Gulf of Mexico OCS Region. p 217p.

ABSTRACT: The Minerals Management Service sponsored a workshop in New Orleans, Louisiana, on August 1-3, 1989, to review the impacts of human activities on sea turtles and marine mammals, and to rank data collection for these species. The meeting convened experts from throughout the United States, Mexico, and Canada to discuss the following goals: (1) review the existing state of knowledge for Gulf of Mexico protected species; (2) review ways in which marine mammals and sea turtles have been or could be affected, either directly or indirectly, by activities and events associated with various Gulf of Mexico industrial activities; (3) identify the types and specificity of data needed to support consultations or management decisions; (4) discuss and reach consensus on the most immediate data still needed for consultations; and (5) identify and discuss the advantages and disadvantages of various method that might be used to obtain needed data.

KEYWORDS: Endangered Species/ Mammals/ Turtles/ Offshore drilling/ Conservation/ Mexico Gulf/ Meetings/ Environmental impacts/ Humans/ Crude oil/ Natural gas/ Populations/ Dredging/ Mortality/ Debris/ Whales/ Protection/ Dolphins(Mammals)/ Cetacea/ Commercial Fishing/ Marine Mammal Protection Act of 1972.

**752.**

Tunnicliffe, V., J.F. Garrett, and H.P. Johnson. 1990. Physical and biological factors affecting the behaviour and mortality of hydrothermal vent tubeworms (vestimentiferans). Deep-Sea Research 37(1A):103-125.

ABSTRACT: Vestimentiferan tubeworms of two hydrothermal vents on Juan de Fuca Ridge, Northeast Pacific, were photographed with a time-lapse camera over periods of 1, 5 and 26 days and supplemented with video for 25 min. Mortality of the worms was heavy: 44% of the worms studied in the 26-day period were removed by falling sulphate/sulphide spires or died for other reasons. Predation effects are very common among collected specimens and implicate the activities of photographed rat-tail fish and polynoid polychaetes. Time-lag auto-correlations reveal a discernible semidiurnal and diurnal periodicity in the retraction/extension movements of the vestimentiferan population. However, no direct correlation exists with measures of surrounding currents or suspended particulates that have clear tidal components to their periodicity.

KEYWORDS: Mortality; biological phenomena; physical properties; hydrothermal springs; activity patterns; Vestimentifera; Pacific Ocean, Northeast; deep sea; hydrothermal vents; INE, Juan de Fuca Ridge; *Ridgeia piscesae*; R*idgeia phaeophiale*; Behaviour; Affecting.

**753.**

U.S. Fish and Wildlife Service and National Marine Fisheries Service . 1991. Recovery plan for U.S. population of Atlantic Green Turtle (*Chelonia mydas*). National Marine Fisheries Service. Washington D.C.

ABSTRACT:Breeding populations in Florida and on the Pacific coast of Mexico are federally listed as endangered. All other populations are listed as threatened. Primary nesting beaches occur along a six county area in east central and southeast Florida. Nesting activity ranges from approximately 350-2,300 nests annually. Coastal development threatens nesting habitat and populations while commercial fisheries and pollution pose significant threats in the marine environment. The recovery goal is to delist the species in the United States once recovery criteria are met. The U.S. population of green turtles can be considered for delisting if, over a period of 25 years, the following conditions are met: 1) The level of nesting in Florida has increased to an average of 5,000 nests per year for at least 6 years. 2) At least 25 percent (105 km) of all available nesting beaches (420 km) is in public ownership and encompasses greater than 50 percent of the nesting activity. 3) A reduction in stage class mortality is reflected in higher counts of individuals on foraging grounds. 4) All priority one tasks have been successfully implemented. Six major actions are needed to achieve recovery. 1) Provide long-term protection to important nesting beaches. 2) Ensure at least 60 percent hatch success on major nesting beaches. 3) Implement effective lighting ordinances or lighting plans on nesting beaches. 4) Determine distribution and seasonal movements for all life stages in marine environment. Minimize mortality from commercial fisheries. Reduce threat to population and foraging habitat from marine pollution. If funds are available to accomplish recovery tasks and new information does not indicate other limiting factors, the anticipated date of recovery is 2015.

KEYWORDS:Endangered Species.

## 754.

U.S. Fish and Wildlife Service and National Marine Fisheries Service . 1992. Recovery plan for the Kemp's Ridley Sea Turtle (*Lepidochelys kempii*),National Marine Fisheries Service. St. Petersburg, Florida.

ABSTRACT:Kemp's Ridley, *Lepidochelys kempii*, has received protection in Mexico since the 1960's and was listed as endangered throughout its range December 2, 1970 under United States law. Less than fifty years ago, Kemp's ridley was a very abundant sea turtle in the Gulf of Mexico. The population was able to generate a synchronized reproductive effort of an estimated 40,000 females in one day on the single known nesting beach on the northeastern coast of Mexico (Carr 1963, Hildebrand 1963), and a much larger adult population may have existed. The population crash that occurred between 1947 and the early 1970's may have been the result of both intensive annual harvest of the eggs and mortality of juveniles and adults in trawl fisheries (Magnuson et. Al. 1990). The recovery of the species has been forstalled primarily by incidental mortality in commercial shrimping, preventing adequate recruitment into the breeding population. Because of Kemp's ridleys' aggregated nesting behavior, very restricted breeding range, and increasing threats from the expanding global human population and general environmental degradation, complete recovery (delisting) may not be achievable. Since the principal nesting beach is in Mexico, the continued long-term cooperation of two nations is necessary to recover the species. The recovery goal of this Plan is to remove the species from the Endangered status and downlist to Threatened status. Criteria for delisting will be left to future revisions of the recovery plan. The criteria we establish for downlisting the species are to: 1) continue complete and active protection of the known nesting habitat, and the waters adjacent to the nesting beach (concentrating on the Rancho Nuevo area) and continue the bi-national protection project; 2) essentially eliminate mortality from incidental catch in commercial shrimping in the United States and Mexico through use of Turtle Excluder Devices (TEDs) and to achieve full compliance with the regulations requiring TED use; 3) attain a population of at least 10,000 females nesting in a season; 4) successfully implement all priority one recovery tasks. The most important actions needed for recovery are to: 1) assist Mexico to assure long-term protection of the major nesting beach and its environs, including the protection of the adult breeding stock and enhanced production/survival of hatchling turtles; 2) continue TED regulation enforcement in the United States waters, expanding the areas and seasonality of required TED use to reflect the distribution of the species; encourage and assist Mexico to incorporate TEDs in their Gulf of Mexico shrimp fleet; 3) fill in gaps in knowledge that will result in better management. In order to minimize threats and maximize recruitment we should: determine distribution and habitat use for all life stages, determine critical mating/reproductive behaviors and physiology, determine survivorship and recruitment.

KEYWORDS:Endangered Species.

## 755.

Uchupi, E. 1975. Physiography of the Gulf of Mexico and Caribbean Sea, pp 1-64. In: Nairn AEM, F.G. Stehili, (Editor). The Ocean Basin and Margins. Plenum Press, New York, NY.

ABSTRACT: The Gulf of Mexico and the Caribbean Sea have attracted the attention of many geological investigators because of their topographic complexity. The author reviews several recent theories concerning the topography and structure of these regions. He then attempts to describe the physiography of both areas in the light of seismic reflection data collected by numerous investigators during the past decade, data from the Deep-Sea Drilling Project, and a new detailed bathymetric chart of the Gulf of Mexico and Caribbean. These new data greatly expand the fund of critical knowledge and have resulted in new insights into the origin and evolution of the Gulf of Mexico and Caribbean.

KEYWORDS: Geology; Ocean Bottom Topography; Mexico Gulf; Caribbean Sea; Marine Geology; Seismic Data; Bathymetry; Structural Geology; Stratigraphy; Archipelagoes; Tectonics; Geologic Age Determination; Ocean Ridges; Deltas; Orogeny; Ocean Models; Continental Drift; Evolution(General); Reprints; Ocean Basins; Continental Margins; Ntisdodxr; Ntisdodn; Ntisnsfg.

**756.**
Uchupi, E. and Emery. K. O. 1968. Structure of continental margin off the Gulf Coast of the United States. Bulletin of the American Association of Petroleum Geologists 52(7):1162-1193.

ABSTRACT: Continuous seismic-reflection profiles were recorded along 15 lines across the continental margin of the Gulf of Mexico. The steep slopes off Florida and Yucatan (Florida and Campeche escarpments) appear to have been formed by construction of coral or algal reefs during the Cretaceous Period. The adjacent upper continental slope and continental shelf were formed by prograding and upbuilding of largely calcareous sediments after the death of the Cretaceous reef-building organisms. Off Louisiana, Texas, and part of Mexico the upper continental slope and the continental shelf were formed by progradation and upbuilding of terrigenous sediment largely by the Mississippi River during the Tertiary Period. These sediments buried deeply much of the Early Cretaceous reef. Considerable alteration of the general structure off Louisiana and Texas resulted from contemporaneous intrusion of salt diapirs. Sediments in the basin between the diapirs were derived partly from the tops of the nearby salt intrusives. The Sigsbee escarpment at the seaward edge of the sedimentary prism off Louisiana and Texas is bordered by a broad ridge of diapirs, to which it may owe its origin. Although diapiric structures are best known north of the Sigsbee escarpment, others are present on the south, at the center of the Gulf basin, as far south as Golfo de Campeche. During early Cretaceous time the reef once almost surrounded the Gulf of Mexico, probably leaving only one narrow connection with the open ocean at the southeast. The narrow opening and the low relative sea level, indicated by reef structure and calcareous algae nearly 3,000 m below present sea level, suggest that water circulation was restricted during the Early Cretaceous time. If it had been somewhat more restricted earlier, conditions could have been suitable for the widespread deposition of Late Triassic to Middle Jurassic salt that later fed the diapiric structures.

KEYWORDS: Geology.

**757.**
Uliana, M. and F. Andreucci. 1996. Sea-trial validation of an echosounder for seafloor classification and mapping. Proceedings of the 1996 Offshore Technology Conference 1:649-657.

ABSTRACT: In the context of the Italian Scientific Program for Antarctica, a multibeam echosounder to be used for scientific research in the Ross sea (Antarctica) is under development. The instrument implements an original technique for cepstral analysis of the acoustic echoes, which makes it capable of effectively discriminating different types of seafloor. In the past few decades, several researchers have shown that it is possible to extract information on small-scale topography and material composition of the seabottom from backscattered acoustic waves. Unfortunately, the identification performance of conventional techniques is poor when more than three or four seafloor types are considered. In recent years, many theoretical and experimental studies have shown the effectiveness of cepstral analysis in problems such as voice recognition, ultrasonic characterization of materials, etc. The technique implemented in the echosounder takes advantage of the recent progress made in these fields. Generally speaking, the instrument will be used in marine geological and/or biological surveying and mapping of large areas. Specific applications could be found in mineral resource surveying, or in seabottom monitoring after oil tanker spills. After describing the echosounder and the signal processing algorithms, the paper reports the results of field validation of the instrument. The field data show that the classification technique implemented by the instrument gives a better performance than that of a conventional echosounder with classification capability. In particular, over a set of six different types of seafloor (mud, sand, gravel, rock, seagrass, and dead seagrass), the identification performance of the instrument was better than 85%. This result shows that the performance of an echosounder for seafloor surveying can be significantly increased properly using advanced signal processing techniques. (Author abstract) 8 Refs.

KEYWORDS: Geology; Submarine Geology; Sounding Apparatus; Acoustic Wave Reflection; Acoustic Wave Backscattering; Geological Surveys; Hydrographic Surveys; Marine Biology; Underwater Mineral Resources; Mineral Exploration; Echosounders; Seafloor Classification; Seafloor Mapping.

**758.**

Van Andel, T.H. 1960. Sources and dispersion of Holocene sediments, northern Gulf of Mexico, pp 34-55. In: Shepard FP, Van Andel TH. Recent sediments, northwest Gulf of Mexico. American Association of Petroleum Geologists, Tulsa, Okla..

ABSTRACT: Principal sediment sources in the northern Gulf of Mexico are the Mississippi and Rio Grande basins, which supply subarkosic sands with highly unstable heavy mineral suites derived from mixed sedimentary, volcanic, plutonic, and metamorphic rocks. Components belonging to the last three groups predominate in the heavy mineral assemblages. Much of the detritus has been transported over very long distances. Tectonically, the source areas include both cratons and orogens. The distributive provinces are homogeneous, and sands, silts, and clays spread over the entire width of the shelf. The drainage basins of the rivers of western Louisiana, Texas, and the area east of the Mississippi represent less abundant sediment sources. With the exception of the metamorphic and sedimentary suite of the Colorado River, sediments are orthoquartzitic with stable heavy mineral suites, and are derived from the Cretaceous and Tertiary margins of the Gulf Coast basin. Sands from these sources are distributed mainly in the nearshore zone, whereas the clays are carried by Gulf residual currents and deposited on the middle and outer shelf together with fine-grained Mississippi and Rio Grande material. The distribution patterns of the two major textural groups, sand and silt-clay, are virtually independent, and in many instances the sand, silt, and clay modes of the same locality have different sources. The sequence of nearshore environments produced by the Holocene transgression has resulted in the deposition of a complex pattern of sediments from a variety of sources. Modification of the composition of the sand fraction by agents operating in the depositional basin appears to be of little significance except for the removal of pyroxenes by weathering from Mississippi and Rio Grande deposits exposed on the continental shelf during the Pleistocene. A review of Gulf sediments in the light of theories on tectonic control of sediment properties leads to the conclusion that the tectofacies of the source and depositional areas has little influence on sediment composition in this area. Sediment texture is controlled almost exclusively by depositional environment, which is only to a small extent dependent upon tectonics. Consequently, in the Gulf of Mexico both textural and compositional properties of the sediments are to a large degree independent of tectofacies.

KEYWORDS: Geology; Atlantic Ocean; Economic Geology; Gulf of Mexico; North Atlantic; Petroleum.

**759.**

Van Andel, T.H.andJ.R. Curray. 1960. Regional aspects of modern sedimentation in northern Gulf of Mexico and similar basins, and paleogeographic significance, pp 345-364. In: Shepard FP. Recent sediments, northwest Gulf of Mexico. American Association of Petroleum Geologists, Tulsa, Okla.

ABSTRACT: This paper summarizes some of the results of recent sediment studies in the northern Gulf of Mexico and Orinoco area in terms of their interest for stratigraphy and paleogeography. The discussion is limited to modern sediments formed in a broad, open basin with a vast hinterland, an abundant supply of terrigenous sediment, and a general predominance of sedimentation over tectonic effects. Studies of modern sediments are often based upon close observation grids, whereas in stratigraphy and paleogeography broad regional investigations using relatively open control are common. The importance of comparability in scale of comparative studies of ancient and modern sediments cannot be overemphasized. Many studies of recent sediments require generalization in terms of broad facies units and of descriptive features that are likely to be preserved, before they are suitable for use in the interpretation of ancient deposits. For the Gulf of Mexico a limited number of broad facies units can be established on the basis of simple and permanent lithologic, petrographic, and paleontologic criteria. Three of these are deltaic the top set, fore-set, and bottom-set facies; three, marginal non-deltaic the littoral, subhumid, and semiarid bay facies; and four, marine the shelf, slope, marginal reef, and nondepositional facies. The same facies units can be used in describing geologically similar modern areas, for example, the Orinoco shelf. In simplified form, the geographic distribution of these facies is a function of the relative rates of sediment supply from the land and redispersion by marine agents. The series delta-subhumid bay and littoral-semarid bay and littoral reflects decreasing importance of land-derived sediment and increasing marine reworking and dispersion. Where the supply of land-derived sediment is small, marine forces produce complete separation of the material in a coarse fraction deposited in the littoral zone, and a fine fraction which is carried away in suspension. Where the current pattern supplies the suspended material and the water is deep and quiet enough to permit settling, the shelf facies is formed. Nondepositional areas occur where supply by marine currents is impossible (parts of the Gulf of Mexico), or log-period waves and shallow depth prevent deposition (Orinoco-Trinidad shelf). Under conditions of changing sea level, the rate of positive or negative sea-level change is a factor of importance in controlling facies development. The effects of this factor are still poorly known. In areas of high supply of sediment its importance appears small; changes in the relative positions of sea and land in deltaic areas are primarily due to erosional transgressions and depositional regressions. On the other hand, where sediment supply is reduced, as in the area of non-deltaic marginal and shelf facies, eustatic and tectonic sea-level changes exert important control. The littoral facies is best developed under conditions of stable or very slowly rising sea level; the resulting bay facies is completely separated from the open-marine environment. With an intermediate transgression rate, open lagoons and low barriers are formed; with very rapidly rising sea level littoral sediments are deposited as a thin veneer without strong differentiation in bay and littoral facies. Little information is available concerning the influence of regressions. The stratigraphic sequence still appears the best means of distinguishing between transgressive and regressive deposits.

KEYWORDS: Geology; Atlantic Ocean; Deltas; Facies; Gulf of Mexico; North Atlantic; Regional Aspects; Sedimentation.

**760.**
Van Cappellen, P., E. Viollier, A. Roychoudhury, L. Clark, E. Ingall, K. Lowe, and T. Dichristina. 1998. Biogeochemical cycles of manganese and iron at the oxic-anoxic transition of a stratified marine basin (Orca Basin, Gulf of Mexico). Environmental Science and Technology 32(19):2931-2939.

ABSTRACT: Chemical distributions and microbial culture data are combined to identify the biogeochemical pathways that control the cycles of manganese and iron at the oxic-anoxic transition of the Orca Basin. The redox transition coincides with an increase in salinity from 35 to 260per mille ; hence, mixing diagrams are used to constrain the salinity ranges over which consumption or production of solute species takes place. Analysis shows that the very high dissolved Mn(II) levels (>400 mu M) at intermediate salinities (60- 180per mille ) result from dissimilatory (microbial) reduction of manganese oxides, coupled to organic matter oxidation. The manganese oxides are continuously regenerated in the oxygenated, low-salinity region (45-52per mille ) by microbial oxidation of dissolved Mn(II). Precipitation of manganese carbonate in the high- salinity zone (> 180per mille )is the main removal mechanism of Mn to the sediments. Upward diffusing Fe(II) ions are extracted from solution within the anoxic, high-salinity range (230-260per mille ) , through anaerobic oxidation by manganese oxides or a nonoxidative sorption process. Ferric oxyhydroxides are reduced by reaction with dissolved sulfide and are, therefore, not an important terminal electron acceptor for organic matter oxidation. Overall, the acid-base chemistry, redox transformations, and microbial activity across the salinity transition are strongly coupled to the cycle of manganese.

KEYWORDS: Chemistry; Gulf of Mexico; Orca Basin ; Biogeochemical Cycle ; Iron ; Manganese ; Marine Environment ; Salinity.

**761.**
van den Bold, M.C., T.F. Moslow, and J.M. Coleman. 1987. Origin and timing of seafloor erosion on the Louisiana continental slope. Transactions Gulf Coast Association of Geological Societies 37:487-498.

ABSTRACT: Erosional stripping of sediments on the Louisiana upper continental slope, between 210 and 640 m water depth in the Garden Banks Area, is commonly observed on high-resolution seismic profiles in association with significant (>10 m ) topographic relief such as fault scarps, and salt or shale diapirs. Many of the erosional features are adjacent to diapiric structures and faults which, due to their excellent potential as hydrocarbon traps, serve as likely sites for engineering and geotechnical projects (i.e., drilling platforms, cable routes, guy wires, pipelines, and salvage operations). Therefore, it is of paramount importance for geologists and engineers to understand the timing, nature, and origin of the submarine processes that produced this erosion. In order to distinguish a Holocene versus Pleistocene age (biozones X,Y, and Z) of sedimentary deposits and depositional events, density distributions of Globorotalia menardii were determined from samples in gravity cores that penetrate erosional surfaces. In 10 cores, the G.menardii curves show pelagic, Holocene (Z zone) deposits averaging 70 cm thick, indicating that the processes producing the erosion are no longer active. The uppermost meter of the six remaining cores contrasts both sedimentologically and micropaleontologically with the pelagic Holocene deposits in the other ten cores. Random distribution of G menardii, differing grain size, and calcium carbonate distributions, and an irregular basal contact with underlying deposits, suggests a non-pelagic, possibly mass-movement related origin. Four of these sediment gravity flows or "slumps" were deposited on pelagic Holocene age (Z zone) sediment, While two "slumps" were deposited on Pleistocene age (Y zone) hemi-pelagic sediment. While the timing of emplacement of these "slump" deposits" is at best variable, Pleistocene (Y zone) deposits were not found at the tops of any cores. The erosion that is observed on high-resolution seismic profiles took place during the end of the late Wisconsin sea level lowstand or early during the Holocene sea level rise. Because of the rapid melting of the ice sheet, large amounts of sediment were deposited on the outer shelf and upper slope in a short time. Due to rapid deposition and burial, these overpressured sediments on steep gradients yielded to sediment instability processes such as mass movements and sediment gravity flows. As a result, seafloor scarps, scars, and bed truncation are commonly observed on high-resolution seismic profiles in the study area and much of the continental slope of the northern Gulf of Mexico.

KEYWORDS: Geology.

**762.**
Vargo, G.A.andT.L. Hopkins. 1990. Plankton, pp 195-230. In: Continental Shelf Associates I. Synthesis of available biological, geological, chemical, socioeconomic, and cultural resource information for the south Florida Area. MMS 90-0019. Minerals Management Service Atlantic OCS Region,

ABSTRACT: None.

KEYWORDS: Water column biology; biology.

**763.**
Vastano, A.C. and C.N.Jr. Barron. 1994. Comparison of satellite and drifter surface flow estimates in the northwestern Gulf of Mexico. Continental Shelf Research 14(6):589-605.

ABSTRACT: A comparison of flow observations has been made with drifting buoys and infrared satellite images for northwestern Gulf of Mexico surface waters during the interval from 10 March to 23 April, 1989. Each drifter was drogued to a depth of 2.7 m and reported four-nine positions along its trajectory every 24 h through the NOAA satellite Argos data collection system. Corresponding flow observations were computed from sequential infrared imagery obtained by Advanced Very-High Resolution Radiometer (AVHRR) on the same satellites. Vector estimates of advective motion were extracted from surface temperature pattern displacements between images paired at 24 and 12 h intervals without knowledge of the drifter trajectories. Twenty-two blind test cases at 24 h intervals formed the data base for examining the relative accuracy between trajectories simulated with satellite flow estimates and those obtained with the drifters. The comparison of actual and computed velocities for 24 h displacements resulted in a counterclockwise regression angle of simulated to actual velocities of -1.7 degrees , a standard error in estimates of simulated speeds from actual speeds of 5.5 cm $s^{-1}$ for actual speeds in the range from 0 to 60 cm $s^{-1}$ and a regression complex coefficient of determination ( $rho^2$ of 0.936). The study indicates a convergence of results for the satellite image and Argos drifter methods of surface flow estimation and a combined capacity to investigate inertial range circulation variability.

KEYWORDS: Physical Oceanography; Oceanographic Regions; Oceanographic Techniques; Remote Sensing; Satellite Surface Flow Estimates; Drifter Surface Flow Estimates; Infrared Satellite Images; Advanced Very-High Resolution Radiometer Data; Avhrr Data; Advective Motion; Surface Temperature Pattern Displacements; Counterclockwise Regression Angle; Ad 1989 03 10 to 04 23; Gulf of Mexico.

**764.**
Vazquez De la Cerda, A.M. 1975. Currents and waters of the upper 1200 meters of the southwestern Gulf of Mexico. Texas A&M UniversityThe Mexican Government surveyed the southwestern Gulf of Mexico systematically from the R/V URIBE in eight cruises made from October 1970 to November 1971. Data from these cruises form the basis of this new and more detailed description of the circulation and water masses of the western Gulf. The May-June and November 1971 cruises are analyzed in detail by the method of isanosteric analysis. All cruises are discussed through the use of the 15°C isothermal surface topography, which approximates the gastrophic flow pattern. The results confirm the dominance of the anticyclonic circulation in the western Gulf. The circulation of its west side has somewhat higher geostrophic velocity than Pilot Chart information suggests. Because of the apparently invariable presence in the west of a large anticyclone, the name Mexican Anticyclone is proposed for this feature. Its average geostrophic volume transport is approximately $10 \times 10^6 m^3 sec^{-1}$. A cyclonic region found in the central or western Bay of Campeche seems to be a permanent feature. At times it is strong and apparently closed. Another cyclonic region in the northeast of Tamiahua Lagoon may be a recurring feature. A southward intrusion of a ridge in geopotential is found west of Campeche Bank and is sometimes connected with the Mexican Anticyclone. It is, apparently, a permanent feature also.

KEYWORDS: Physical Oceanography.

**765.**
Vazquez De la Cerda, A.M. 1993. Bay of Campeche cyclone. Texas A&M UniversityThe Bay of Campeche is found to contain a semi-permanent cyclonic gyre. This contrasts with the western Gulf of Mexico north of 22°N latitude, which is dominated by anticyclonic eddies spawned from the Loop Current in the eastern Gulf. The cyclonic gyre's horizontal scale (of order 100 to 200 km) is smaller than that of the anticyclonic eddies in the northwestern Gulf and it is generally less energetic. Characteristics of the cyclone have been documented from systematic oceanographic surveys in the southwestern Gulf of Mexico carried out by the Mexican Government during the last two decades (commencing in 1970), supplemented by prior studies of Texas A&M University and the U.S. Fish and Wildlife Service. The average volume transport in the Bay of Campeche cyclonic gyre is about 3.3 x $10^6$ $m^3s^{-1}$, based on estimates from thirteen cruises conducted in different years but covering all four seasons. There is also evidence of a yearly cycle in transport which has a range comparable to the yearly average. Climatological wind stress information for the southwestern Gulf of Mexico suggests that the Bay of Campeche cyclonic gyre is forced by the cyclonic wind stress curl, which has a very pronounced seasonal cycle.

KEYWORDS: Physical Oceanography.

**766.** Vecchione, M. 1987. Commercial fishing for gulf butterfish, *Peprilus burti*, in the Gulf of Mexico. Marine Fisheries Review 49(4):14-22.

ABSTRACT: This study was done to determine if gulf butterfish, *Peprilus burti*, is a reasonable alternative to traditional resources for commercial fishermen in the northern Gulf of Mexico. A commercial fishing firm which has successfully fished for and marketed butterfish off New England was contracted to conduct operations in the Gulf of Mexico. Two of the firm's stern-rigged freezer trawlers fished for 1 month (May-June 1986) on the outer continental shelf off Mississippi. Both vessels caught gulf butterfish in quantities and sizes that were commercially valuable, and the fish were successfully marketed In Japan. Data on catch rates, unloading and shipping costs, and marketing results are presented.

KEYWORDS: Fisheries/ Gulf of Mexico.

**767.**
Vendeville, B.C. and M.P.A. Jackson. 1992. The rise of diapirs during thin-skinned extension. Marine & Petroleum Geology 9(4):331-353.

ABSTRACT: Grabens above diapirs are generally attributed to the intrusion, withdrawal, or dissolution of salt. In contrast, this paper proposes that many grabens or half-grabens above diapirs form by regional thin-skinned extension. These concludions are supported by dynamically scaled physical modelling, theoretical reasoning and observations from seismic sections. A diapir pierces a thick, brittle overburden in three evolutionary stages: reactive, active and passive. Diapirs initially pierce a thick overburden reactively in response to faulting during slow regional extension. The central fault block sinks while the diapir rises below it. Reactive diapirism is controlled by the slow rate of regional extension. If the diapir becomes tall enough, it can pierce actively and emerge rapidly at the durface. During subsequent passive piercement, a diapir widens by regional extension. Diapirs can also bypass the reactive and active modes of growth if the overburden is thin and uneven. Faulting, folding and thickness changes are negligible around passive diapirs. -from Authors.

KEYWORDS: Geology; Thin Skinned Extension; Diapirism; Salt Tectonics.

**768.**
Venkataramaiah, R.H. 1996. Application of an integrated environmental monitoring model for natural hydrocarbon seeps in the Gulf of Mexico (Remote Sensing). Texas A&M UniversityAn Integrated Environmental Monitoring (IEM) model was applied to study the fate and transport of Hydrocarbon (HC) discharge due to natural seepages in the Gulf of Mexico. The HC seeps that are manifested as a microlayer on the ocean surface that can be detected by remote sensing were chosen for IEM application.^A vertical transport model based on Discrete Particle Random Walk (DPRW) method was applied to obtain the spreading and dispersion of HC droplets in the water column. The horizontal extent of the spreading, dispersion and size of the footprint on the surface were determined from the model. Acoustic Doppler Current Profiler (ADCP) data was used to characterize the subsurface currents in the study area. The model was evaluated by actual field measurements of current speed and direction at different depths and by employing aircraft based remote sensing images of the seep footprints.^The particle tracking random walk model was applied, also, for determination of horizontal drifting extents and degradation of the microlayer. Time-series of wind speed and direction were used as input to the model along with degradation rates derived from literature. The shape and dimension of the microlayer detected and imaged in ERS1-SAR image was measured and employed for evaluation of the drift model. Longitudinal traverse analysis of microlayers from the satellite images was applied to estimate normalized spread of the microlayers. Microlayer covered waters and pristine water transects served as a baseline for comparison. Global Positioning System (GPS) based surface tracking drift buoy experiment in the study area estimated the rate of drifting due to currents and winds. Microlayers were sampled for geochemical analysis along the length to determine the rate of degradation as a function of surfaced time.

KEYWORDS: Engineering, Marine and Ocean ; Engineering, System Science ; Engineering, Civil ; Remote Sensing.

**769.**
Verghese, J. 1998. Issues and challenges to commercialization via floating prodution systems. Conference Paper Presented at Deep Offshore Technology, New Orleans, LA 17-19 Novemeber 1998 .

ABSTRACT: None.

KEYWORDS: Technology.

**770.**
Verret, A.J. and P.A. Hays. 1999. Deepstar's Program Related to FPSO's. Proceedings of the 31$^{th}$ Annual Offshore Technology Conference .

ABSTRACT: Since DeepStar's inception in 1992, the Program has progressed from a $500,000 paper study of the feasibility of extended reach subsea tiebacks to focus on developing generic deepwater technology. DeepStar Phase IV began in 1998 and now has a budget of approximately $13MM for its' work studies. As with Phase III, Phase IV emphasizes testing with a goal of expediting the deployment of technology. DeepStar Committees focus on Regulatory, Flow Assurance, Subsea Equipment, Vessels, Mooring, Risers, Drilling & Completions, Reservoir Engineering, and MetOcean (Gulf of Mexico Inflow Measurement) issues. The continued cooperative research efforts between DeepStar, Industry, and Government Agencies reap many benefits. Illustrative examples of DeepStar technology include: novel pigging and instrumentation, flow assurance instrumentation, prediction of hydrate plug movement, subsea intervention, dynamic steel tube umbilicals, composite drilling risers, and methods to alleviate shallow water flows. Nearing completion of Phase IV on December 31,1999, DeepStar has initiated work on a field-scale hydrate and paraffin flow assurance test facility at a DOE site in Casper, Wyoming. DeepStar has deployed an electrically heated pipeline system in an ocean environment, polyester mooring in the Gulf of Mexico (GOM) and kicked off a project to measure the inflow through the Yucatan (GOM) Straight.

KEYWORDS: Technology.

**771.**
Vidal, V.M.V., F.V. Vidal, A.F. Hernandez, E. Meza, and J.M. Perez-Molero. 1994. Baroclinic flows, transports, and kinematic properties in a cyclonic-anticyclonic-cyclonic ring triad in the Gulf of Mexico. Journal of Geophysical Research 99(C4):7571-7597.

ABSTRACT: During October-November 1986 the baroclinic circulation of the central and western Gulf of Mexico was dominated by an anticyclonic ring that was being bisected by two north and south flanking cyclonic rings. The baroclinic circulation revealed a well-defined cyclonic-anticyclonic-cyclonic triad system. The anticyclone's collision against the western gulf continental slope at 22.5 degrees N, 97 degrees W originated the north and south flanking cyclonic rings. The weakening of the anticyclone's relative vorticity, during the collision, was compensated by along-shelf north and south jet currents and by the anticyclone's flanking water mass's gain of cyclonic vorticity from lateral shear contributed by east and west current jets with individual mass transports of approximately -18 Sv. Within the 0-1000 and 0-500 dbar layers and across 96 degrees W the magnitudes of the colliding westward transports were 17.80 and 8.59 Sv, respectively. These corresponding transports were 85 and 94% balanced by along-shelf jet currents north and south of the anticyclone's collision zone. This indicates that only minor amounts (<15%) of the anticyclone's colliding westward transports might have flowed into the western gulfs continental shelf water mass or else they sank into deeper water along the continental slope during the anticyclone's collision event. The resultant effect of the coupled interaction between the anticyclone and the cyclonic pair was the surging of the water mass in the cyclones and its sinking in the anticyclone. This mechanism controlled the magnitude, direction, location of vertical advection, and transfer of kinetic energy from the upper to the deeper water layers. The authors' vertical transport estimates through the 1000-m-depth surface revealed a net vertical descending transport of 0.4 Sv for the ring triad system. This mass flux occurred primordially within the south central gulf region and most likely constituted a principal mechanism that propelled the gulfs deep horizontal circulation.

KEYWORDS: Physical Oceanography; Oceanographic Regions; Ocean; Circulation; Baroclinic Flow; Transport; Kinematic Properties; Cyclonic-Anticyclonic-Cyclonic Ring Triad; Dynamics; Three Ring System; Ad 1986 10; Ad 1986 11; Continental Slope; Vorticity; Collision; Shelf Water Mass; Vertical Advection; Mesoscale; Gulf of Mexico.

**772.**
Vidal, V.M.V., F.V. Vidal, and J.M. Perez-Molero. 1992. Collision of a loop current anticyclonic ring against the continental shelf slope of the western Gulf of Mexico. Journal of Geophysical Research 97(C2):2155-2172.

ABSTRACT: A Loop Current anticyclonic ring similar to 330 km in diameter and extending to a depth of > 1500 m was observed to collide in January of 1984 against the continental shelf slope of the western Gulf of Mexico between 21.5 degree and 23 degree N. The collision occurred precisely at the time we conducted our Argos 84-1 hydrographic cruise in the western gulf (26 degree 00' to 19 degree 20'N) aboard the R/V Justo Sierra . The Caribbean Subtropical Underwater (SUW) was used as a tracer to identify the Loop Current anticyclonic ring within the western gulf. The collision was identified from temperature and salinity distributions and from the dynamic topography distribution relative to 500 m.

KEYWORDS: Physical Oceanography; current rings; continental slope; collisions; STD observations; vorticity; cyclonic motion; anticyclonic motion; mesoscale features; water currents; ocean circulation; Gulf of Mexico.

**773.**
Vukovich, F.M. 1986. Aspects of the behavior of cold perturbations in the eastern Gulf of Mexico: A case study. Journal of Physical Oceanography 16(1):175-188.

ABSTRACT: Between 2 March and 13 May 1983, while using in situ and satellite data, three cold perturbations were observed off the West Florida Shelf. These perturbations moved southward along the boundary of the Loop Current at speeds of about 4 to 10 km $day^{-1}$. Geostrophic current and current meter data indicated a cyclonic circulation associated with the cold perturbations. The geostrophic current indicated northward flow on the west side of the warm filaments that formed on the shoreward side of the cold perturbation, and weak southward flow on the east side. However, the current meter data only gave indications of northward flow in the filaments. The current meter array may not have been able to discriminate the entire flow pattern in the filaments.

KEYWORDS: Physical Oceanography; current observations; ocean circulation; water temperature; satellite sensing; geostrophic flow; Loop Current; Cold Perturbations; Gulf of Mexico.

**774.**
Vukovich, F.M. 1988. Loop current boundary variations. Journal of Geophysical Research 93(C12):15585-15591.

ABSTRACT: The periodicity of warm ring separation from the Loop Current and the characteristics of cold perturbations found along the Loop Current boundary were studied using a long-term data set made up of NOAA satellite infrared images. The results showed that the period between separation of warm rings from the Loop Current was highly variable. The average period was about 10.9 months. The minimum period was 6 months, and the maximum period was 17 months. For the data set used, ring separations occurred most often in the winter. The study of the cold perturbations indicated that these perturbations were most pronounced along the northern and eastern portions of the Loop Current boundary and were less pronounced south of 27 degree N along the western boundary. The data suggested that the perturbations either formed or intensified in the northwestern portions of the boundary.

KEYWORDS: Physical Oceanography; Loop Current; heat transfer; ocean circulation; current rings; boundary layers; ocean currents; Dynamical Oceanography; Gulf of Mexico.

**775.**
Vukovich, F.M. and B.W. Crissman. 1986. Aspects of warm rings in the Gulf of Mexico. Journal of Geophysical Research 91(C2):2645-2660.

ABSTRACT: Various aspects of warm rings in the Gulf of Mexico were derived from satellite infrared data and Ship-of-Opportunity data. After the warm rings separate from the Loop Current, they move into the western Gulf of Mexico. It was shown from 12 years of data (1973 through 1984) that there are three characteristic paths of movements of the rings: a northern path, a mid-Gulf path, and a path that takes the rings into the southern extremities of the western Gulf of Mexico. It was shown that all three paths eventually lead the ring to a region in the northwestern portion of the western Gulf of Mexico. As the rings move from the eastern Gulf to the western Gulf, the speed of the ring was observed to oscillate. The oscillation is over a speed range from 1 to 8 km per day, on the average, and the period varies from 40 to 100 days.

KEYWORDS: Physical Oceanography; Oceanography; Ocean; Warm Ring; Ad 1973 to 1984; Velocity; Loop Current; Paths of Movements; Speed; Gulf of Mexico.

**776.**
Vukovich, F.M., B.W. Crissman, M. Bushnell, and W.J. King. 1979. Some aspects of the oceanography of the Gulf of Mexico using satellite and in situ data. Journal of Geophysical Research 84(C12):7749-7768.

ABSTRACT: Satellite infrared data and in situ data were combined to study synoptic-scale and mesoscale fronts in the Gulf of Mexico in the period 1973-1977. Deep northward penetrations of the Loop Current were noted in the winter, and a major warm gyre developed in the winter, 1974. Other major warm gyres were seen to develop in the early spring (1974 and 1977). In all cases, a very large meander developed off the southern part of the west Florida shelf prior to the development of the major warm gyre.

KEYWORDS: Physical Oceanography; Oceanography; Oceanography; Loop Current; Gyres; West Florida Shelf; Ad 1973 to 1977; Ocean Current; Gulf of Mexico.

**777.**
Vukovich, F.M. and G.A. Maul. 1985. Cyclonic eddies in the eastern Gulf of Mexico. Journal of Physical Oceanography 15(1):105-117.

ABSTRACT: Cold-domed cyclonic eddies juxtaposed to the cyclonic shear side of the Gulf Loop Current are observed in simultaneously obtained hydrographic, current meter mooring, and satellite infrared data. The cyclones are initially observed in the satellite data as cold perturbations on the northern extreme of the current and grow either into a cold tongue or a quasi-stable meander off the Dry Tortugas, Florida. Areal shipboard surveys show closed isopleths of temperature and salinity, and surface geostrophic current speeds relative to 1000 db are in excess of 100 cm $s^{-1}$. The diameter of the cold domes varied from 80 to 120 km.

KEYWORDS: Physical Oceanography; current rings; current observations; Loop Current; Gulf of Mexico.

**778.**
Vukovich, F.M. and E. Waddell. 1991. Interaction of a warm ring with the western slope in the Gulf of Mexico. Journal of Physical Oceanography 21,(7):1062-1074.

ABSTRACT: Between November 1985 and May 1986, a warm ring encountered the western slope in the Gulf of Mexico, moved away from the slope, and began to dissipate. Before encountering the slope, the ring was quasi-circular. After encountering the slope, it became elliptically shaped with a center of circulation that changed position rapidly and erratically. The major axis of the ring rotated rapidly in a clockwise sense as the ring increased in size, most probably through interaction with two other rings in the western Gulf. During this period, neither satellite nor in situ data indicated large-scale exchange of shelf and ring water.

KEYWORDS: Physical Oceanography; slopes (topography); bottom topography effects; current rings; Loop Current; Gulf of Mexico.

**779.**
Wade, T.L., M.C. Kennicutt, and J.M. Brooks. 1989. Gulf of Mexico hydrocarbon seep communities: Part 3. Aromatic hydrocarbon concentrations in organisms, sediments and water. Marine Environmental Research 27(1):19-30.

ABSTRACT: Organism tissues from areas of natural oil seepage contain significant amounts of polynuclear aromatic hydrocarbons (PAH). Higher concentrations are found in sedentary organisms (i.e. mussels and tube worms) than in more mobile species (i.e. fish). The PAH distributions indicate that the seep organisms are exposed to sediment and/or water associated PAH. The concentration and composition of PAH in sedentary organisms are similar to that of an oyster from a coastal site indicating similar mechanisms of PAH uptake, depuration and accumulation. Tissue PAH concentrations indicate that these organisms are chronically exposed to high levels of petroleum in their environments and yet thriving communities are present at these locations. Microbial biomass in these seep areas is also substantially enhanced, and the carbon isotopic composition of tissues of organisms from higher trophic levels reflects the incorporation of bacterial biomass.

KEYWORDS: oil seepages; community composition; aromatic hydrocarbons; bioaccumulation; sediment pollution; marine organisms; ASW, Gulf of Mexico; Pollution Effects.

**780.**
Wales, R.W., Jr. J.W. Gladden, and M.W. Roberts. 1976. Social, Economic, and Environmental Requirements and Impacts Associated with the Development of Oil and Gas Resources in the Outer Continental Shelf of the Gulf of Mexico. Mississippi Marine Resources Council. Long Beach, MSS MMRC Project No. OCS-4.

ABSTRACT:None.

KEYWORDS:Socioeconomics.

**781.**
Walker, J. R. and J. V. Massingill. 1970. Slump features on the Mississippi fan, northeastern Gulf of Mexico. Geological Society of America Bulletin 81(10):3101-8.

ABSTRACT: During recent geologic time, the Mississippi River system has been the dominant contributor of terrigenous sediment to the northeastern Gulf Basin. A large mass of sediments has been produced on the continental slope seaward of the mouth of this system. This sedimentary feature has been referred to as the Mississippi Fan. During a recent geophysical cruise in the Gulf of Mexico, several crossings of the fan resulted in seismic records that led to the conclusion that large scale slumps were active on the fan in very recent time. Evidence presented here indicates one slump movement originated near the mouth of the Mississippi Trough and moved about 160 nm toward the southeast. A part of this slump flowed to the south and southwest, or a second slump developed about the same time and flowed in this direction of about 130 nm. The southeasterly slump is about 70 nm in width, and the smaller slump, to the west, is nearly 38 nm wide. The Maximum measured vertical distance from the point of origin of these features to the downslope limit is about 4000 ft.

KEYWORDS: Geology.

**782.**
Walsh, J.J., D.A. Dieterle, M.B. Meyers, and F.E. Mueller-Karger. 1989. Nitrogen exchange at the continental margin: A numerical study of the Gulf of Mexico. Progress in Oceanography 23(4):245-301.

ABSTRACT: A two-layered baroclinic circulation model and a 21-layered biochemical model are used to explore the consequences of Loop Current-induced upwelling and terrestrial eutrophication on "new" production within the Gulf of Mexico. During a quasi-annual penetration and eddy-shedding cycle of the Loop Current, the simulated seasonal changes of incident radiation, wind stress, and surface mixed layer depth induce an annual cycle of algal biomass that corresponds to in situ and satellite time series of chlorophyll. The simulated nitrate fields match those of shipboard surveys, while fallout of particulate matter approximates that caught in sediment traps and accumulating in bottom sediments. Less than 25% of the nitrogen effluent of the Mississippi River may be stored in bottom sediments, with most of this input dispersed in dissolved form beneath the pycnocline, after remineralization of particulate detritus within several production cycles derived from riverine loading. At a sinking rate of 3 m/d, however, sufficient phytodetritus survives oxidation in the water column to balance estimates of bottom metabolism and burial at the margins.

KEYWORDS: Water column biology; Gulf of Mexico; upwelling; modelling; temporal variations; continental margins; water circulation; baroclinic motion; eutrophication; nitrates; Nitrogen Cycle.

**783.**
[Anonymous]. 1979. pp 1-589. In: Ward CH, M. E. Bender, D. J. Reish, (Editor). The Offshore Ecology Investigation: Effects of Oil Drilling and Production in a Coastal Environment (Timbalier Bay, Louisiana). 65. Rice University Studies, Houston, TX.

ABSTRACT: None.

KEYWORDS: Socioeconomics.

**784.**
Ward, E.G., R.E. Haring, and P.V. Devlin. 1999. Deepwater Mooring and Riser Analysis for Depths to 10,000 Feet. Proceedings of the 31th Annual Offshore Technology Conference (OTC paper 10808).

ABSTRACT: The purpose of this paper is to identify technology needs for analysis tools and methods for designing Floating Production Systems in depths to 10,000 feet. The authors and their colleagues specifically addressed analysis tools and experimental methods needed to establish design values for surface vessel motions and dynamics, riser motions and loads, mooring systems and loads, and the coupled response of the vessel, risers, and mooring for deepwater Floating Production Systems. The identified technology needs were prioritized, and suggested approaches to achieve the desired results are presented.

KEYWORDS: Technology.

**785.**
Waren, A. and P. Bouchet. 1993. New records, species, genera, and a new family of gastropods from hydrothermal vents and hydrocarbon seeps. Zoologica Scripta 22(1):1-90.

ABSTRACT: More than 100 species of gastropods from vent and seep localities around the world are reviewed, based on literature information and new material. The external morphology of the soft parts is described for most of the taxa involved. Some features in the biology and distribution of the gastropod fauna are discussed. About half the fauna consists of species belonging to families or superfamilies endemic to this environment. One-fifth of the remaining species belong to taxa normally associated with biogenic substrates in the deep sea. -from Authors.

KEYWORDS: Hydrocarbon Seep Community ; Gastropod ; Hydrothermal Vent Fauna; Taxonomy.

**786.**
Waring, G.T., D.L. Palka, K.D. Mullin, J.H.W. Hain, and L.J. Hansen. 1997. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments, 1996: <NOTE> Technical memo:268p.

ABSTRACT: Section 117 of the 1994 amendments to the Marine Mammal Protect Act (MMPA) requires that an annual stock assessment report (SAR) for each stock of marine mammals that occurs in water under U.S. jurisdiction, be prepared by the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS), in consultation with regional Scientific Review Groups (SRG). The MMPA requires that each SAR contain several items, including: (1) a description of the stock, including its geographic range; (2) a minimum population estimate, a maximum net productivity rate, and a description of current population trend, including a description of the information upon which these are based; (3) an estimate of the annual human-caused mortality and serious injury of the stock, and, for a strategic stock, other factors that may be causing a decline or impending recovery of the stock, including effects on marine mammal habitat and prey; (4) a description of the commercial fisheries that interact with the stock, including the estimated number of vessels actively participating in the fishery and the level of incidental mortality and serious injury of the stock by each fishery on an annual basis; (5) a statement categorizing the stock as strategic or not, and why; and (6) an estimate of the potential biological removal (PBR) level for the stock, describing the information used to calculate it. The MMPA also requires that SARs be updated annually for stocks which are specified as strategic stocks, or for which significant new information is available, and once every three years for nonstrategic stocks. Following enactment of the 1994 amendments, the NMFS and FWS held a series of workshops to develop guidelines for preparing the SARs. The first set of stock assessments for Atlantic Coast (including the Gulf of Mexico) were published in July 1995 in the NOAA Technical Memorandum series (Blaylock et al. 1995). In April 1996, the NMFS held a workshop to review proposed additions and revisions to the guidelines for preparing SARs (Wade and Angliss 1997). Guidelines developed at the workshop were followed in preparing the 1996 SARs. In this document, major revisions and updating of the SARs were only completed for strategic stocks. These are identified by the 1997 date-stamp at the top right corner at the beginning of each report. Except for some minor editorial changes, stocks designated by the 1995 date-stamp are unchanged from the 1995 document (Blaylock et al. 1995).

KEYWORDS: Endangered Species; Marine mammals; Atlantic Ocean; Mexico Gulf; United States; Whales; Dolphins(Mammals); Porpoise; Seals; Conservation; Animal populations; Trends; Mortality; Fisheries; Marine biology; Monitoring; Migration; Surveys; Stock Assessment; Marine Mammal Protection Act.

**787.**
Watkins, D.J.andL.M.Jr. Kraft. 1978. Stability of continental shelf and slope off Louisiana and Texas; geotechnical aspects, pp 267-286. In: Bouma AH, Moore GT, Coleman JM. Framework, facies, and oil-trapping characteristics of the upper continental margin. American Association of Petroleum Geologists, Tulsa, OK.

ABSTRACT: Mudflows, faults, surface scarps, and other deformational features, which indicate that the seafloor may be experiencing continuous or intermittent movements, are present on the outer continental shelf and upper slope offshore Louisiana and Texas. Possible mechanisms causing instability and soil movement include hurricane waves, various forms of gravity driven slope failure, and other geologic phenomena. The magnitude and rate of soil movements and the forces these movements transmit to structures must be estimated for design of offshore production facilities. Lateral forces on offshore structures due to soil movement can exceed 20 million Newtons (20,000 kN). A quantitative analysis of soil deformation and structural loading requires a comprehensive interdisciplinary study of the geologic and oceanographic environment. Analytic procedures to evaluate the stability of a site include finite-element analyses and limit-equilibrium methods. Data for these analyses should be based on well-planned geophysical and geotechnical site investigations and engineering laboratory testing.

KEYWORDS: Geology; Continental Shelf; Continental Slope; Cores; Engineering Geology; Failures; Faults; Finite Element Analysis; Grabens; Growth Faults; Lithofacies; Loading; Louisiana; Marine Installations; Mass Movements; Mechanism; Mississippi Delta; Mudflows; Offshore; Sedimentary Structures; Slope Stability; Slumping; Soil Mechanics; Statistical Analysis; Texas; United States.

**788.**
Watkins, J.S., J.W. Ladd, R.T. Buffler, F.J. Shaub, M.H. Houston, and J.L. Worzel. 1978. Occurrence and evolution of salt in deep Gulf of Mexico, pp 43-65. In: Bouma AH, Moore GT, Coleman JM. Framework, facies, and oil-trapping characteristics of the upper continental margin. American Association of Petroleum Geologists, Tulsa, OK.

ABSTRACT: Multifold seismic reflection investigations have provided data pertinent to the problem of origin and mode of deformation of salt in the Gulf of Mexico. The Challenger seismic unit which contains Jurrasic salt covered the Jurrasic abyssal basin and onlapped the Campeche and West Florida continental margins; it is thought to have onlapped the Texas-Louisiana, Rio Grande, and East Mexican margins as well. The unit has an estimated average thickness of 1.5 km and a maximum thickness of at least 2.5 km. Onlap and pinchout of the Challenger unit and isostatic considerations suggest that the unit was deposited on a seafloor several thousand meters below sea level. The data are inconclusive with respect to the question of whether the salt was deposited in deep water or whether the surface of the Gulf was greatly lowered. The principal dissimilarity of the Challanger from overlying units derives from mobilization of salt within the Challanger. The causes of localization of salt mobilization are not clear, but salt mobility is developed best in areas where the lower, seismically transparent part of the Challenger is thickest. The volume of salt within the Challenger equals an estimated 20 to 50 times the volume of salt in present Gulf waters. An Accumulation of this magnitude required continuous replacement from the world ocean and could not have resulted from a single episode of drying-up of the Gulf of Mexico. Four modes of salt mobilization and emplacement can be recognized: (1) geographically random diapirism continuously active from Jurassic to present in the Texas-Louisiana Shelf and upper slope, Campeche Knolls, and Sigsbee Knolls; (2) formation of sinuous, subparallel ridges beneath the Mississippi cone, probably due to differential sediment loading of the prograding delta; (3) Pleistocene overthrusting of a salt "tongue" in the central Sigsbee Scarp; and (4) late Miocene-early Pliocene mobilization of Jurassic stratiform salt in the Campeche Knolls province. The Mexican Ridges, which some investigators have suggested are cored by salt, appear to be cored with shale.

KEYWORDS: Geology; Atlantic Ocean; Campeche Knolls; Challenger Unit; Deep-Sea Environment; Deltas; Diapirism; Evolution; Geophysical Surveys; Gulf of Mexico; Mexican Ridges; North Atlantic; Occurrence; Salt Tectonics; Seismic Surveys; Sigsbee Knolls; Sigsbee Scarp; Structural Geology; Surveys; Tectonics; Texas-Louisiana Shelf.

**789.**
Watkins, J. S., J. L. Worzel, M. H. Houston, M. Ewing, and J. B. Sinton. 1975. Deep seismic reflection results from the Gulf of Mexico: Part 1. Science 187:834-6.

ABSTRACT: Deep sounding seimic reflection data show undeformed reflectors at depths down to 11 kilometers beneath the continental rise and abyssal plain and 7 kilometers in basins of the lower slope. Weak reflectors are visible beneath the salt of the Sigsbee Scarp and within salt ridges separating the lower slope basins.

KEYWORDS: Geology.

**790.**
Watson, J.A. 1968. Ferruginous layers in sediments from the Gulf of Mexico. Master's Thesis. Texas A&M University. College Station, TX.

ABSTRACT: None.

KEYWORDS: Geology; Abundance; Atlantic Ocean; Composition; Gulf of Mexico; Iron; Marine Geology; Metals; North Atlantic; Oceanography; Sediments.

**791.**
Watson, J.A. and E.E. Angino. 1969. Iron-rich layers in sediments from the Gulf of Mexico. Journal of Sedimentary Petrology 39:1412-1419.

ABSTRACT: Thin yellow layers (0.5 to 2 cm) examined in seven cores in the west and central portions of the Gulf of Mexico are enriched in iron, manganese, cobalt, and nickel with respect to the surrounding sediments. The average enrichment is 66, 33, 51, and 28 percent, respectively. The highest correlation coefficients between single pairs of elements yield Co: Ni (r = 0.53), Fe: Ni (0.64), Fe: Co (0.62), and Mn: Co (0.50). The yellow, iron-rich sediments commonly occur in the Pleistocene-Holocene transition zone and in the upper Pleistocene sediments. The iron-rich zones are considered to be the result of a reduced sediment accumulation rate. Carbon 14 dates support this arguement. The close association with iron-stained foraminiferal tests in the sediments suggests post-depositional scavenging. The yellow layers are most prevalent on the lower continental slope, continental rise, and Sigsbee abyssal plain.

KEYWORDS: Geology.

**792.**
Weimer, P. 1989. Sequence stratigraphy, facies geometry, and depositional history of the Mississippi Fan, Gulf of Mexico. The American Association of Petroleum Geologists Bulletin 74:425-453.

ABSTRACT: The Mississippi Fan is a large, mud-dominated submarine fan over 4 km thick that was deposited in the deep Gulf of Mexico during the late Pliocene and Pleistocene. Analysis of 19000 km of multifold seismic data across the fan defined 17 seismic sequences, each characterized by a series of channel, levee, and associated overbank deposits, along with other mass transport deposits. At the base of nine sequences are a series of seismic facies consisting of mounded, hummocky, chaotic, and subparallel reflections, which constitute 10-20% of the sediments in the sequence. These facies are externally mounded in cross section and occur in two general regions of the fan. In the upper and middle fan, they occur below channel's distribution. In the middle to lower fan, they have a fan-shaped distribution, increasing in width downfan. These facies are interpreted to have formed as disorganized slides, debris flows, and turbidites, and are informally called mass transport complexes. Overlying this basal interval and characteristic of all sequences are well-developed channel-levee systems, which constitute 80-90% of the fan's sediments. Channels consist of high-amplitude, subparallel reflections. Levee sediments have subparallel reflections that have moderate to high amplitudes at the base changing upward to low amplitude. The vertical change in amplitude may reflect a decrease in the grain size and bed thickness of the levee sediments. Overbank sediments consist of interbedded subparalled to hummocky and mounded reflections, suggesting both turbidites derived from channel, as well as slides and debris flows derived from the slope. Pliocene-Pleistocene eustatic cycles are interpreted to have been the major factor controlling the timing and style of sedimentation in the fan. Mass transport complexes are interpreted to have formed during a lowering of sea level, and reflect sediments derived from retrogressive slumping during the formation of submarine canyons in the upper slope and outer shelf. Channel-levee systems were deposited when sea level was near its lowest position and sediment derived from deltas was transported into the deep basin via submarine canyons. During highstands in sea level, a thin layer of hemipelagic sediment was deposited on the fan surface. The Mississippi Fan serves as an exploration model for mud-dominated submarine fans and has four prospective reservoir facies: channel sands with linear trends, unchannelized sands beyond the downdip terminus of the channel (possible lobes), potentially sand-prone levees immediately adjacent to initial channels deposited in some sequences, and limited parts of mass transport complexes.

KEYWORDS: Geology.

**793.**
Weimer, P. and R. T. Buffler . 1989. Structural geology of the Mississippi Fan Foldbelt, deep Gulf of Mexico. SEPM Gulf Coast Section Tenth Annual Research Foundation Conference :146-147.

ABSTRACT: None.

KEYWORDS: Geology.

**794.**

Weimer, P., P. Varnai, F.M. Budhijanto, Z.M. Acosta, R.E. Martinez, A.F. Navarro, M.G. Rowan, B.C. McBride, T. Villamil, C. Arango and others. 1998. Sequence stratigraphy of Pliocene and Pleistocene turbidite systems, northern Green Canyon and Ewing Bank (offshore Louisiana), northern Gulf of Mexico. American Association of Petroleum Geologists Bulletin 82(5 pt B):918-960.

ABSTRACT: The stratigraphic variations of Pliocene and Pleistocene turbidite systems in the northern Green Canyon and Ewing Bank protraction areas were mapped by an integrated exploration database. A complex Pliocene-Pleistocene geologic evolution of the area was indicated by the seismic and geologic facies, depositional rates, nature of turbidite systems, and sand content. Significant sand deposits were deposited in most sequences and directly overlie sequence boundaries. Salt tectonics and faulting greatly influenced the loci of the fans' deposition. Analysis of all sequences indicated a complex depositional history where significant sands were deposited wherein abrupt decreases in bathymetric gradient were associated with salt tectonic or faulting. 33 Refs.

KEYWORDS: Geology; Petroleum Geology; Stratigraphy; Lithology; Sedimentology; Tectonics; Offshore Petroleum Prospecting; Seismic Prospecting; Oil Sands; Oil Shale; Offshore Oil Fields; Pliocene Turbidite Systems; Pleistocene Turbidite Systems; Bathymetric Gradient.

**795.**

Weller, D.W., B. Wursig, H. Whitehead, J.C. Norris, S.K. Lynn, R.W. Davis, N. Clauss, and P. Brown. 1996. Observations of an interaction between sperm whales and short-finned pilot whales in the Gulf of Mexico. Marine Mammal Science 12(4):588-594.

ABSTRACT: During studies within the north central Gulf of Mexico (28° 43.20' N, 088° 44.13''W) on 24 August, 1994, a group of sperm whales (*Physeter macrocephalus*) were observed exhibiting defense reaction to the presence of short-finned pilot whales (*Globicephala macrorhynchus*). This account provides suggestive evidence that short-finned pilot whales may show aggression toward, or threaten, sperm whales. The observed groups consisted of mixed, adult/calf sperm whale groups and scattered groups of adult pilot whales. Initial behaviors within mixed species groups included tail lunging and tail slapping at the head of an adult sperm whale by several large pilot whales, excited and erratic swimming and body posturing by both species, and Marguerite formations (groups assembled horizontally at the surface with heds in and tails out, or groups vertically oriented with heads at the surface) and closely huddled grouping of sperm whales. During periods of huddled grouping, sperm whales exhibited the following behaviors: open mouth behavior; inverted surface posturing; lateral fluke swishes; peduncle arching; underwater bubble clouds; tail slapping; spy hopping; and inverted underwater posturing. The pilot whales remained near and among the sperm whales during most of the observation period, and appeared to take particular interest in attempts to penetrate the marguerite formation of sperm whales. The interpretation of this interspecific interaction as agnostic is based on observations of similar defense behaviors by sperm whales when confronted by human whalers, killer whales (*Orcinus orca*), false killer whales (*Pseudorca crassidens*), and sharks. From this interaction, it was hypothesized that the pilot whales were testing the vulnerability of of these sperm whales to assess the potential for separating particularly weak or young individuals from the group. Because no real attacks on the sperm whales were observed, it is also possible that the pilot whales were engaged in play or practice of predation.

KEYWORDS: Endangered Species; Endangered Species; Gulf Of Mexico; sperm whale (Physeteridae); Pilot Whales; Animal behavior.

**796.**
West, D.B. 1989. Model for salt deformation on deep margin of central Gulf of Mexico Basin. American Association of Petroleum Geologists Bulletin 73(12):1472-1482.

ABSTRACT: Based on available nonexclusive seismic data, a preliminary model has been developed for salt deformation on the deep margin of the central Gulf of Mexico basin. In this model, the Tertiary clastic wedge prograded to the basinward limit of original Jurassic salt by the middle Miocene. As the salt and overburden thinned basinward, lateral flow, combined with a strong component of downward force exerted by subsiding voluminous middle Miocene loading, caused the basinward limit of the Louann Salt to effectively shear off. Deposition of the upper Miocene and Pliocene sediments was confined primarily shoreward of an incipient salt swell, but Pleistocene sediments were eventually able to breach the barrier. -from Author.

KEYWORDS: Geology; Salt; Deformation; Tertiary; Pinch and Swell Structure; Gulf of Mexico.

**797.**
Whelan, J.K. 1986. Geochemistry summary - Leg 96 - the Mississippi Fan., pp 691-695. In: Bouma AH, Coleman JM, et al. Initial reports Deep Sea Drilling Project, Leg 96, Ft. Lauderdale to Galveston, Texas, 1983. U.S. Govt. Printing Office,

ABSTRACT: Generally, organic lean sediments (organic carbon 0.5-1.5%) and pyrolyzable organic carbon (50-100 mg/g organic carbon) prevail. The strong contribution of terrigenous organic matter is shown. The compositions and low levels of extractable hydrocarbons are consistent with either organic matter recycled from continental sources or traces of petroleum hydrocarbon migration. Clay mineral composition on the fan is distinctly different from that of the more hemipelagic intraslope basin sites. -from Author.

KEYWORDS: Chemistry.

**798.**
Whitaker, R.E. 1971. Seasonal Variations of Steric and Recorded Sea Level of the Gulf of Mexico. Master's Thesis. Physical oceanography Texas A&M UniversityMonthly mean steric sea levels (geopotential) relative to 150 db are computed for the Gulf of Mexico from monthly mean temperature fields and a constant salinity. The temperature distributions for the upper 150 m of the Gulf are determined from some 17,000 BT observations. The monthly topographies of the 22 degrees surface, which are roughly expended mirror images of sea-surface geopotential relative to a deep reference pressure, exhibit a set of regular annual changes. The Loop Current and its seasonal variation and the western high-pressure region are clearly indicated. The monthly steric sea levels (relative to 150 db) are found to agree with the known, large-scale, persistent features of the surface circulation although the indicated Loop Current is less intense than it is known to be. However, when the geopotential is taken relative to 1000 db for months with sufficient data, February and August, the topography gives velocities which agree quantitatively with known current velocities. The ranges of recorded sea level at nine tide stations around the Gulf are accounted for to the extent of 42-57 percent by the steric sea levels for regions of 150 m depth or more. (Author).

KEYWORDS: Physical Oceanography; Height Finding; Temperature; Salinity; Sea Water; Bathythermograph Data; Density; Heating; Numerical Analysis; Theses; Geopotential; Steric Sea Level; Sea Level; Ntisn; Gulf of Mexico.

**799.**
Williams, A.B. 1988. New marine decapod crustaceans from waters influenced by hydrothermal discharge, brine, and hydrocarbon seepage. Fishery Bulletin 86(2):263-287.

ABSTRACT: Five species of decapod crustaceans new to science are described. These are caridean shrimps of the family Bresiliidae -- Alvinocaris markensis from a Mid-Atlantic Rift Valley hydrothermal field, A. muricola from a cold brine seep at the foot of the West Florida Escarpment in the Gulf of Mexico, and A. stactophila from a hydrocarbon seep on the continental slope of the northern Gulf of Mexico, with a key to the species of Alvinocaris ; a squat lobster of the family Galatheidae -- Munidopsis alvisca from the Guaymas Basin and from the Juan de Fuca and Explorer ridges in the eastern Pacific; and a brachyuran crab of the family Bythograeidae -- Bythograea mesatlantica from a Mid-Atlantic Rift Valley hydrothermal field.

KEYWORDS: seepages; hydrothermal springs; identification keys; ISE, Explorer Ridge; A, Mid-Atlantic Rift Valley; Gulf of Mexico; Florida Escarpment; ISE, California Gulf, Guaymas Basin; INE, Juan de Fuca Ridge; animal morphology; brines; hydrocarbons; *Alvinocaris*; *Munidopsis alvisca*; *Bythograea mesatlantica*; Galatheidae; Bythograeidae; New Species.

**800.**
Williams, D.C. and K. B. Hom. 1979. Onshore Impacts of Offshore Oil: A User's Guide to Assessment Methods,Department of the Interior Office of Policy Analysis. Washington, D.C.

ABSTRACT:None.

KEYWORDS:Socioeconomics.

**801.**
Williams, D.C., P.R. Stang, and B. Hyde. 1977. State Information Needs Related to Onshore and Nearshore Effects of OCS Petroleum Development:191p.

ABSTRACT: The United States currently has underway a program to develop tracts on the Outer Continental Shelf (OCS) for their petroleum resources that can have significant impact on and near the shore. The potentially affected States bordering the Atlantic and Pacific Oceans and the Gulf of Mexico have expressed serious concerns about the availability and adequacy of the information they need to make planning and management decisions about onshore activities and impacts related to OCS petroleum development. This report discusses state policies, major concerns, organization, planning approaches and relation to other state planning efforts.

KEYWORDS: Socioeconomics; Coastal zone management; Regional planning; Offshore operations; Crude oil; Petroleum; Energy policy; Government policies; State government; Coasts; Continental shelves; Environmental impacts; Oil pollution; Social effect; Economic impact; States(United States); Energy Source Development; Pacific Coast Region; Gulf Coast Region; South Atlantic Region; Middle Atlantic Region; North Atlantic Region.

**802.**
Williams, D.F.andI. Lerche. 1987. Salt domes, organic-rich source beds and reservoirs in intraslope basins of the gulf coast region., pp 751-786. Dynamical geology of salt and related structures. Academic Press, Orlando, FL.

ABSTRACT: None.

KEYWORDS: Geology.

**803.**
Williams, D.F.andB. Kohl. 1986. Isotope chronostratigraphy and carbonate record for Quaternary Site 619, Pigmy Basin, Louisiana continental slope., pp 671-676. In: Bouma AH, Coleman JM, et al. Initial reports DSDP, Leg 96, Ft. Lauderdale to Galveston, Texas, 1983.

ABSTRACT: Sediments accumulated in Pigmy Basin at a fairly constant rate over the last 105 000 yr. The oxygen-isotope record shows evidence for periods of freshwater run-off at times other than glacial terminations. Increased carbonate contents are also associated with these events. -from Authors.

KEYWORDS: Chemistry.

**804.**
Williams, L.K. 1971. Selected planktonic foraminifera as biological indicators of hydrological conditions in the eastern Gulf of Mexico. M.S. Thesis. Florida State University. Tallahassee, FL.

ABSTRACT: Biological indicators are organisms whose limited environmental tolerances make them useful as indicators of hydrological conditions. They may be used to trace current systems or identify and define water masses. In this study selected population dynamics of 20 species of planktonic foraminifera were analyzed to determine faunal relationships to hydrological conditions in the eastern Gulf of Mexico in June 1970. Preferred environmental ranges of temperature, salinity, and depth were measured for each of the species sampled during this survey. Selected species were then used to characterize and define the limits of the "Loop Current System," the major circulation feature in this part of the Gulf. As would be expected, some species made better indicators than did others. *Globigerinoides sacculifer*, *G. ruber*, and *Globigerinella siphonifera* proved extremely useful in determining the path of the current throughout its measured extent. The eastward turn of the main current flow was located between the latitudes covered by Transects I and II (latitudes 27-28°N and 25-27°N). The main current flow, with its contained foraminiferal population, turned east before, and never reached as far north, as Transect I (latitude 27-28°N). Higher population values for several species were sampled in the southbound current than in the northbound. This suggests the Gulf as a possible source area for these species, in that they were not observed entering the Gulf in large numbers, but were observed exiting in abundance. It is likely that they were entrained into the main current flow at some point within the Gulf.

KEYWORDS: Physical Oceanography.

**805.**
Williams, N.A., D.R. Dixon, E.C. Southward, and P.W.H. Holland. 1993. Molecular evolution and diversification of the vestimentiferan tube worms. Journal of the Marine Biological Association of the U.K. 73(2):437-452.

ABSTRACT: The Vestimentifera, or deep-sea tube worms, comprise an ecologically and anatomically unusual group of marine invertebrates, with poorly understood biogeography, ecology, phylogenetic affinities and evolutionary radiation. To gain insight into evolutionary diversification within the group, we have used a molecular biological approach. We report the cloning of a region of 28S ribosomal DNA from representatives of five vestimentiferan genera plus, for comparison, a polychaete and a perviate pogonophore. Phylogenetic analyses using these DNA sequences confirm that Ridgeia and Tevnia are closely related genera. The analyses also lead us to propose the hypothesis that the earliest vestimentiferan lineage to diverge gave rise to the genus Lamellibrachia only. In addition, our comparative DNA sequence data now provide a means to use molecular methods for identification of deep-sea tube worms; we employed this approach to demonstrate that the first vestimentiferan specimen from the eastern Atlantic Ocean belongs to the genus Lamellibrachia . DNA-based identification should have wide applications in the study of vestimentiferan biogeography and ecology.

KEYWORDS: evolution; phylogenetics; DNA; species diversity; vestimentifera; Pogonophora.

**806.**
Wilson, R.J. 1967. Amount and distribution of water masses in February and March 1962 in the Gulf of Mexico. Masters Thesis. Texas A&M University. College Station, TX.

ABSTRACT: None.

KEYWORDS: Physical Oceanography.

**807.**
Wilson, T.L. 1977. Survey of Employment and Labor Force Characteristics in Morgan City's Petroleum and Related Industries, pp 231-291. In: Stallings EF, T. F. Reilly, R. B. Gramling , D. P. Manual, (Editors). Outer Continental Shelf Impact, Morgan City, Louisiana. Louisiana Department of Transportation and Development., Baton Rouge, LA.

ABSTRACT: None.

KEYWORDS: Socioeconomics; Louisiana.

**808.**
Winker, C.D. 1982. Cenozoic shelf margins, northwestern Gulf of Mexico. Transactions Gulf Coast Association of Geological Societies 32:427-448.

ABSTRACT: Syndepositional gravity tectonics in the northwestern Gulf of Mexico Basin have obscured the geometry of Tertiary shelf-slope stratification and thereby inhibited the recognition of relict shelf edges. However, examination of the modern shelf margin, formed primarily by deltaic deposition during the late Pleistocene low stand of sea level, can lead to alternative criteria for recognizing Tertiary shelf margins. Late Pleistocene shelf-margin deltas, in contrast to inner shelf deltas, are characterized by rapid subsidence and growth faulting, thick progradational cycles, and steep clinoform stratification. High subsidence rates result from deep-seated gravity sliding of the continental slope which creates a strongly extensional regime along the shelf margin. Many downdip Tertiary formations are similarly characterized by large growth faults with high expansion ratio in deltaic sequences; hydraulic isolation of shallow water sandstones by large fault offsets leads to overpressuring. These structurally complex downdip trends, typically with geopressured gas reservoirs, represent the shelf margin megafacies. Mapping of these shelf-margin trends provides a concise summary of the Cenozoic depositional and structural history of the basin. Major influxes of sand to the shelf margin correspond to episodes of rapid progradation and are interpreted as large shelf-margin deltas. Pre-Pleistocene shelf-margin deltas do not appear to be synchronous across the basin and therefore, are probably a function of sediment supply rather than sea-level fluctuations. The three largest such Tertiary delta complexes can be correlated with major tectonic episodes in likely source areas in western North America: (1) the late Paleocene (lower Wilcox) Rockdale Delta system in East Texas as coincides with the major pulse of Laramide uplift in the Southern Rockies; (2) the mid-Oligocene (Frio) Norias Delta system in South Texas coincides with extensive ash-flow volcanism in the Sierra Madre Oriental; and (3) the Neogene ancestral Mississippi Delta system in louisiana coincides with reactivation of the Southern Rockies and regional uplift.

KEYWORDS: Geology.

**809.**
Winker, C.D. and M.B. Edwards. 1983. Unstable progradational clastic shelf margins ( Gulf of Mexico, Niger-Delta). Society of Economic Paleontologists and Mineralogists 33:139-157.

ABSTRACT: In some continental margin basins such as the NW Gulf of Mexico and the Niger Delta, large-scale slumping of the continental slope disturbs the topset-foreset geometry of the prograding shelf margin and thereby inhibits recognition of ancient shelfedges. Ancient, unstable clastic shelf margins can be approximately located by criteria such as isopach maxima, timing of growth faulting, and the stratigraphic top of geopressure. Gravity sliding of the continental slope creates a strongly extensional regime along the shelf margin, resulting in growth faulting and greatly enhanced subsidence rates. The corresponding compressional regime along the lower slope is important in initiating salt and shale structures.-from Authors.

KEYWORDS: Geology.

**810.**
Wood, M.L. and J.L. Walper. 1974. The evolution of the interior Mesozoic basin and the Gulf of Mexico. Transactions Gulf Coast Association of Geological Societies 24:31-41.

ABSTRACT: The evolution of the Interior Mesozoic Basin is presented in terms of an evolving Gulf of Mexico which had its origin with the rifting and breakup of Pangea, particularly with the separation of North and South America. This Mesozoic event was preceded by the formation of Pangea in the late Paleozoic when plate collision produced the Appalachian-Ouachita-Marathon orogeny. As a result of this orogenic episode of plate collision and accompanying crustal dislocation along three major transcurrent fault systems, the Texas, Wichita and Mississippi megashears, a proto Atlantic was closed and a distributive pattern of pre-Mesozoic rocks was created that was to have a lasting effect on the shape of the Interior Mesozoic Basin. Rifting in the early Triassic created an incipient Gulf of Mexico with associated peripheral grabens that defined the shape of Mesozoic sedimentation. Crustal thinning and attenuation accompanied the divergent rifting of Pangea and early sedimentation in rift grabens is represented by the Eagle Mills Formation. Deltaic prisms are postulated, coincident with the three megashears, and represent the positions of ancestral Rio Grande, Red and Mississippi Rivers. They augment the continental red beds of the grabens formed during early rifting and the succeeding marine shelf sediments of a diverging plate margin and constitute exploratory objectives. The thick evaporite deposition, represented by the Werner evaporite and Louann Salt, in a shallow basin on a subsiding plate margin is the result of an unique combination of events. The updomed rift margin of the trailing plate formed a restricting barrier that allowed the continued influx of sea water into the attenuated and rifted portion of the plate that was subsiding to form the Interior Mesozoic Basin. The sea water, upon encountering this highly saline waters of this subsiding basin initiated rapid salt deposition by the brine mixing method. Eastward rotation of Mexico into its present position deepened the Gulf of Mexico and peripheral rifting aided in continued submergences with normal marine deposition being established in late Jurassic time.

KEYWORDS: Geology.

**811.**
Woodbury, H.O. 1977. Movement of sediment on the Gulf of Mexico continental slope and upper continental shelf, pp 263-273. In: Richards AF. Marine slope stability. 2. Crane, Russak & Co, New York, NY.

ABSTRACT: Grain size, coarse fraction analyses, and depositional environment as interpreted from microfauna are related to the character of sparker reflections at the location of core holes drilled by Exxon, Chevron, Gulf, and Mobil on the continental slope of the northern Gulf of Mexico. Continuous sparker reflections are correlated with slowly deposited, evenly bedded sediments containing bathyal faunas. The coarse fraction is dominated by the tests of foraminifera. Discontinuous, discordant reflections and diffractions are correlated with sediments more rapidly emplaced in the bathyal environment of the continental slope by slumping and sliding from the continental shelf. Their coarse fraction is dominated by terrigenous sand grains. A large portion of the volume of continental slope sediments appears to consist of these "displaced" sediments, including an area 3-24 km wide and 80 km long, southeast of Corpus Christi, Texas. Comparable processes of movement of sediments are interpreted on the continental shelf south of the Southwest Pass of the Mississippi River. Bathymetry in this area is characterized by a series of subaqueous "gullies" radiating from the river mouth and leading to terraces at their southern extremities. Side-scan sonar and PDR surveys show a rough bottom in these "gullies" and terraces, as contrasted with a relatively smooth bottom elsewhere. The rough bottom is interpreted as indicative of slump and creep of the sediments from shallower water. Some foundation soil borings in this area south of Southwest Pass find a low-strength material gradually increasing in strength with depth. Other borings find a "crust" of anomalously strong material 8-15 m below the mudline. The microfauna recovered from the "crust" has moved to its present position by slump or creep from shallower water along a pattern comparable to the gullies shown in the present-day bathymetry.

KEYWORDS: Geology; Atlantic Ocean; Case Studies; Continental Margin; Continental Shelf; Continental Slope; Cores; Data; Gulf of Mexico; Inner Shelf; Marine Environment; Marine Transport; Mass Movements; North Atlantic; Oceanography; Paleo-Oceanography; Paleobathymetry; Sedimentation; Slides; Slope Stability; Slumping; Transport.

**812.**
Woodbury, H.O., I.B. MurrayJr., J. Pickford, and Akers W. H. 1973. Pliocene and Pleistocene depocenters, outer continental shelf, Louisiana and Texas. Bulletin of the American Association of Petroleum Geologists 57:2428-2439.

ABSTRACT: The Pliocene and Pleistocene, embracing only 5.5 m.y., were times of very rapid sedimentation on the continental shelf and slope of the northern Gulf of Mexico. During this period the center of maximum deposition shifted over 200 mi (320 km) southward from just west of the present mouth of the Mississippi River to 100 mi (160 km) south of the present shoreline at the Louisiana Texas border. This shifting of the center of maximum deposition was accompanied by 50 mi (80 km) of southward progradation of the continental shelf edge to its present position near the 600 ft. (200 m) isobath. Hydrocarbon productive trends follow the shifting of the depocenter. Rapid sedimentation took place upon substrata which included several thousand feet of mobile salt, plus a comparable thickness of mobile prodelta clay. The weight of the accumulating sediments has caused movement of the underlying mobile material, with the result that the structural configuration of the strata in the Plio-Pleistocene depocenters is complicated by large piercement salt and diapiric shale massifs, which are estimated to occupy about 20 percent of the total area at a depth of 12,000 ft. (3,657 m) in the Pleistocene depocenter.

KEYWORDS: Geology.

**813.**
Worrall, D.M.andS. Snelson. 1989. Evolution of the northern Gulf of Mexico, with emphasis on Cenozoic growth faulting and the role of salt, pp 97-138. In: Bally AW, A.R. Palmer, (Editors). The geology of North America: and overview, Geologic Society of America Decade of North America Geology. J. Geological Society of America, Boulder, CO.

ABSTRACT: None.

KEYWORDS: Geology.

**814.**
Worrall, D.M.andS. Snelson. 1989. Evolution of the northern Gulf of Mexico, with emphasis on Cenozoic growth faulting and the role of salt: pp 97-138. In: Bally AW, Palmer AR, (Editors). The geology of North America; an overview. A. Geological Society of America, Boulder, CO.

ABSTRACT: None.

KEYWORDS: Geology; Atlantic Ocean; Cenozoic; Continental Margin; Diapirism; Distribution; Dnag; Faults; Geophysical Surveys; Growth Faults; Gulf Coastal Plain; Gulf of Mexico; North Atlantic; Ocean Floors; Oceanography; Salt Tectonics; Seismic Surveys; Structural Geology; Surveys; Tectonics.

**815.**
Worzel, J.L.andC.A. Burk. 1979. The margins of the Gulf of Mexico, pp 403-419. In: Watkins JS, Montadert L, Dickerson PW. Geological and geophysical investigations of continental margins. American Association of Petroleum Geologists, Tulsa, OK.

ABSTRACT: Preliminary results of a long-term program to investigate the tectonic history of the Gulf of Mexico are summarized principally through multichannel seismic reflection methods. Knowledge of the deep part of the Gulf contributes significantly to understanding the evolution of its continental margins. Reasonable and usual stratigraphic principles, based on marine reflection data, can be used successfully to interpret the geological history of such regions. The stratigraphic unit which contains the Late Jurassic salt responsible for the diapirs of the deep Gulf of Mexico can now be recognized throughout this region, and diapirs have now been located as far east as the base of the West Florida Escarpment. Basement structural arches which seem responsible for the reef growth controlling the Florida and Campeche scarps are also present in the Yucatan Straits. All post-Jurassic units of the deep Gulf pinch out by depositional overlap against the Florida Escarpment to the east, against the Campeche Escarpment to the south, and against the newly discovered basement feature in the Strait of Florida. There is no evidence of faulting associated with these scarps. The post-jurassic through Miocene sediments of the deep Gulf originally continued north of the Sigsbee scarp, and completely across the Mexican Ridges to west. Deformation by detachment sliding and diapirism progressed southward on the United States margin throughout the Cenozoic and occurred suddenly in the folded Mexican Ridges in the late Pliocene or Pleistocene time. There is no evidence in the deep Gulf of Mexico of pre-Pleistocene deep-sea cones. The large deep-sea cone of the present Mississippi River is a prominent and unique feature of the Gulf.

KEYWORDS: Geology; Atlantic Ocean; Cenozoic; Continental Margin; Continental Shelf; Continental Slope; Geophysical Surveys; Gulf of Mexico; Mesozoic; North Atlantic; Oceanography; Reefs; Reflection Methods; Seismic Surveys; Sigsbee Abyssal Plain; Surveys.

**816.**
Worzel, J.L. and J.S. Watkins. 1973. Evolution of the northern Gulf Coast deduced from geophysical data. Transactions - Gulf Coast Association of Geological Societies: 23(23):84-91.

ABSTRACT: Seismic refraction data from the western part of the Northern Gulf Coast of the United States indicate that the uppermost crust of the Gulf region consists of a thick sequence of sedimentary rocks with thicknesses locally ranging up to 17 km. Beneath the sedimentary sequence a layer with velocities ranging from 5.2 to 6.0 km/sec probably consists of high velocity sedimentary rocks comprised mainly of evaporites and carbonates. The combined thickness of the sedimentary sequence and the 5.2-6.0 km/sec layer is between 15 and 20 km. The igneous and metamorphic continental crust has a velocity of 5.8-6.0 km/sec, and is 12-20 km thick beneath the interior of the coastal plain. It thins seaward and disappears beneath the shelf. The lower crust is 15-20 km thick beneath the coastal plain, has a velocity of 6.45-6.9 km/sec and grades into normal oceanic crust somewhere beneath the shelf or slope. From all available data, we have constructed three profiles from the North Gulf Coastal Plain to the Sigsbee dee From these profiles, making what we consider reasonable interpolations where data is sparse or missing, we have derived structure cross sections of the former Gulf Coast at the end of Cretaceous, Oligocene and Pliocene. Our reconstructions are based on the assumption that region has remained closely in isostatic equilibrium as it is today. We have thus arrived at a first order approximation to the post-Mesozoic evolution of the Gulf Coast Geosyncline, the Continental Shelf and the transition from continental crust to oceanic crust at this continental margin.

KEYWORDS: Geology; Atlantic Ocean; Basins; Cenozoic; Crust; Evolution; Folds; Geophysical Surveys; Ground; Gulf Coastal Plain; Gulf of Mexico; Isostasy; Mississippi; North Atlantic; Northwest; Ocean Floors; Profiles; Refraction; Salt Tectonics; Seismic Surveys; Sigsbee Scarp; Structure; Surveys; Tectonics; Texas; United States.

**817.**
Wunderly, W.L. 1970. Indicated Geostrophic Velocities and Volume Transports Central and Eastern Gulf of Mexico, Warmest and Coldest Months. Master's thesis. Physical oceanography U.S. Naval Postgraduate School. Monteray, California.

ABSTRACT: To make comparisons to seven similar cruises, the geostrophic method of volume transport and velocity analysis was applied to ALAMINOS cruises 67-A-6 of 4 to 22 August 1967 and 68-A-2 of 13 February to 6 March 1968. An average velocity of 83 cm/sec and a volume transport of 27.5 Sverdrups was found in the Yucatan Channel in August and an average velocity of 79 cm/sec and a volume transport of 26.6 Sverdrups was found in the channel for February to March. A subsurface westward flow occurred in August along the southern coast of Cuba providing input into the Loop Current north of the Yucatan Channel. The Loop Current never crossed 25 degrees N latitude. A cold ridge extended from the Florida shelf to the Campeche Bank. An analysis of East-West volume transport in the central Gulf indicated a merging of east and west Gulf waters between 87 deg 50 min W and 89 deg 30 min W longitude for the MABEL TAYLOR cruise of 1932 and the ATLANTIS cruise of 1935. The GERONIMO cruise of February-March 1967 and cruise 68-A-2 indicated a merging of east and west Gulf waters between 89 deg 30 min W and 91 deg 00 min W longitude. (Author).

KEYWORDS: Physical Oceanography; Ocean Currents; Velocity; Volume; Fluid Flow; Oceanographic Vessels; Theses; Alaminos Vessel; Gulf of Mexico.

**818.**
Young, C.M., E. Vazquez, A. Metaxas, and P.A. Tyler. 1996. Embryology of vestimentiferan tube worms from deep-sea methane/sulphide seeps. Nature 381(6582):514-516.

ABSTRACT: The Vestimentifera are gutless worms that live around deep-sea hydrothermal vents and cold seeps, obtaining energy from hydrogen sulphide with the aid of endosymbiotic chemosynthetic bacteria. Their phylogenetic relationships have been debated ever since they were first discovered. Moreover, hydrothermal vents are ephemeral and spatially patchy, raising questions about how vestimentiferan populations are established and maintained, and how symbionts are transmitted. Although post-settling juveniles have been described, embryos and larvae have been neither collected nor cultured. Here we describe the early development of vestimentiferans from cold seeps in the Gulf of Mexico, and discuss the implications of our findings for dispersal potential and phylogeny.

KEYWORDS: Embryology; Lamellibrachia; Escarpia; Hydrothermal Vents; Phylogeny; Dispersal.

**819.**
Zande, J.M. 1994. Feeding and life history of the gastropod *Bathynerita naticoidea* from Gulf of Mexico hydrocarbon seeps. PhD. Dissertation. Pennsylvania State University. University Park, PA.

ABSTRACT: Gulf of Mexico hydrocarbon seep communities contain both chemosynthetic and apparently heterotrophic organisms. *Bathynerita naticoidea* (Gastropoda: Neritacea) is one of the dominant apparent heterotrophs at Gulf seep communities between 500 1000m on the Louisiana continental slope. The gill tissue of *B. naticoidea* is free of bacterial symbionts, but a fungal associate of unknown function is found on and between the gills cells by light, transmission electron, and scanning electron microscopy. Using its rhipidoglossan radula, *B. naticoidea* grazes on the hard surfaces of chemosynthetic macrofauna. Microbiota and detrius found on the shells of chemosynthetic mussel, Bathymodiolus sp., by scanning electron microscopy, acridine orange, and DAPI staining, and in the gut and feces of the gastropod by scanning electron microscopy and acridine orange staining, are the most likely source of nutrition. Efforts to confirm feeding experimentally were inconclusive. There is site specific variation in population size structure at four Gulf sites attributable to differential growth and/or survival. Egg capsules retrieved from field collections and observations of specimens maintained in laboratory aquaria indicate the B. naticoidea deposits approximately 150 embryos in capsules where they undergo complete development, emerging as fully formed individuals. This lecithotropic mode of development implies limited dispersal capabilities; therefore the means of dispersal among Gulf sites is uncertain.

KEYWORDS: Geology.

**820.**
Zetler, B. D. and D. V. Hansen. 1970. Tides in the Gulf of Mexico. A review and proposed program. Bulletin of Marine Science 20(1):57-69.

ABSTRACT: A study of tides in the Gulf of Mexico is proposed as part of the program for Gulf Science Year (1970). There are several existing hypotheses explaining the diurnal tides in the gulf. These are described and discussed and a new hypothesis is suggested. The semidiurnal tides are generally small, and therefore have had less attention; nevertheless, there are several hypotheses that are quite contradictory. A program of tide and tidal current observations is proposed which should permit discrimination among the various hypotheses.

KEYWORDS: Physical Oceanography.

**821.**
Zimmer, R.A., R.F. Figgers, J.F. Geesling, H. Kim, D.H. Yueng, and et al. 1999. Design and Fabrication of the URSA TLP Deck Modules and TLP Upper Column Frame. Proceedings of the 31th Annual Offshore Technology Conference (OTC paper 10755).

ABSTRACT: This paper discusses the design and fabrication of the URSA TLP deck modules and upper column frame. The URSA TLP is installed at Mississippi Canyon 809 in over 3800 feet of water. The high rate URSA wells are produced through large diameter tubing strings inside dual cased risers. The URSA topside package includes a full drilling facility and production facilities that can process 150,000 barrels of oil and 400 million scf of gas per day. Also, as the URSA TLP has potential to act as a hub for the surrounding fields, it can carry an additional flexibility payload of about 3000 short tons.

KEYWORDS: Technology.

**822.**
Zimmerman R.A. and D.C. Biggs. 1999. Patterns of distribution of sound-scattering zooplankton in warm- and cold-core eddies in the Gulf of Mexico, from a narrowband acoustic Doppler current profiler survey. Journal of Geophysical Research C: Oceans .

ABSTRACT: The acoustic backscatter intensity (ABI) reflected from epipelagic zooplankton communities in the central Gulf of Mexico was measured during June 1995 with a vessel-mounted, narrowband-153-kHz acoustic Doppler current profiler (ADCP). Horizontal and vertical variations in ABI were documented in three kinds of mesoscale hydrographic features commonly found in the Gulf of Mexico: the warm-core Loop Current (LC), a warm-core Loop Current eddy (LCE), and a cold-core region that separated the two warm-core features. Since new nitrogen domes close to surface waters in cold-core features whereas surface waters of warm-core features are nutrient depleted, the cold-core region was expected to have higher biological stocks as a result of locally higher primary production. Both ABI and net tow data confirmed that the cold-core region was in fact a zone of local aggregation of zooplankton and micronekton. During both day and night, ABI when integrated for the upper 50 and 100 m in the cold-core region was significantly greater than in the LC or in the LCE, and ABI was positively correlated with standing stock biomass taken by the net tows. Further investigations into the biological differences between Gulf of Mexico divergence and convergence regimes are warranted, and the ADCP will be a useful tool for examination of the distribution of sound scatterers in such features.

KEYWORDS: Acoustic Doppler Current Profiler; backscatter; biogeography; mesoscale eddy; population ecology; spatial distribution; zooplankton; Gulf of Mexico; Water column biology.

## The Department of the Interior Mission

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 **Royalty Management Program** 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.