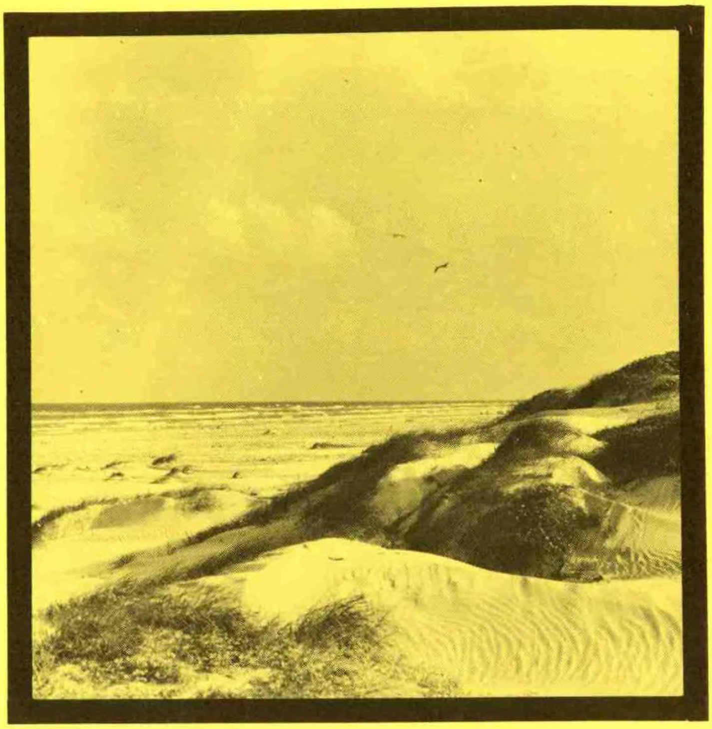
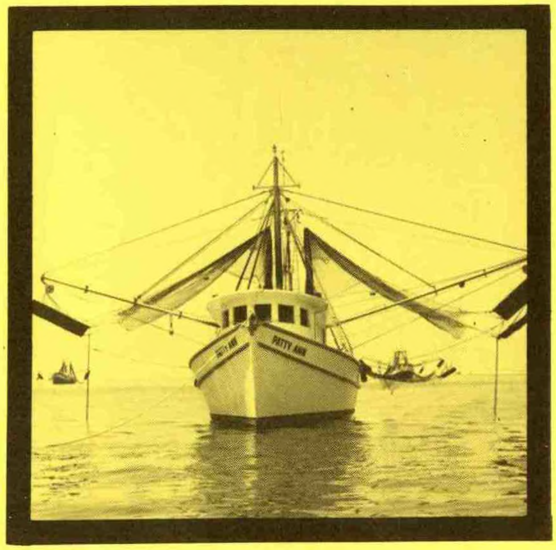
Marine Environmental Assessment

GULF OF MEXICO

ANNUAL SUMMARY 1983





U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Environmental Satellite, Data, and Information Service
Assessment and Information Services Center

CLIMATE IMPACT ASSESSMENT
UNITED STATES

The AISC/Marine Environmental Assessment Division (MEAD), Marine Assessment Branch (MAB), produces periodic assessments of weather impacts on economic sectors of marine environmental activity. From September, 1981, through March, 1982, MAB issued monthly assessments of Chesapeake Bay in the economic sectors of fisheries, recreation, and transportation. The Chesapeake Bay region served as a model for assessment development. We now issue quarterly assessments in order to extend the service to other marine areas within existing resource limitations. As a reflection of this effort, we produced a prototypic assessment of the Gulf of Mexico for 1982.

Please send any comments or subscription queries to the Chief, Marine Assessment Branch, Marine Environmental Assessment Division, NOAA/NESDIS/AISC, E/AI32, 3300 Whitehaven Street, NW, Washington, DC 20235, or call (202) 634-7379.

Front Cover Photographs

Offshore Oil Rig - Texas Shores
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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NOAA
U.S. DEPARTMENT OF COMMERCE

January 1985

ERRATUM

The title for Table 6-7, p. 83, should read: "Total spills of oil, hazardous materials, and other substances by state - number, volume, and percent of U.S. total, 1983." Total encompasses all saltwater, freshwater, and terrestrial spills.

GULF OF MEXICO MARINE ENVIRONMENT
1983 ANNUAL SUMMARY

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SECTION 1

INTRODUCTION

The Gulf of Mexico 1983 Annual Assessment presents a synoptic view of several economic sectors and their direct and indirect relations to the physical and biological marine and atmospheric environment. We attempt to bring into a single focus the numerous commercial, social, and scientific activities in the Gulf relative to environmental conditions, especially weather and oceanographic events or trends. Using research results in the fields of physical oceanography, marine biology, meteorology, political science, and economics, we have developed a multi-disciplinary view of the Gulf during a single calendar year.

Assessment of the economic impacts of weather and environment is important to planners, engineers, scientists, and commercial interests because of heavy multiple-use requirements for the coastal zone. Our population relies on the nearshore estuarine and coastal shelf environment for food, recreation, energy, transportation, and industrial and societal waste disposal. Most uses conflict at some level of activity. Furthermore, the relative impacts and conflicts are sensitive to weather and climate in many areas. Impacts or conflicts can be minimized if timely information on impacts is available.

The measurement of impacts is imprecise. Specification of relationships between exogenous variables (weather, oceanography, catch statistics) and economic sector variables (transportation, pollution costs, fishery market dynamics) requires further investigation. In this publication we bring together data from several economic sectors and four environmental disciplines for a single viewing. No attempt is made to limit data to specific models or preconceived ideas of causal relationships. Only confirmable relationships are presented as definite connections. Where direct relationships are unclear, the presentation of data from several scientific and economic areas has value by displaying the multiple use of the Gulf coastal environment.

By presenting this collection of data, we intend to stimulate further investigation by scientists and to provide information to those persons responsible for usage regulations of the Gulf and its estuaries.

1.1 Organization of the Report

The report comprises six sections. In the introductory section we delineate the concept of marine environmental assessment embodied in this report, specify the coverage of the present report, and suggest extensions and future development for the assessment function.

In Section 2 we present a summary of impacts identified for 1983. Only confirmed relationships appear as impacts.

Sections 3 through 6 contain details of the weather and oceanography, fisheries, recreation, transportation safety, and pollution events of the Gulf of Mexico marine environment for 1983. Discussions in these sections cover all information available to the Marine Assessment Branch at this time, but are neither exhaustive nor definitive. The review gives a limited synoptic view of several sectors and their relationships for a single year.

1.2 Scope of the Report

The geographical area considered is that part of the Gulf of Mexico which lies north of an imaginary line extending from Brownsville, Texas, to Key West, Florida.

We present a summary of weather and oceanographic events during 1983 over the region. Coverage is only for calendar year 1983, though environmental cycles vary in different regions of the Gulf. Discussion will indicate where such environmental variability is important. The calendar year serves the assessment function in tracking economic variables. Where discussion of environmental patterns or events requires reference to 1982 or to 1984, we extend coverage.

Four economic sectors appear in this report: fisheries, recreation, transportation, and industry. The fisheries section covers finfish and shellfish. Distribution and abundance of species are influenced by local and regional salinity and temperature regimes.

These changing regimes of salinity and water temperature in turn are related to precipitation, air temperature, and general coastal conditions over a broad span of space and time. Harvest of commercial species varies with climate conditions, fishing effort, and market conditions. Pollution and tranportation sectors affect distribution of the fisheries species as well as harvest activity.

Recreation includes park usage, boating, and recreational accident statistics. The recreational sector responds quickly to weather variations and correlates with pollution incidents and the presence of annoying or dangerous organisms in the water. The Gulf Coast is used heavily for recreation including swimming, boating, fishing, and tourism.

Transportation includes shipping, pollution events, and related shore activity. Through most months of the year shipping and related shore activities remain unaffected by climate and weather. Only tropical storms or severe cyclones interrupt normal marine transportation.

Industry in this report appears only as specific events such as spills of oil and hazardous substances. Tributaries of the Gulf form a large resource for waste disposal for surrounding industry and populations. Heavy use of the Gulf and its tributaries for transportation leads to spills of cargo substances, some harmless, others potentially harmful.

1.3 Future Work

The Assessment and Information Services Center, Marine Environmental Assessment Division recognizes the need for extension of this assessment to other sectors and more detailed and rigorous analyses in those sectors already discussed. The industrial complex surrounding the Gulf includes heavy manufacturing (steel, automobiles), food processing (spices, sugar), refining, shipbuilding, and chemical production. The use of water in each of these industries contributes to the quality of water entering the Gulf coast estuaries.

The fisheries assessment may ultimately treat species-specific problems. The analysis can assess the sensitivity of life stages of individual species to changes in environmental conditions.

Future work in the recreation sector may include assessment of sport fishing, marina usage, tourism, and sales of recreational equipment.

In transportation a study of the detailed distribution of Search and Rescue (SAR) in categories of damage, injury, cost, and geography may enhance the usefulness of the assessment. The costs related to maintenance of navigational aids may be of interest to port authorities and the shipping industry.

The discharge of heated water from electric power generating plants contaminates estuarine systems with waste energy. While local changes to each system can be measured at present, the cumulative impact of heat loading on the integrated ecosystems needs to be assessed.

Finally, the Gulf of Mexico assessment will increase in convenience to each user, if sensitivity scales for impacts can be derived. For each sector or resource factor (e.g., streamflow, salinity change, temperature anomaly, wave height, number of rain days) the assessor needs to know not only if the impact is positive or negative, but the degree of impact.

SECTION 2

IMPACT SUMMARY

HURRICANE ALICIA, THE FIRST HURRICANE TO MAKE LANDFALL IN THE UNITED STATES IN THREE YEARS, HIT THE TEXAS COAST IN AUGUST, SPAWNING 22 TORNADOES AND CAUSING 18 DEATHS AND AN ESTIMATED $3 BILLION DAMAGE. This storm was the meteorological highlight of a year with below normal temperatures and above normal precipitation around the Gulf of Mexico. The above normal precipitation kept river streamflows above normal and caused flooding in many areas. This abnormal rainfall and the subsequent high river discharges were instrumental in forcing the coastal sea surface salinities to below normal concentrations.

At year's end a series of Arctic air masses with extremely cold temperatures pushed southward and caused more than $550 MILLION DAMAGE to property and crops as well as KILLING HUNDREDS OF THOUSANDS OF FISH.

Fisheries

The Gulf of Mexico region yielded the nation's largest commercial fishery landings by weight in 1983. Over 2.3 billion pounds of finfish and shellfish, worth more than $615 million, were harvested. Only the combined Pacific coast and Alaska region exceeded the dollar value of the landings, although at a volume that was 30 percent lower. The Gulf of Mexico region landed 38 percent of the total United States catch by weight and 25 percent by value. Louisiana, with a record menhaden catch, led all other states in the nation with a record landing of 1.8 billion pounds. The $230.3 million value of this catch ranked third nationally.

Recreation

Although precipitation was above normal, and air temperatures were slightly below normal around the Gulf the entire year, both national and state park visitation figures continued to increase in 1983.

Transportation

Foreign import and export waterborne commerce figures were lower in 1983 than in 1982, as general Gulf transportation continued to decline. The decline in dry bulk cargo and fewer demands for coal and grain products are contributing factors to the decline in imports and exports. Although transportation declined, the total number of spills of oil and hazardous substances in the Gulf rose in 1983 following a decline over the past seven years. The increase in spills is probably due to the increase in the number of accidents. Adverse weather conditions, onshore and offshore, hit the Gulf regions resulting in outstanding property damages and coastal flooding that probably effected the decline in transportation and the increase in spills.

SECTION 3

WEATHER AND OCEANOGRAPHY

Hurricane Alicia, the first hurricane to make landfall in the continental U.S. in three years, hit the Texas coast in August, spawning 22 tornadoes and causing 18 deaths and an estimated $3 billion damage. Abnormal rainfall from Florida through Louisiana the first 4 months of 1983 caused flooding and restricted outside activity. For the year, precipitation was above normal for all stations sampled with departures ranging from 4 to 48 percent.

Along with the wet conditions in 1983 temperatures were below normal for the year at all stations. At year's end a series of Arctic air masses pushed southward over the area with extremely cold temperatures (nearly 10°F below normal for a month period), causing property and crop damage in excess of $600 million.

3.1 Storm Summary

Hurricane Alicia struck the Texas coast in August, bringing death and widespread destruction to the area. Although Alicia inflicted more damage than any other single event in the Gulf in 1983, other phenomena impacted the coast causing flooding and other significant damage. For various reasons, it is not possible to assign dollar values to all damages induced by the weather. Table 3-1 gives a chronological list of weather events and impacts during 1983.

3.2 Review of Events

Storm systems that developed in the Gulf in January spread heavy rains from Louisiana eastward. The storms brought flood conditions to areas with already saturated ground. At mid-month, an Arctic air mass brought freezing temperatures to north central Florida. At the end of the month tornadoes caused considerable damage in coastal Louisiana and Texas.

In February storm systems from the Gulf caused heavy rains from south Texas to the Atlantic coast. Tornadoes and strong gusty winds caused deaths and destruction in north central Florida on February 1 and 2. Further storms damaged coastal east Texas and southern Louisiana on February 9.

Again in March, a series of storms brought excessive rains to eastern Texas and part of the panhandle and western peninsula of Florida. On March 4, 5, and 6, windstorms, tornadoes, and rain caused damage from southern Texas to coastal Mississippi, Alabama, and Florida. On March 24, thunderstorms, winds, and tornadoes caused extensive damage in east and west central Florida. The combined effect of heavy rains and cool temperatures had a detrimental effect on outside activities.

The trailing cold front associated with a low pressure system in the central U.S. caused heavy rains in Louisiana and Mississippi, April 5-8. Columbia, MS, had almost 16 inches of rain in a 24-hour period. The associated flooding caused over $500 million damage in southern Mississippi and Louisiana. Tornadoes in north central Florida caused considerable damage on the 9th (more than $500 thousand damage). Cloudy, wet weather persisted and temperatures remained below normal over the entire area for the 4th consecutive month.

Table 3-1.--Summary of storm events and impacts, Gulf of Mexico, 1983.

Date	Storm Event	Impacts
January 20	Windstorm (FL)	Coastal flooding (most of western Florida)
February 1, 2	Severe thunderstorms and tornadoes (FL)	Local flooding (most of Florida - particularly Orlando area) damage to property and boats.
March 4, 5, 6	Windstorm (TX, LA, AL, MS, FL)	Property damage, coastal flooding (>$0.5 million)
March 15	Tornado (TX)	Property damage (Cameron Co., TX) (>$0.5 million)
March 24	Wind, hail, tornadoes (FL)	Property damage (east central Florida) (>$5 million)
April 5, 6, 7, 8	Heavy rains, thunderstorms, (southern LA, MS)	Flooding (southeast LA - New Orleans, southern AL, MS - Columbia) crop and property damage (>$250 million property and >$0.5 million crop)
April 23	Tornadoes (FL)	Property damage (northern peninsula - Florida) (>$2 million)
May 19, 20	Windstorms, thunderstorms, tornadoes (LA, AL, MS, TX)	Property damage, flooding (LA, AL, Jackson, MS, Houston, TX), damage in excess of $50 million
June 6	Thunderstorms, hailstorms, tornadoes (TX)	Property and crop damage (TX) (>$2.5 million property, >$1.5 million crop)
July 15	Heavy rains (TX)	Flooding, property damage (TX)
August 1, 2	Heavy rains (southern LA)	Flooding, property damage (about $10 million)
August 17, 18	Hurricane Alicia (TX)	Flooding, property damage (Galveston, Houston, TX) estimated to exceed $3 billion
September 18, 19, 20	Heavy rains (TX)	Flooding, property damage (Houston, TX)
October 18, 19, 20	Heavy rains (TX)	Flooding, property and crop damage (Lubbock, TX)
November 19	Thunderstorms, tornadoes (TX, LA)	Property damage (Allenfarm, TX, LA - northeast corner)
November 22, 23	Windstorm, severe thunderstorms (TX, LA)	Property damage (TX - widespread, LA - Shreveport, minor damage)
December 2, 3	Heavy rains (MS, AL)	Flooding, property damage (Birmingham, AL 9.22" in 24 hr)
December 6	Tornado (LA)	Property damage (La Place, LA)
December 15 - 31	Cold weather (Entire area)	Property, crop damage (TX - >$5 million, LA - >$5 million, Florida - >$50 million) Hundreds of thousands of fish killed (Corpus Christi and Galveston, TX)

Heavy rains continued into May in eastern Texas, Louisiana, and Mississippi from frontal systems extending southward from Colorado lows. Monthly rainfall amounts as high as 22 inches fell in northern Louisiana, and the 8-16 inches of precipitation in Mississippi caused extensive flood damage northeastward through northern Mississippi. The Pearl River at Jackson, MS, flowed at or above flood stage more than half the time over the 6 month period from December, 1982, to May, 1983. Thunderstorms, winds, and tornadoes damaged areas in southeastern Texas, central Louisiana, and northern Mississippi on the 19th and 20th.

June weather over the Gulf states returned to near-normal conditions, as a subtropical, then a tropical low, tracked through the Gulf. Temperatures were slightly cooler-than-normal, and precipitation was above normal from eastern Texas to the Atlantic.

By July weather over the Gulf had settled into the summer pattern with circulation around an extension of the Bermuda high. This brought warm moist air to the western Gulf, but the prevailing circulation prohibited onshore flow onto the central and eastern Gulf coasts, and the rainfall in these coastal areas was below normal.

The 1983 season's only tropical storms, hurricane Alicia and hurricane Barry, affected the Gulf coast area in August. Hurricane Alicia hit the Texas coast around Galveston on the 18th and spread heavy rains northwestward to the Plains states. Tropical storm Barry crossed southern Florida on the 25th, intensified into a hurricane as it crossed the Gulf, and brought rains to southern Texas on the 28th. Temperatures over the area were near normal for the month.

Storms originating in the Gulf dropped rain on coastal areas around mid-September as the circulation changed from summer zonal to fall meridional. These storms caused some flooding in south central Texas and along the eastern Texas coast.

Temperatures in October were slightly above normal over the Gulf coast areas. Rains from a series of frontal systems kept most immediate coastal areas wet (departures more than 100 percent). The remnants of what had been hurricane Tico in the eastern Pacific crossed Mexico and passed to the northeast bringing heavy precipitation and some flooding to west and north Texas.

Temperatures in November were cooler-than-normal in the eastern Gulf area and warmer from Mississippi westward. A series of low pressure systems developed east of the Rockies and moved through the central United States causing precipitation in all but the south Texas coast area of the Gulf. A windstorm in southern Texas caused widespread damage totalling more than $5 million.

Cold Canadian air pushed into the western Gulf the last half of the month. The cold temperatures associated with those air masses caused $50 million in property damage and $500 million crop damage in Florida. Heavy rains in northern sections of Alabama and Mississippi caused flash flooding December 2 and 3. A devastating tornado occurred in La Place, LA, on December 6 causing an estimated $6 million damage.

3.3 Precipitation

Precipitation anomalies at the Gulf coast stations in Figure 3-1 were variable during January ranging from -50 percent in southern Texas to well over 100 percent in southern Florida. Heavy thunderstorms in the Key West, FL, area brought over 10 inches of rain in 24 hours at that station on January 22 and 23. This brought the station's monthly total to almost ten times the normal January rainfall. Table 3.2 lists the normal precipitation and the 1983 departures for selected stations in the Gulf region.

In February, precipitation was well above normal in the eastern half of the Gulf and in southern Texas, with departures from normal over 100 percent in southern Florida, the Mississippi-Alabama border, and southern Texas. Again some areas in southern Florida received over 10 inches of rain.

From Louisiana eastward, precipitation was above normal in March and April with departures greater than 200 percent in Florida both months. For Texas, however, the situation was different. Two hundred percent positive departures in March reversed to 100 percent declines in April with Brownsville and Corpus Christi each receiving only a trace of rainfall for the month.

Precipitation over the immediate coastal area along the Gulf was generally below normal during May, but inland there was a band of above normal rainfall from eastern Texas northeastward through Louisiana, northern Mississippi, and Alabama. Excessive rains occurred in northern Louisiana (over 20 inches) giving that state another month of flooding.

Rainfall was greater-than-normal over the Gulf area in June, except for southern Texas and extreme southern Florida where precipitation was 75 percent of normal. Departures were almost 300 percent in Louisiana. In July precipitation was generally below normal, except for the southeastern Texas coast, where the tropical storm that came ashore in mid-month brought anomalies of 300 percent above normal. Precipitation in August was above normal from Louisiana west to a portion of the southeastern Texas coast and over some of central peninsular Florida. Other areas were generally below normal. The major precipitation event was hurricane Alicia that hit the Texas coast early on the morning of the 18th.

September, October, and November precipitation amounts were above normal over the entire Gulf coastal area, except for a section of Florida in the northeast Gulf.

Precipitation ranged from normal to slightly above normal over the coastal Gulf areas in September. The storms of September 18-20 dropped heavy rains over the south central and upper Texas coasts. October precipitation was above normal over central Florida, the immediate coastal areas of Mississippi and Louisiana, and central southeastern Texas. The heavy rains from the remnants of hurricane Tico were extensive in western and northern Texas, but did not affect the eastern and southern parts of the state. Precipitation was above normal over the area in November, except for the immediate coast of western Louisiana and Texas.

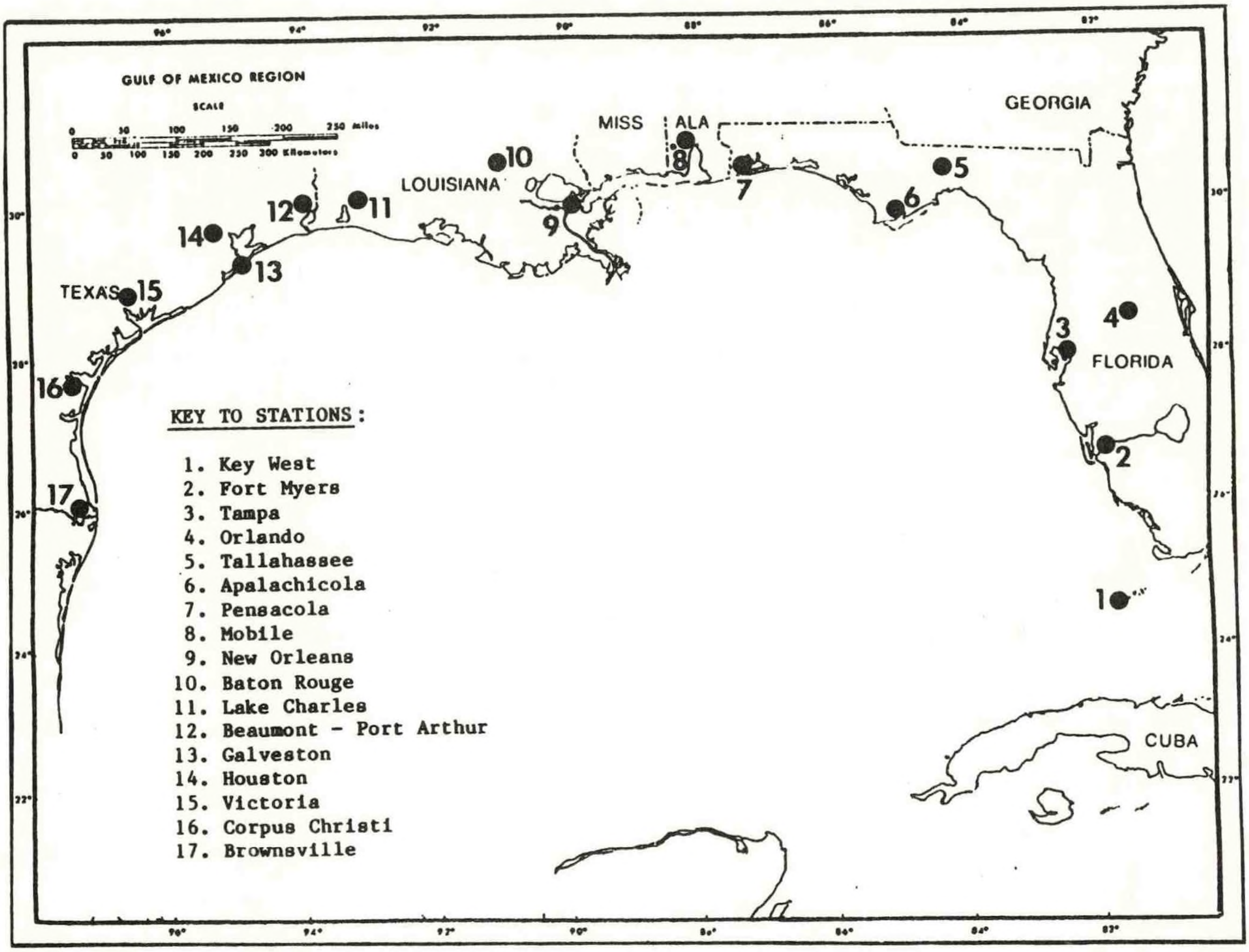

Figure 3-1.--Selected National Weather Service meteorological stations, Gulf of Mexico coastal region (Modified U.S. Department of Interior map).

Table 3-2.--Normal monthly total precipitation (1951-1980) and departure from normal, selected stations, Gulf of Mexico, 1983.

A. Normal monthly total precipitation (inches)

Station	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual Total
	Month												
Key West, Florida	1.74	1.92	1.31	1.49	3.22	5.04	3.68	4.80	6.50	4.76	3.23	1.73	39.42
Fort Myers, Florida	1.89	2.06	2.85	1.52	4.11	8.72	8.52	8.58	8.56	3.86	1.35	1.57	53.64
Tampa, Florida	2.17	3.04	3.46	1.82	3.38	5.29	7.35	7.64	6.23	2.34	1.87	2.14	46.73
Orlando, Florida	2.10	2.83	3.20	2.19	3.96	7.39	7.78	6.32	5.62	2.82	1.78	1.83	47.83
Tallahassee, Florida	4.66	5.00	5.60	4.13	5.16	6.55	8.75	7.30	6.45	3.10	3.31	4.58	64.59
Apalachicola, Florida	3.51	3.64	4.04	3.25	2.94	4.81	7.09	7.53	8.66	3.19	2.82	3.50	54.98
Pensacola, Florida	4.47	4.90	5.66	4.45	3.87	5.75	7.18	7.04	6.75	3.52	3.42	4.15	61.16
Mobile, Alabama	4.59	4.91	6.48	5.35	5.46	5.07	7.74	6.75	6.56	2.62	3.67	5.44	64.64
New Orleans, Louisiana	4.97	5.23	4.73	4.50	5.07	4.63	6.73	6.02	5.87	2.66	4.06	5.27	59.74
Baton Rouge, Louisiana	4.58	4.97	4.59	5.59	4.82	3.11	7.07	5.05	4.42	2.63	3.95	4.99	55.77
Lake Charles, Louisiana	4.25	3.88	3.05	4.06	5.14	4.19	5.55	5.39	5.21	3.47	3.76	5.08	53.03
Beaumont-Port Arthur, Texas	4.18	3.71	2.93	4.05	4.50	3.96	5.37	5.45	6.13	3.63	4.33	4.55	52.79
Galveston, Texas	2.96	2.34	2.10	2.62	3.30	3.48	3.77	4.40	5.82	2.60	3.23	3.62	40.24
Houston, Texas	3.21	3.25	2.68	4.24	4.69	4.06	3.33	3.66	4.93	3.67	3.38	3.66	44.77
Victoria, Texas	1.87	2.24	1.34	2.61	4.47	4.53	2.58	3.33	6.24	3.31	2.24	2.14	36.90
Corpus Christi, Texas	1.63	1.55	0.84	1.99	3.05	3.36	1.96	3.51	6.15	3.19	1.55	1.40	30.18
Brownsville, Texas	1.25	1.55	0.50	1.57	2.15	2.70	1.51	2.83	5.24	3.54	1.44	1.16	25.44

Table 3-2.--(Continued). Normal monthly total precipitation (1951-1980) and departure from normal, selected stations, Gulf of Mexico, 1983.

B. Departure from normal, 1983 (percent departure from normal)

Station	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual Total
	Month												
Key West, Florida	914	81	402	26	-30	-24	26	-42	-65	-75	-72	187	33
Fort Myers, Florida	138	425	160	-12	84	106	-44	-25	14	14	171	106	39
Tampa, Florida	-42	142	119	51	21	36	-13	16	6	-25	24	120	30
Orlando, Florida	-1	194	68	47	-55	6	-17	-24	-8	34	-24	191	16
Tallahassee, Florida	-16	35	133	85	-35	43	-73	-66	-32	-67	94	35	4
Apalachicola, Florida	23	51	23	274	-91	67	-68	-29	-20	-36	137	70	17
Pensacola, Florida	19	80	18	142	1	112	-30	-46	23	4	29	28	28
Mobile, Alabama	27	142	6	134	-72	60	-78	71	-9	45	44	53	29
New Orleans, Louisiana	-33	141	3	230	-27	130	-56	4	-3	83	56	74	43
Baton Rouge, Louisiana	36	-7	17	128	28	294	-52	66	1	-41	10	62	39
Lake Charles, Louisiana	38	15	-14	-57	98	-1	-66	62	66	-95	-5	-40	4
Beaumont-Port Arthur, Texas	38	7	56	-87	153	105	22	163	94	-91	-2	43	48
Galveston, Texas	43	44	39	-91	-54	42	93	154	99	-52	-15	-27	34
Houston, Texas	-38	22	44	-90	55	32	57	157	47	-57	-6	1	19
Victoria, Texas	-12	69	214	-52	-61	-35	306	-44	-23	111	40	-76	15
Corpus Christi, Texas	-54	111	261	-100	-9	-26	348	-24	15	25	-1	-59	22
Brownsville, Texas	-12	69	22	-100	-34	-34	305	-17	64	-29	-64	-59	10

Table 3-3.--Normal monthly mean air temperature (1951-1980) and departure from normal, selected stations, Gulf of Mexico, 1983.

A. Normal monthly air temperature (Degrees F)

	Month												Annual
Station	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Average
Key West, Florida	68.7	70.1	74.1	77.7	80.6	82.9	84.5	84.3	82.6	80.1	75.5	71.0	77.7
Fort Myers, Florida	63.4	64.1	68.8	73.1	77.9	81.1	82.6	82.8	81.7	76.5	69.8	64.7	73.9
Tampa, Florida	59.8	60.8	66.2	71.6	77.1	80.9	82.2	82.2	80.9	74.5	66.7	61.3	72.0
Orlando, Florida	60.5	61.5	66.8	72.0	77.3	80.9	82.4	82.5	81.1	74.9	67.5	62.0	72.4
Tallahassee, Florida	51.6	53.6	60.2	67.1	74.0	79.5	81.2	81.1	78.3	68.4	58.8	53.0	67.2
Apalachicola, Florida	52.8	54.7	60.7	67.9	74.5	79.8	81.5	81.4	78.9	70.2	61.0	55.0	68.2
Pensacola, Florida	51.7	54.2	60.4	68.0	75.0	80.6	82.3	81.8	78.7	69.4	59.7	53.8	68.0
Mobile, Alabama	50.8	53.6	60.1	68.0	74.9	80.5	82.2	81.8	78.2	68.5	58.6	53.1	67.5
New Orleans, Louisiana	52.4	54.7	61.4	68.7	74.9	80.3	82.1	81.7	78.5	69.2	60.0	54.6	68.2
Baton Rouge, Louisiana	50.8	53.6	60.5	68.4	74.8	80.3	82.1	81.4	77.9	68.2	58.7	53.1	67.5
Lake Charles, Louisiana	51.5	54.3	60.7	68.4	74.9	80.4	82.3	81.8	78.2	69.3	59.7	53.9	68.0
Beaumont-Port Arthur, Texas	51.9	54.9	61.4	69.0	75.6	81.2	83.1	82.8	79.2	70.2	60.6	54.7	68.7
Galveston, Texas	53.6	55.6	61.4	69.1	75.7	81.2	83.2	83.2	80.0	72.7	63.0	56.8	69.6
Houston, Texas	51.4	54.5	61.0	68.7	74.9	80.6	83.1	82.6	78.4	69.7	60.1	54.0	68.3
Victoria, Texas	53.4	56.6	63.3	70.9	76.7	82.0	84.5	84.2	80.1	71.9	62.3	56.1	70.1
Corpus Christi, Texas	56.3	59.3	65.9	73.0	78.1	82.7	84.9	85.0	81.5	74.0	65.0	59.1	72.1
Brownsville, Texas	60.3	62.8	68.6	74.9	79.2	82.6	84.1	84.1	81.4	75.3	67.7	62.3	73.6

Table 3-3.--(Continued). Normal monthly mean air temperature (1951-1980) and departure from normal, selected stations, Gulf of Mexico, 1983.

B. Departure from normal, 1983 (Degrees F)

	Month												Annual
Station	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Average
Key West, Florida	-1.1	-1.8	-4.4	-3.7	-1.8	-0.8	-1.1	-0.4	+0.1	+0.4	+0.2	+1.7	-1.1
Fort Myers, Florida	-1.0	-1.4	-3.4	-3.0	-1.9	-0.9	-0.6	-0.8	-1.9	+0.7	-0.8	+1.7	-1.1
Tampa, Florida	-0.9	-0.5	-2.9	-3.0	-0.3	0.0	0.0	0.0	-1.5	+1.3	-0.8	+1.4	-0.8
Orlando, Florida	-2.5	-1.6	-3.3	-3.4	-0.9	-0.4	+0.8	+1.0	-0.5	+1.6	-1.7	-0.8	-0.9
Tallahasssee, Florida	-2.4	-0.6	-1.3	-4.3	-1.4	-1.3	+1.6	+1.3	-2.6	+1.9	-1.3	-2.3	-1.1
Apalachicola, Florida	-1.9	-0.5	-3.7	-5.2	-1.7	-1.6	+0.2	+0.4	-2.4	+1.2	-1.6	-3.0	-1.7
Pensacola, Florida	-4.1	-3.0	-5.7	-6.7	-2.9	-4.6	+0.7	+1.2	-3.5	+0.2	-0.8	-4.0	-2.8
Mobile, Alabama	-3.7	-2.5	-5.1	-6.2	-2.8	-4.1	-0.4	-0.4	-4.6	-1.1	-0.9	-5.4	-3.1
New Orleans, Louisiana	-2.2	-0.9	-3.1	-4.4	-0.9	-2.7	-0.6	+0.7	-3.2	-0.1	0.0	-5.1	-1.9
Baton Rouge, Louisiana	-2.1	-2.2	-3.2	-5.8	-2.2	-3.3	-0.1	+0.8	-2.7	-0.2	+0.2	-6.6	-2.3
Lake Charles, Louisiana	-2.2	-1.7	-2.9	-4.9	-1.5	-1.9	+1.2	+1.7	-1.3	+1.0	+2.8	-5.7	-1.3
Beaumont-Port Arthur, Texas	-1.5	-0.9	-2.5	-5.2	-2.3	-2.1	-0.7	-0.4	-2.5	+0.1	+3.1	-6.0	-1.7
Galveston, Texas	-0.4	+0.3	-0.1	-3.2	-0.6	+0.1	+1.5	+1.2	-0.8	+2.1	+4.4	-7.0	-0.2
Houston, Texas	-1.3	-2.0	-2.7	-4.7	-1.5	-1.6	-0.9	0.0	-1.8	+0.4	+3.1	-8.3	-1.8
Victoria, Texas	-1.0	-1.4	-2.2	-3.9	-1.5	-1.3	-1.7	-0.2	-2.4	+0.2	+3.0	-9.5	-1.7
Corpus Christi, Texas	-1.2	-1.4	-2.2	-4.0	-2.1	-1.5	-1.8	-0.8	-2.1	+0.1	+2.7	-9.8	-2.0
Brownsville, Texas	-0.5	0.0	-0.4	-1.9	+0.6	+0.8	+0.4	+1.5	+0.3	+0.9	+3.8	-6.9	-0.1

Precipitation was above normal over the eastern three-fourths of the Gulf in December. This resulted from a series of low systems that developed east of the Rockies and dipped down into the lower Mississippi Valley area before heading more eastward.

3.4 Air Temperatures

The entire Gulf averaged below normal air temperatures for the months of January through June and September. This, coupled with most of the area's having large negative departures from normal in December, brought the annual average departure from the mean to -1.5°F for the 17 selected National Weather Service Meteorological stations in Figure 3-1 (Table 3-3).

Temperatures were slightly to moderately below normal over the Gulf area in January (Table 3-3). Departures ranged from -0.4°F to -4.1°F. Cold temperatures occurred in northern Florida in mid-month. Cloudy and rainy weather kept February temperatures generally below normal over the area. No extreme cold temperatures occurred, however. March temperatures were below normal over the coastal areas with the lowest occurring directly along the coast, where they were as much as -5°F below normal. Temperatures continued below normal in April. Stations in lower Mississippi, Alabama, and the Florida panhandle had temperatures around 6°F below normal. A southerly push of cold air the latter part of the month caused freezing temperatures in northern Alabama.

Except for extreme southern Texas, May temperatures remained slightly below normal, rounding out a cool moist spring over the area. Again in June, temperatures were below normal over most of the Gulf area with positive departures in southern Texas. Greatest departures for the region were close to -5°F in coastal Florida and Alabama.

Temperatures were close to normal over the entire area in July and August. The greatest departure for our selected stations was -1.8°F at Corpus Christi in July. Temperatures averaged slightly below normal over almost the entire Gulf area in September, although the greatest departure was -4.6°F in coastal Alabama and Mississippi.

Average fall temperature departures were positive west of central Louisiana and negative east of there. In October, temperatures were near normal over the area. Only one station, Galveston, TX, had as much as a +2°F departure. Except for the north central Gulf, temperature anomalies were positive. Temperatures were slightly below normal from Mississippi eastward and above normal westward in November. The first freeze of the season spread into northern Louisiana, Mississippi, and Alabama the second week of the month.

Temperatures in December were almost 10°F below normal for the month for our sample stations in Texas. All departures were negative, except for southern Florida.

3.5 Streamflow

Streamflow entering the Gulf of Mexico affects the Gulf region's fisheries, recreation, ecology, and water quality. The Gulf Coast rivers drain from a very large inland area. This large area and the subsequent large number of rivers prevent analysis of total streamflow for the Gulf as a whole. Each river, however, is susceptible to both local and large scale weather patterns. These patterns directly affect the rate and quantity of streamflow entering individual estuaries of the Gulf of Mexico.

Twelve major rivers and the locations of the corresponding streamflow monitoring stations are shown in Figure 3.2. Streamflow among the stations averaged 50 percent above normal in 1983. Two of the twelve stations (Alabama River and Tombigbee River) have data only through September, 1983. The remaining rivers, with the exception of the Brazos and the Rio Grande, showed cumulative streamflow excesses for calendar year 1983.

All rivers exhibited streamflows greater than the long-term averages in February and March, while most had below-normal flows in September and October; 70 percent of the months of available data showed excesses for the year.

Monthly data from the twelve selected stations are plotted in Figures 3-3a and 3-3b. Annual mean streamflow in 1983 as percent of normal for each station is listed in Table 3-4.

Table 3-4.--Annual mean streamflow as percent of normal, selected stations, Gulf of Mexico, 1982-1983.

River	Normal Flow (CFS)	1982-1983 Flow (Percent of Normal) 1982	1983
Suwannee	10,207	84	139
Apalachicola	22,509	100	135
Escambia	6,159	97	153
Alabama	36,189	103	*
Tombigbee	30,179	104	*
Pascagoula	9,847	89	185
Pearl	9,764	99	219
Mississippi	467,167	117	146
Atchafalaya	199,500	118	147
Sabine	7,268	83	154
Brazos	6,680	85	78
Rio Grande	1,810	36	22

*Data Unavailable

Data from U.S. Geological Survey and U.S. Army Corps of Engineers

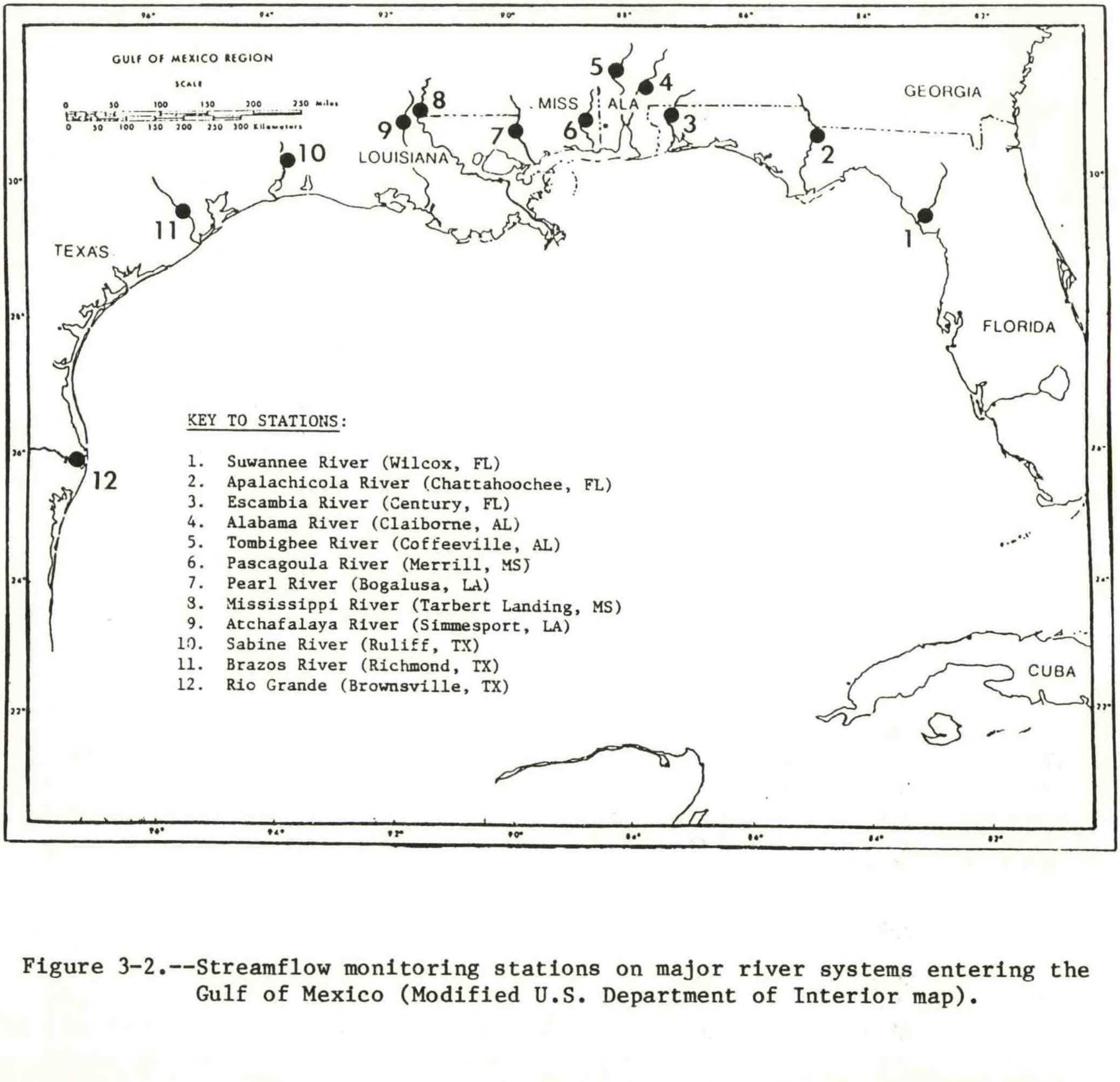

Figure 3-2.--Streamflow monitoring stations on major river systems entering the Gulf of Mexico (Modified U.S. Department of Interior map).

Suwannee River

The Suwannee River flows into an area of the Gulf known as Suwannee Sound. The station located near Wilcox, FL, showed streamflow excesses for eight months of the year. All months of 1983 had streamflow greater than 80 percent of the 1951-1980 monthly averages. March through May exhibited the greatest departure from normal ranging from 175 to 200 percent of normal. September through November were below normal, but high December flow, 142 percent of normal, pushed the cumulative streamflow excess to 940 billion gallons by the year's end.

Apalachicola River

The Apalachicola River flows into Apalachicola Bay. The monitoring station at Chatahoochee, FL, showed streamflow excesses for 10 months of 1983. The two months with less than normal flow, May and August, had rates of 96 and 93 percent, respectively. Record mean December flow, 47,930 cubic feet per second, along with the near-normal and above-normal streamflow for the rest of 1983 brought the streamflow excess to 1,865 billion gallons.

Escambia River

The Escambia River flows into Pensacola Bay. Flow measured near Century, FL, was normal or above for ten months of 1983, with August and October the months with below-normal streamflow. February through April experienced the heaviest streamflow with rates ranging from 180 to 200 percent of normal. The cumulative streamflow excess for 1983 was 765 billion gallons.

Alabama River

The Alabama River flows into Mobile Bay. Streamflow data for October through December, 1983, for the station at Claiborne Lock and Dam are unavailable. Seven of the nine months available had streamflow excesses, with the exceptions January and August - having flows greater than 80 percent of normal. Although the year began with a streamflow deficit, the above-average monthly flows brought the cumulative streamflow to an excess of 1,330 billion gallons by the end of September.

Tombigbee River

The Tombigbee River flows into Mobile Bay, and streamflow is monitored at Coffeeville Lock and Dam. Data are not available for the months of October, November, and December. The first seven months of the year had streamflow that was much above normal, ranging from 117 percent to 342 percent of the mean flow. February, May, and June set records. June's flow was 342 percent of normal. Although August and September had flows that were about one - half normal, the cumulative excess for this river was 5,460 billion gallons for the first nine months of the year.

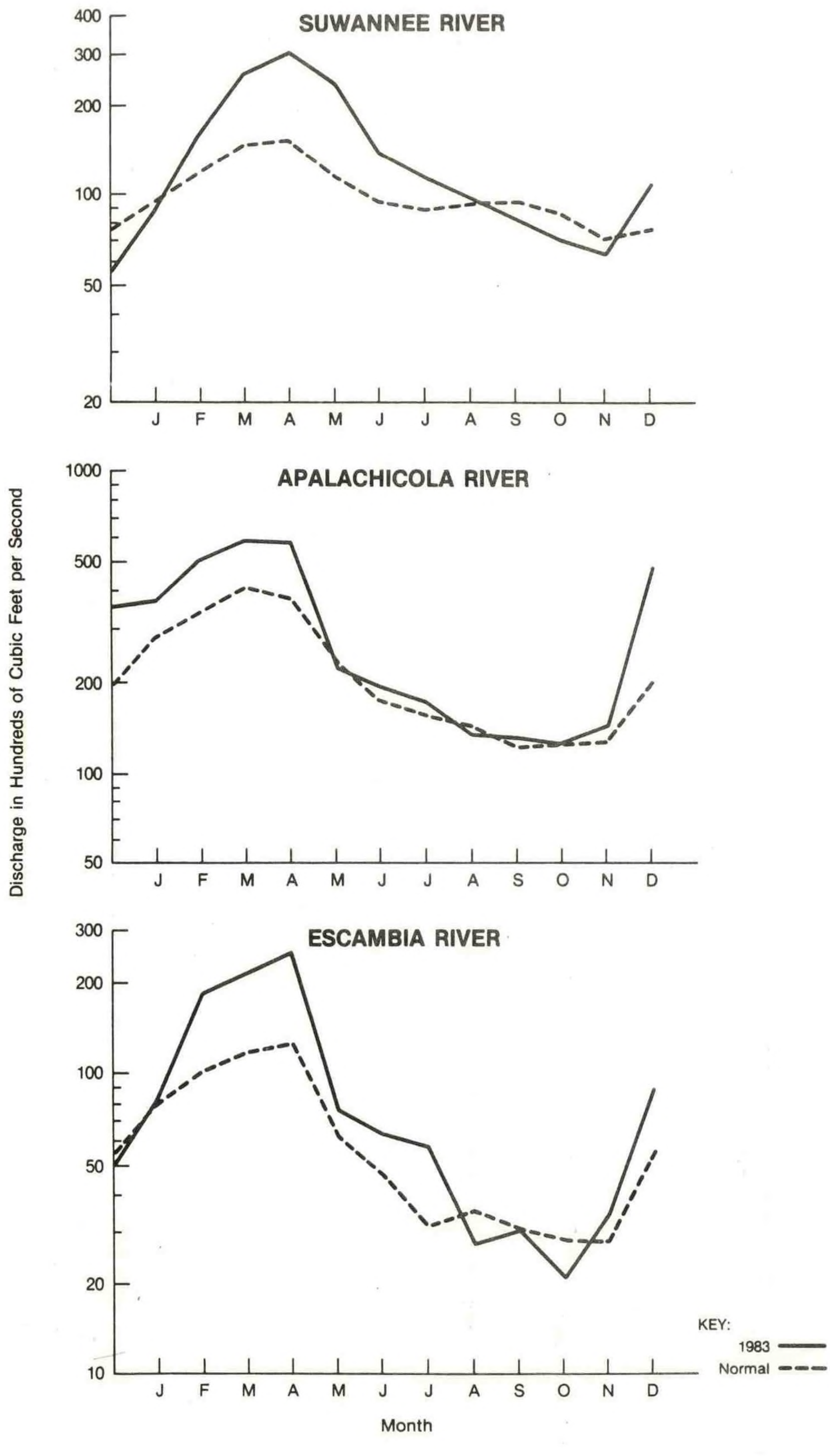

Figure 3-3a.--Monthly streamflow from major river systems entering the Gulf of Mexico during 1983 and average monthly streamflow. Data from U.S. Geological Survey and U.S. Army Corps of Engineers.

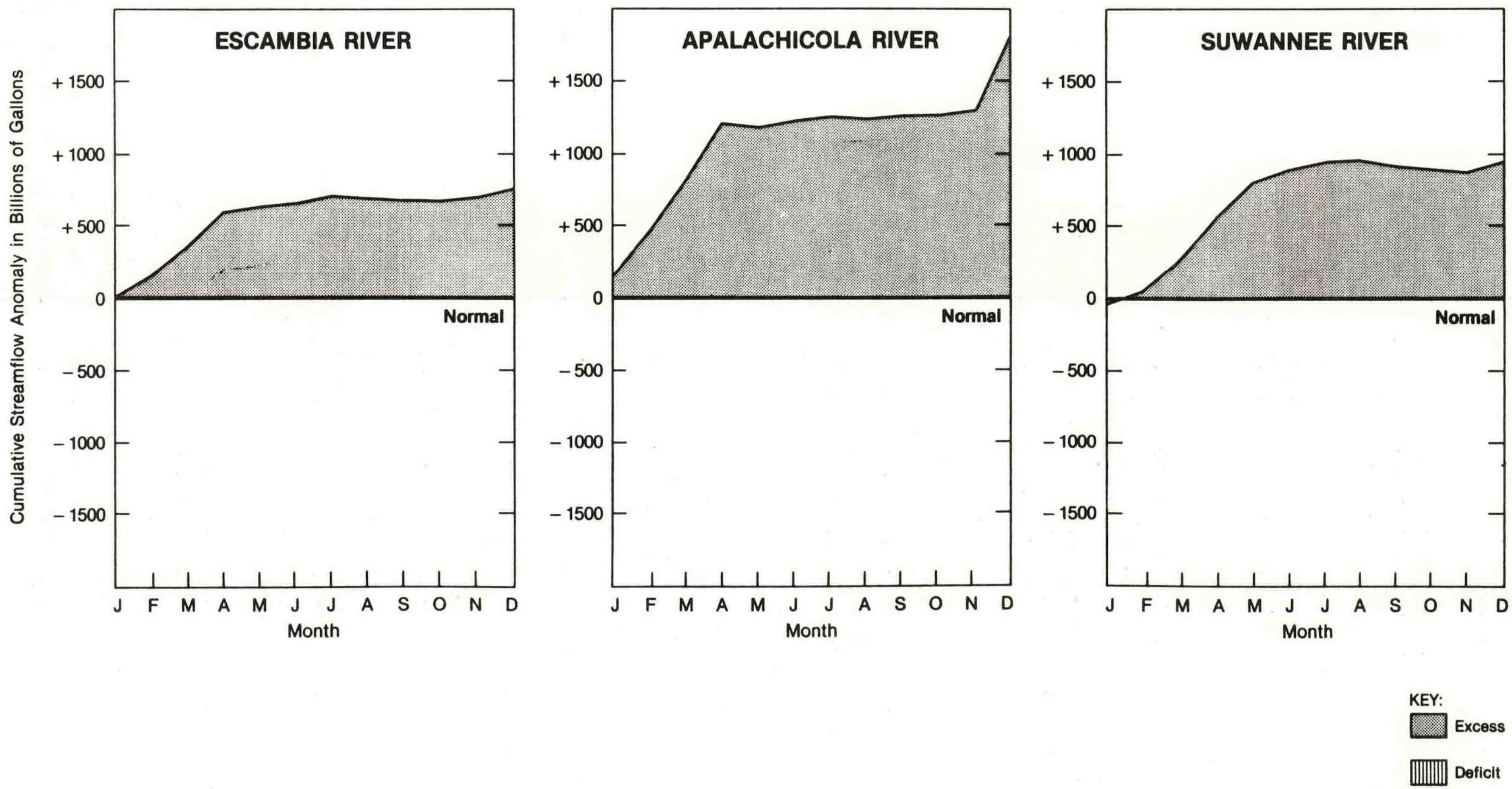

Figure 3-3b.--Cumulative monthly streamflow anomaly, major river systems entering the Gulf of Mexico, 1983. Data from U.S. Geological Survey and U.S. Army Corps of Engineers.

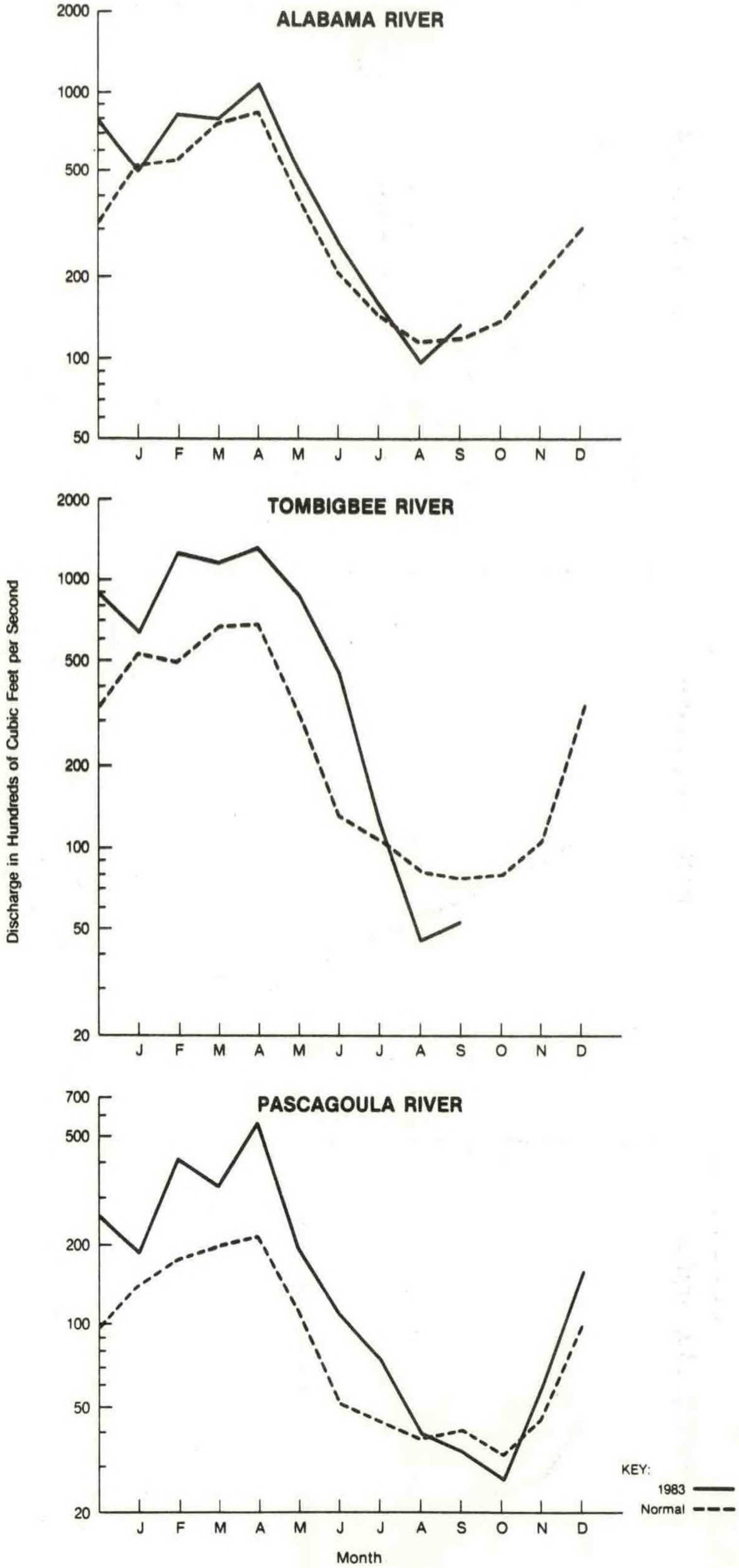

Figure 3-3a (Continued).--Monthly streamflow from major river systems entering the Gulf of Mexico during 1983 and average monthly streamflow. Data from U.S. Geological Survey and U.S. Army Corps of Engineers.

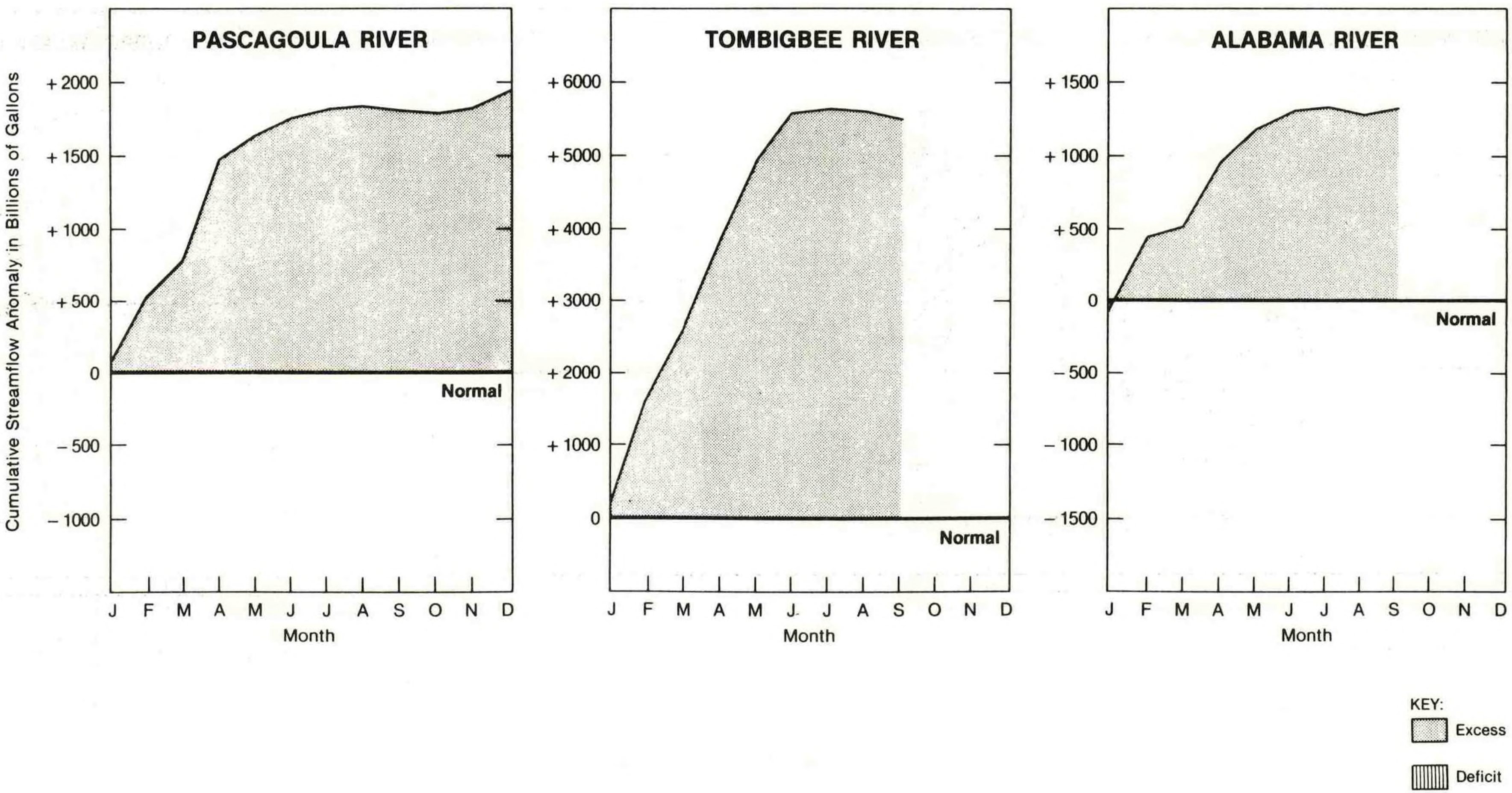

Figure 3-3b (Continued).--Cumulative monthly streamflow anomaly, major river systems entering the Gulf of Mexico, 1983. Data from U.S. Geological Survey and U.S. Army Corps of Engineers.

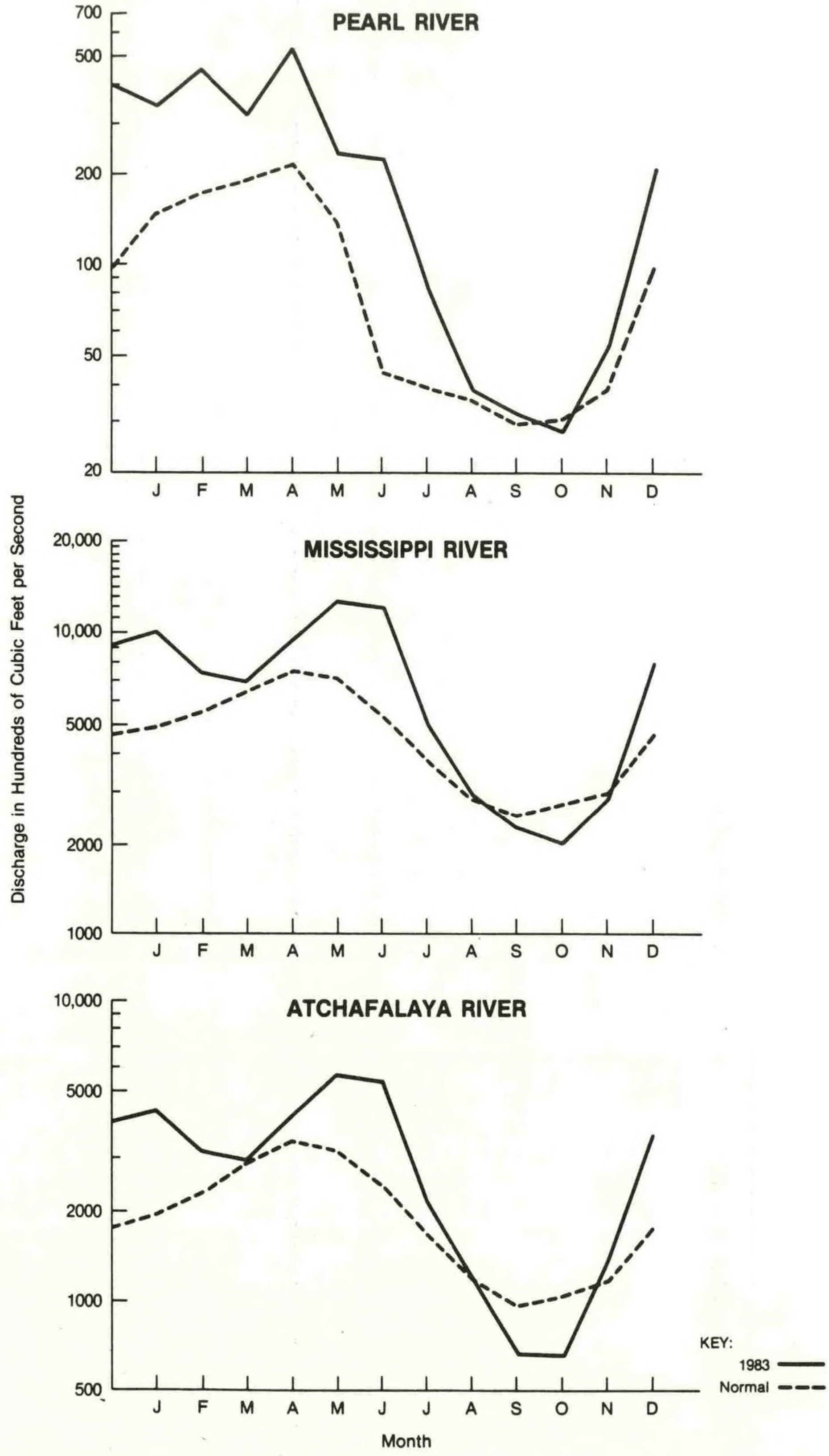

Figure 3-3a (Continued).--Monthly streamflow from major river systems entering the Gulf of Mexico during 1983 and average monthly streamflow. Data from U.S. Geological Survey and U.S. Army Corps of Engineers.

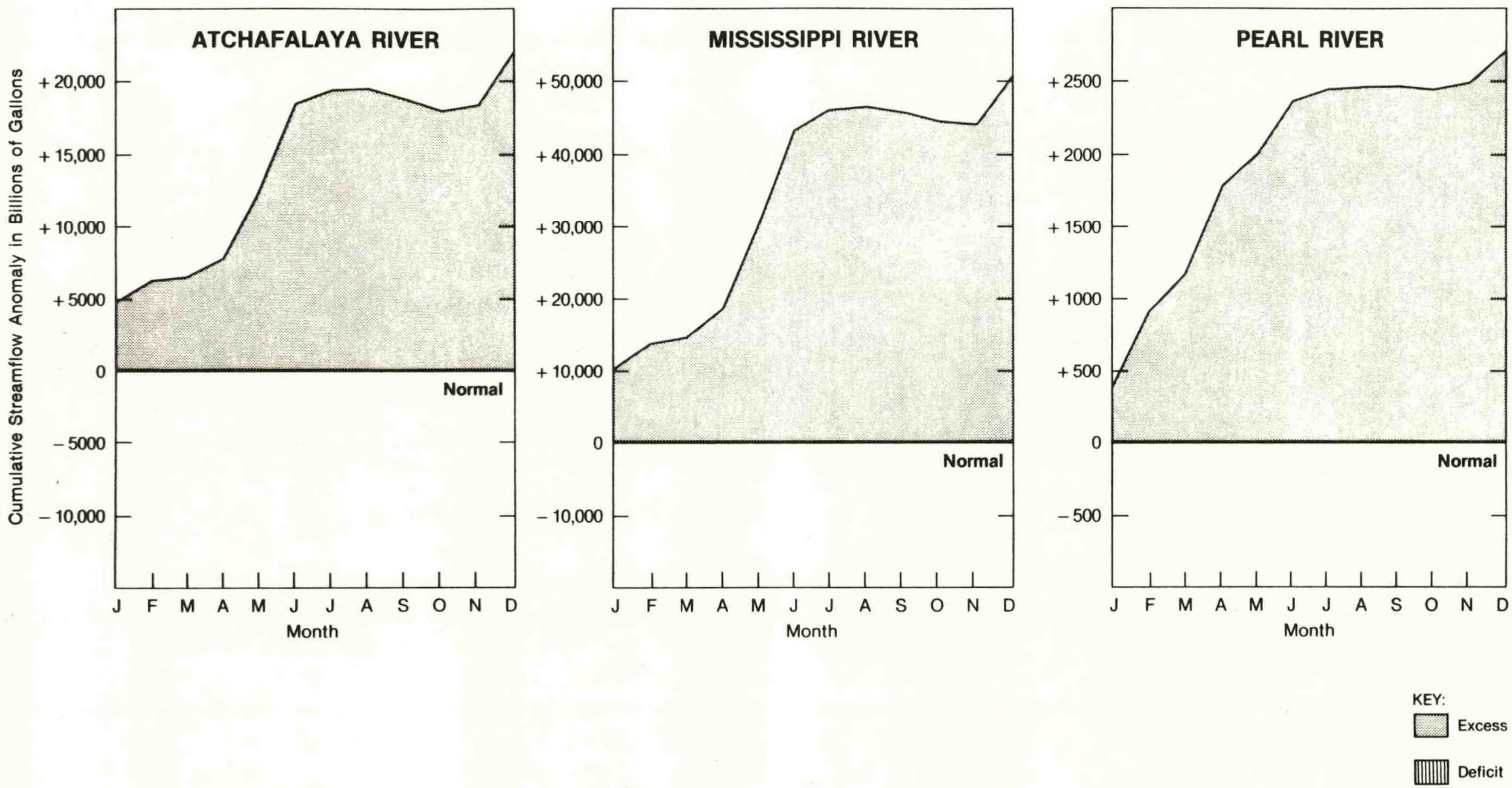

Figure 3-3b (Continued).--Cumulative monthly streamflow anomaly, major river systems entering the Gulf of Mexico, 1983. Data from U.S. Geological Survey and U.S. Army Corps of Engineers

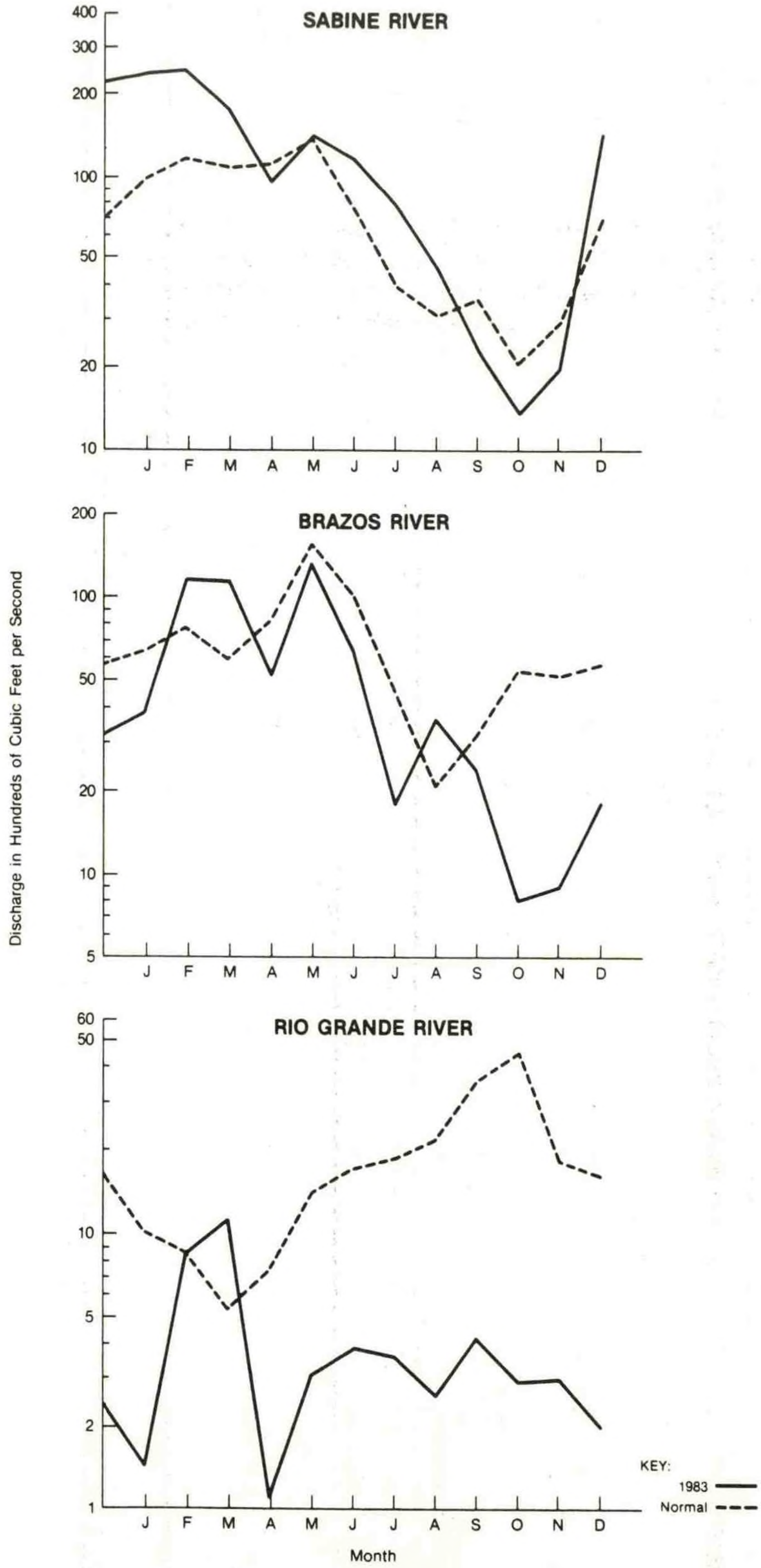

Figure 3-3a (Continued).--Monthly streamflow from major river systems entering the Gulf of Mexico during 1983 and average monthly streamflow. Data from U.S. Geological Survey and U.S. Army Corps of Engineers.

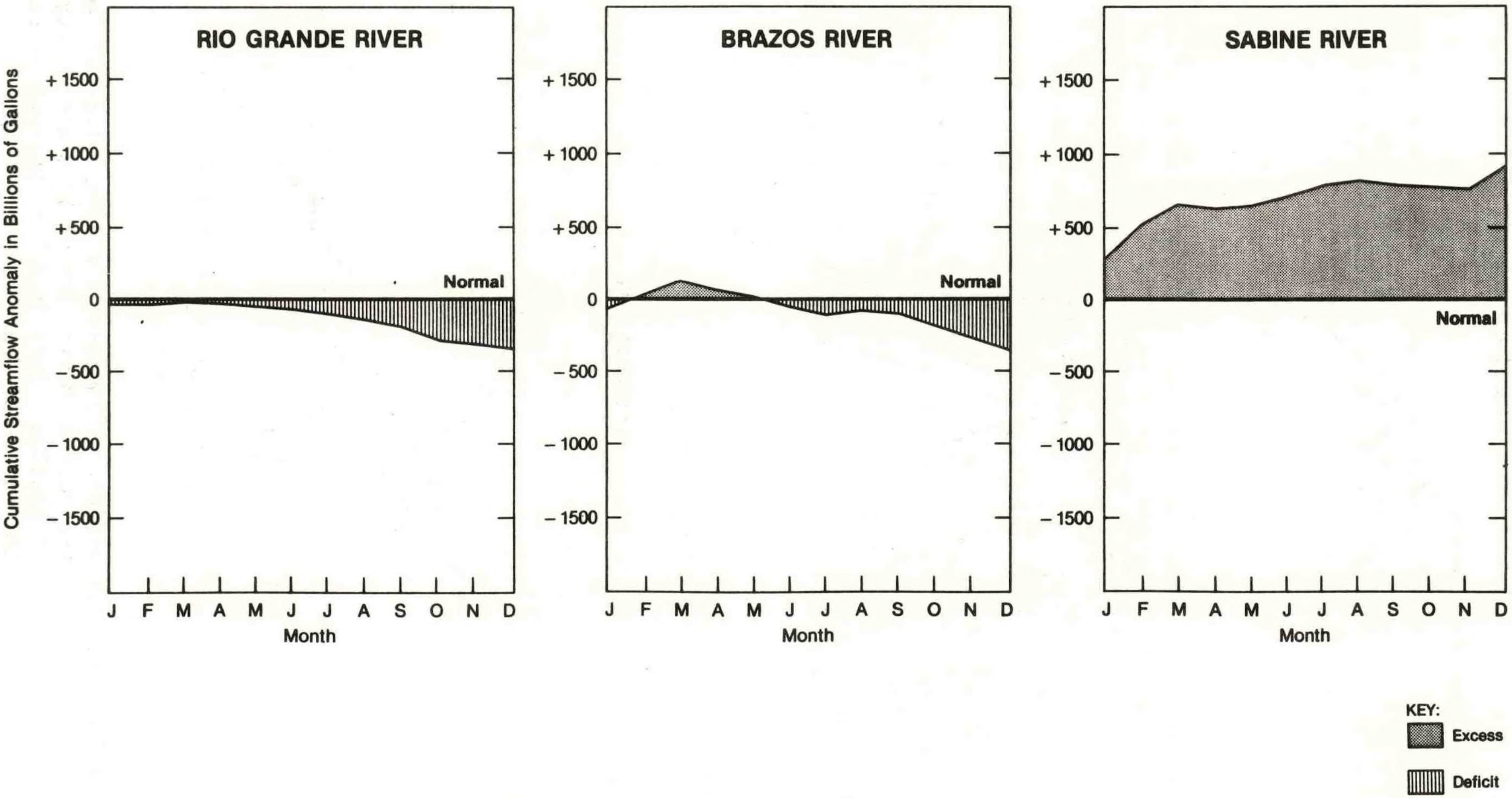

Figure 3-3b (Continued).--Cumulative monthly streamflow anomaly, major river systems entering the Gulf of Mexico, 1983. Data from U.S. Geological Survey and U.S. Army Corps of Engineers.

Pascagoula River

The Pascagoula River flows into an area of the Gulf known as the Mississippi Sound. The station at Merrill, MS, showed streamflow excesses for 10 months of 1983. Nine of these had flows greater than 30 percent above normal, and three, February, April, and June, had flows greater than 200 percent of normal. These high flows brought the cumulative streamflow excess to 1,930 billion gallons for 1983.

Pearl River

The Pearl River, monitored near Bogalusa, LA, flows into Lake Borgne. Only the month of October had streamflow below normal at 91 percent of the mean. Six months had flows greater than 200 percent of normal with June's streamflow of 45,850 cubic feet per second - 508 percent of normal - setting a record for the month for the period of record, 1951 - 1980. Cumulative streamflow excess amounted to 2,700 billion gallons for 1983.

Mississippi River

The Mississippi River station at Tarbert Landing, MS, showed streamflow excesses for nine months of 1983. January streamflow of 1,011,000 cubic feet per second and June flow of 1,212,000 cubic feet per second were record flows for these respective months for the period of record, 1964-1982. Although the flows for the months of September through November were below normal, they were close enough to normal to not greatly affect the year's cumulative streamflow excess of 50,830 billion gallons.

Atchafalaya River

The Atchafalaya River flows into Atchafalaya Bay and is monitored at Simmesport, LA. January streamflow of 434,000 cubic feet per second was the highest for that month for the period of record, 1953-1982, and led off a year which had ten months with streamflow greater than normal. June and December had flows greater than 200 percent of normal contributing to a cumulative discharge excess of 22,060 billion gallons for 1983.

Sabine River

The Sabine River, which is monitored near Ruliff, TX, flows into Sabine Lake. The year began and ended with abnormally high streamflow, with January, February, and December having excesses of more than 100 percent above normal. One-half the remaining months had flows above normal. April and September through November, although below normal, experienced at least 70 percent of their normal flows. The streamflow anamoly for the year was an excess of 915 billion gallons.

Brazos River

The Brazos River flows directly into the Gulf. The station at Richmond, TX, had only three months with streamflow above normal. Above-average streamflows in February and March allowed the cumulative streamflow excess to extend through May. However, in June the anamoly became a deficit and remained so until the end of the year, finishing as a negative departure of 345 billion gallons.

Rio Grande River

The Rio Grande River flows directly into the Gulf of Mexico and is monitored near Brownsville, TX. January flow, only 14 percent of normal, created a streamflow deficit. Although February and March, the only two months having above-normal flow, had rates of 100 and 210 percent, respectively, the cumulative deficit remained throughout the year and finished at 335 billion gallons.

3.6 Surface Water Salinity and Temperature

Surface water salinity and temperature were evaluated for the selected National Ocean Service (NOS) stations depicted in Figure 3-4. Tables 3-5 and 3-6 give the long-term mean salinities and temperatures and the 1983 departures from these normal values.

Salinity

Following the description of the long-term seasonal salinity patterns at selected NOS stations, the monthly mean surface salinity distributions during 1983 will be discussed.

Stations between Naples and Cedar Key normally experience salinity maxima in May or June and minima in September. Secondary maxima occur in late fall or winter and secondary minima in early spring. Stations from Cedar Key north and west to Grand Isle, LA, normally experience salinity maxima in November and minima in spring. Stations farther west experience salinity minima later than stations in the eastern Gulf. Secondary maxima and minima occur at these western Gulf stations in the summer months of some years.

From Galveston to Port Mansfield, TX, the salinity patterns show maxima in August and minima in May with secondary maxima in November following slight secondary minima in October. The salinity cycles discussed reflect the general circulation of the Gulf of Mexico and local responses to freshwater runoff.

The large departures from the monthly mean surface salinity pattern evident in the Port Mansfield station data are difficult to explain. Normal or above normal discharge from the Rio Grande occurred only for the months of February and March. Excess rainfall at Brownsville, TX, occurred in February, July, and September and at Corpus Christi in February, March, and July. Thus, the February and March as well as July reduction in surface salinity could be attributed to the freshwater runoff. Another contributing factor is the onshore transport of offshore waters induced by the surface wind field (See Section 3.7). Since this onshore transport of higher salinity offshore waters did not occur with the normal intensity and duration in 1983, the local freshwater inputs could have dominated the salinity field throughout the year.

The Freeport and Galveston, TX, patterns of monthly mean salinity agree closely. This is expected due to their proximity to each other. Excessive rainfall occurred at Galveston, except for the months April, May, and October

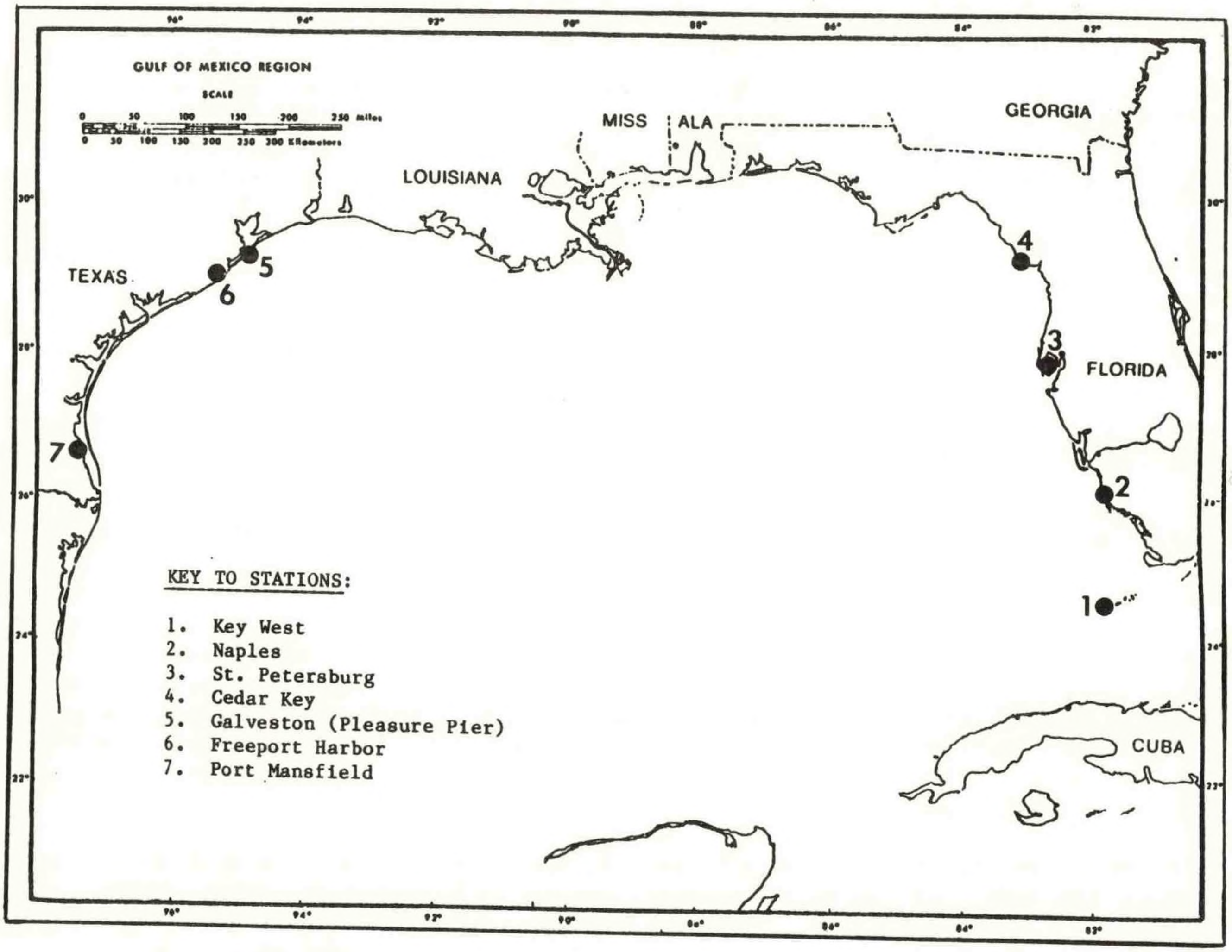

Figure 3-4.--Selected National Ocean Service temperature and density stations, Gulf of Mexico.

Table 3-5.--Monthly long-term average surface salinity and departure from normal, selected stations, Gulf of Mexico, 1983.

A. Monthly long-term average (ppt)

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Average
Key West	36.0	36.2	36.4	36.7	37.0	36.6	36.7	36.7	36.2	35.8	36.3	36.2	36.4
Naples	35.7	35.7	36.2	35.3	36.0	35.8	35.3	34.5	33.7	34.2	34.8	35.0	35.2
St. Petersburg	26.8	26.7	26.4	26.5	27.8	28.8	28.0	25.4	23.4	23.9	25.6	26.5	26.3
Cedar Key	27.1	26.0	24.7	24.7	26.0	27.5	27.1	25.9	25.6	26.1	27.5	27.3	26.3
Galveston (Pleasure Pier)	29.1	29.1	28.4	26.1	24.8	28.2	31.8	33.3	28.6	28.5	29.7	29.5	28.9
Freeport Harbor	24.7	24.1	25.8	25.2	23.3	26.0	30.4	33.1	28.4	25.1	25.9	25.1	26.4
Port Mansfield	34.8	35.0	35.3	35.4	33.6	33.3	36.4	40.3	39.8	37.6	38.6	37.1	36.4

Table 3-5 (Continued).--Monthly long-term average surface salinity and departure from normal, selected stations, Gulf of Mexico, 1983.

B. Departure from normal, 1983 (ppt)

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Key West	*	-1.2	*	-0.7	*	*	-0.1	0.6	0.8	1.6	0.8	0.7
Naples	0.2	-0.6	-3.0	-1.8	-0.3	0.1	0.5	0.7	*	*	0.3	0.1
St. Petersburg	0.7	-1.0	-3.4	-5.1	-4.0	-3.5	*	-0.9	-0.9	-1.2	-0.9	-1.3
Cedar Key	0.9	-2.0	-6.0	-6.2	-3.1	-0.7	-2.3	2.1	-1.8	0.3	-0.9	-1.4
Galveston (Pleasure Pier)	-1.5	-1.5	0.1	2.1	-3.9	-7.8	-8.1	-7.4	-5.9	-3.9	-1.1	-1.1
Freeport Harbor	-2.1	-7.6	-0.9	2.2	-1.3	-4.1	-8.7	-8.7	-10.8	-1.4	1.0	0.6
Port Mansfield	2.3	-1.0	-9.3	-7.9	-2.3	-5.1	-2.4	-13.4	-10.8	-9.3	-10.1	**

* Data reported unavailable by the National Ocean Service.

** Insufficient number of days of data to generate a monthly mean.

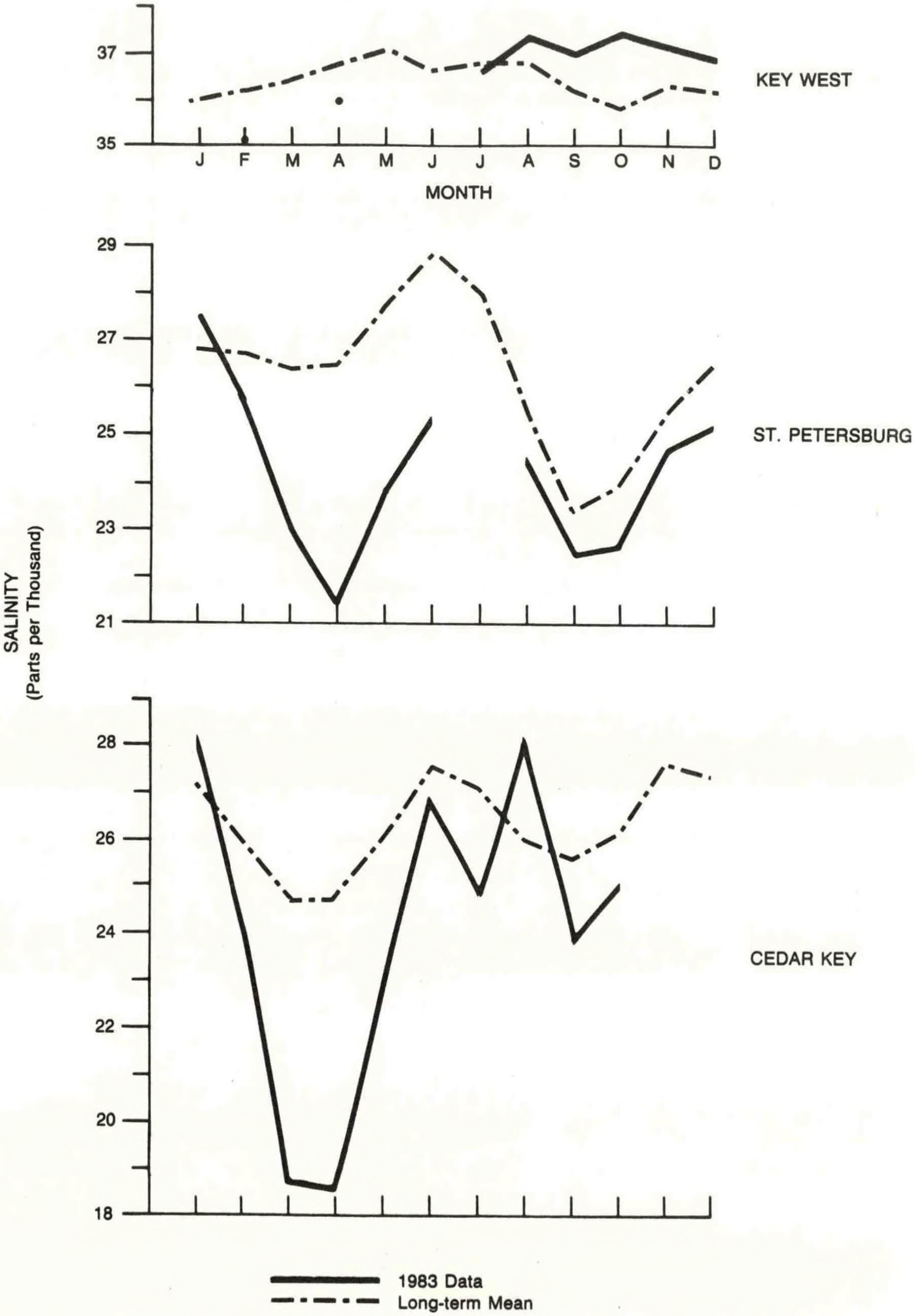

Figure 3-5.--Mean monthly surface salinity, selected stations, Gulf of Mexico, 1983.

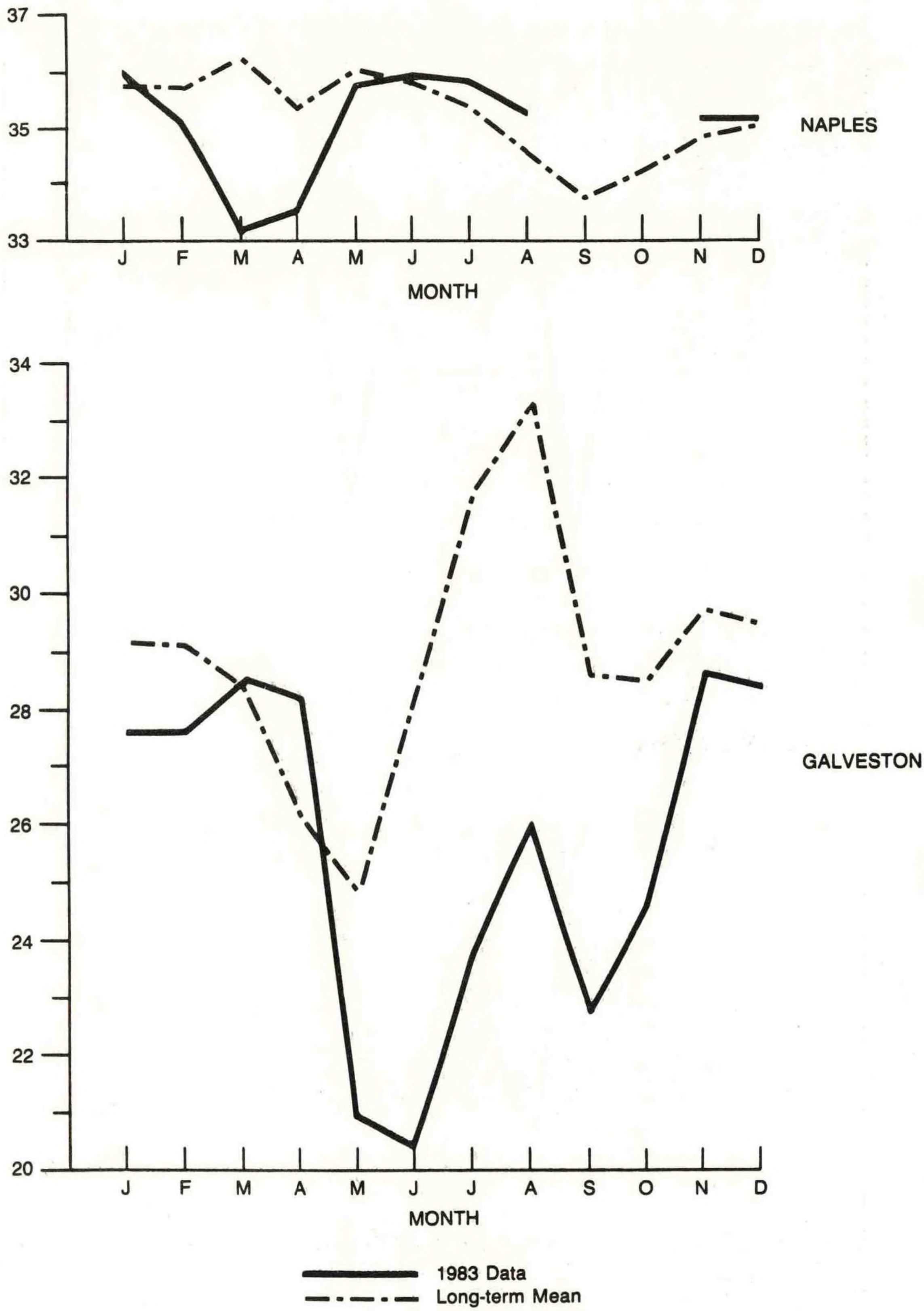

Figure 3-5 (Continued).--Mean monthly surface salinity, selected stations, Gulf of Mexico, 1983.

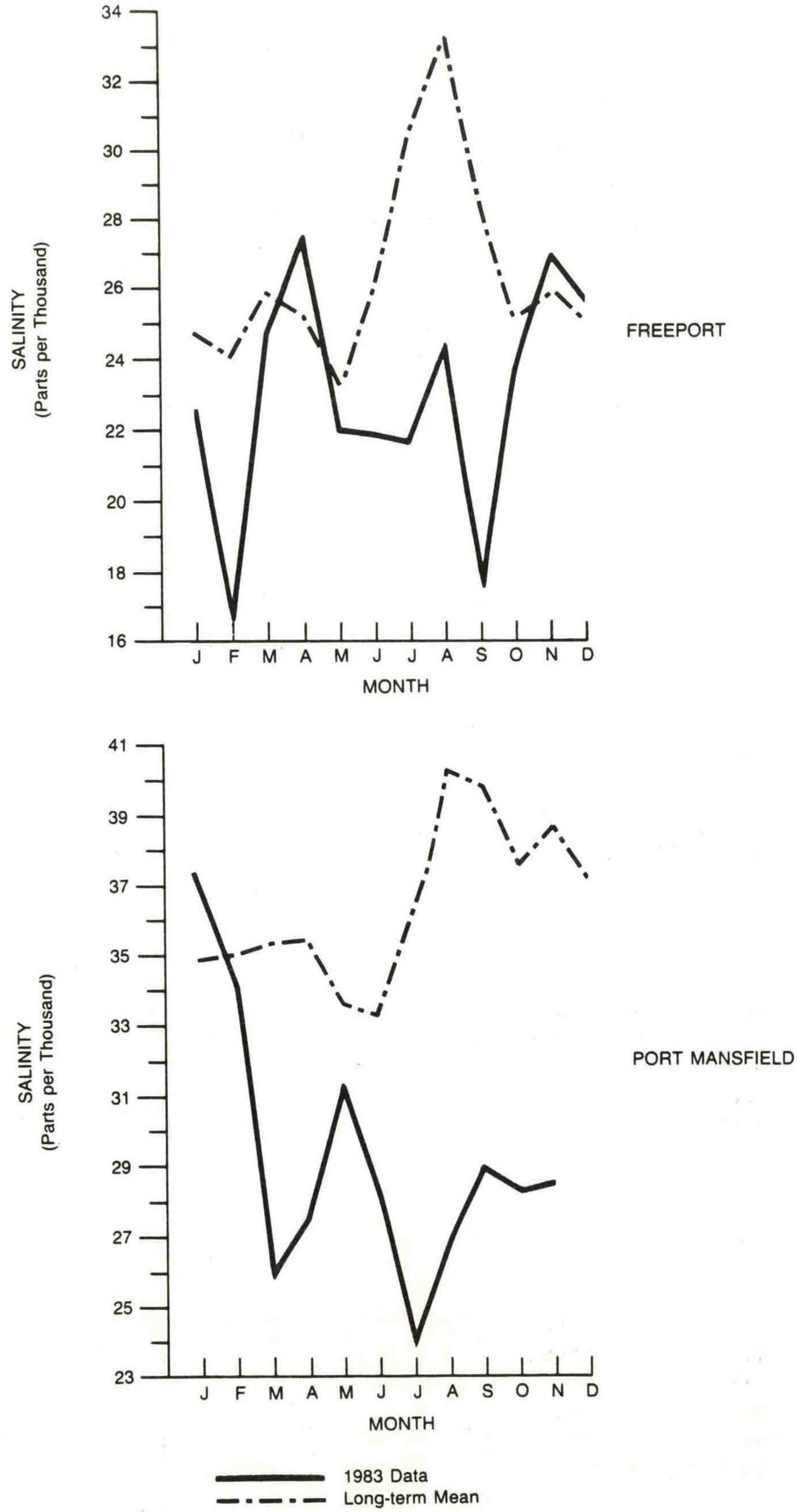

Figure 3-5 (Continued).--Mean monthly surface salinity, selected stations, Gulf of Mexico, 1983.

through December. This rainfall could explain the reductions in surface salinities measured in January and February and the summer months (June - September). March saw a return to the normal monthly mean surface salinity. Sharply reduced precipitation at Galveston could explain the increase in observed salinities for April. The June through August reduction in surface salinities could be a combination of increased local rainfall and reduced longshore transport from the southwest Texas coastal region. The wind-induced transport was more onshore than normal for the period of June through August. The expected longshore transport of higher salinity waters from the southern Texas area of the shelf did not occur. The sharp increase in salinities measured in October indicated the beginning of a return to the normal monthly salinity patterns. November and December saw near normal conditions prevail.

Monthly surface salinities for Cedar Key were available only for the period January through October, 1983. The months of February through May showed the greatest departure from normal conditions for the year. Large positive departures from monthly mean precipitation for the months of February through May, 1983, resulted in above normal streamflow in the Suwannee River which could account for some of these low salinity measurements. The remainder of the year was nearly normal.

St. Petersburg, FL, had the same surface salinity pattern for the months of February through June as did the Cedar Key station. Large departures from mean monthly rainfall and the resulting streamflow for the months of February through June may explain the salinity pattern. August through December showed insignificant differences between the mean and the observed pattern.

The reduction in surface salinities observed in the previous two Florida NOS stations in the months of February through May also occurred at Naples. Rainfall data from Fort Myers tends to confirm that these three NOS sites experienced rainfall-induced reductions in surface salinities for these months. The remainder of the year showed that near-normal conditions prevailed for this site. (September and October data were not available).

Key West's limited data (eight months, only) showed that July through December had near normal conditions. Excessive rainfall occurred at this location for the months of January through April. However, the Loop Current and deep water oceanic conditions dominate the surface salinity field and little variation in the monthly mean is expected throughout the year.

Temperature

Water temperatures at the National Ocean Service Gulf stations followed the long-term seasonal pattern. The departures from normal followed the local air temperatures with March and April cooler than normal and November warmer than normal. The wintertime minimum temperatures occurred in January. With increasing solar insolation, warming began in February and quickly accelerated in the April-May time frame. The temperature increased more slowly during June and July reaching the yearly maximum in July or August. Cooling began in September and accelerated during October and November. In December the cooling slowed as the minimum yearly temperature was approached. Since cold continental

Table 3-6.--Monthly long-term average surface water temperature and departure from normal, selected stations, Gulf of Mexico, 1983.

A. Monthly long-term average (Degrees C)

	Month												Annual
Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
Key West	21.7	22.1	23.7	25.8	27.9	29.6	30.4	30.6	29.7	27.6	24.4	22.3	26.3
Naples	18.1	18.1	19.9	24.8	27.5	29.8	30.7	30.6	29.4	27.6	22.2	19.9	24.9
St. Petersburg	16.7	17.6	19.7	23.1	26.4	28.8	29.7	29.7	28.7	25.4	21.0	17.6	23.7
Cedar Key	14.4	15.7	18.4	22.9	26.4	29.1	29.8	29.8	28.3	24.2	19.0	15.4	22.8
Galveston	11.9	12.8	15.7	21.4	25.4	28.3	29.7	30.0	28.3	24.4	19.3	14.9	21.8
Freeport Harbor	11.9	13.5	16.2	21.4	25.1	27.7	28.7	29.3	27.9	23.8	18.9	14.9	21.6
Port Mansfield	14.6	16.1	18.6	23.8	26.1	28.3	29.2	29.2	28.3	24.6	20.7	16.7	23.0

B. Departure from normal, 1983 (Degrees C)

	Month											
Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Key West	*	-1.0	*	-1.6	*	*	0.0	0.6	0.0	0.9	0.8	1.9
Naples	0.7	1.1	0.4	-1.3	-0.9	-0.1	0.1	0.6	*	*	1.5	1.8
St. Petersburg	0.3	-0.9	-1.2	-1.8	-0.8	-0.3	*	0.4	-0.3	1.2	1.1	0.8
Cedar Key	0.2	-0.6	-1.6	-1.2	0.8	0.4	0.8	1.4	-1.1	1.6	0.1	2.0
Galveston	1.2	0.3	0.7	-3.6	-1.6	0.0	-0.5	-0.7	-0.9	0.9	2.1	0.1
Freeport Harbor	0.7	0.8	0.4	-1.9	-0.7	0.4	0.4	0.2	-0.8	0.9	2.4	-1.8
Port Mansfield	-0.9	-0.2	0.6	-2.4	-1.1	0.1	-0.2	0.7	-0.4	0.8	1.3	**

* Data reported unavailable by the National Ocean Service.

** Insufficient number of days of data to generate a monthly mean.

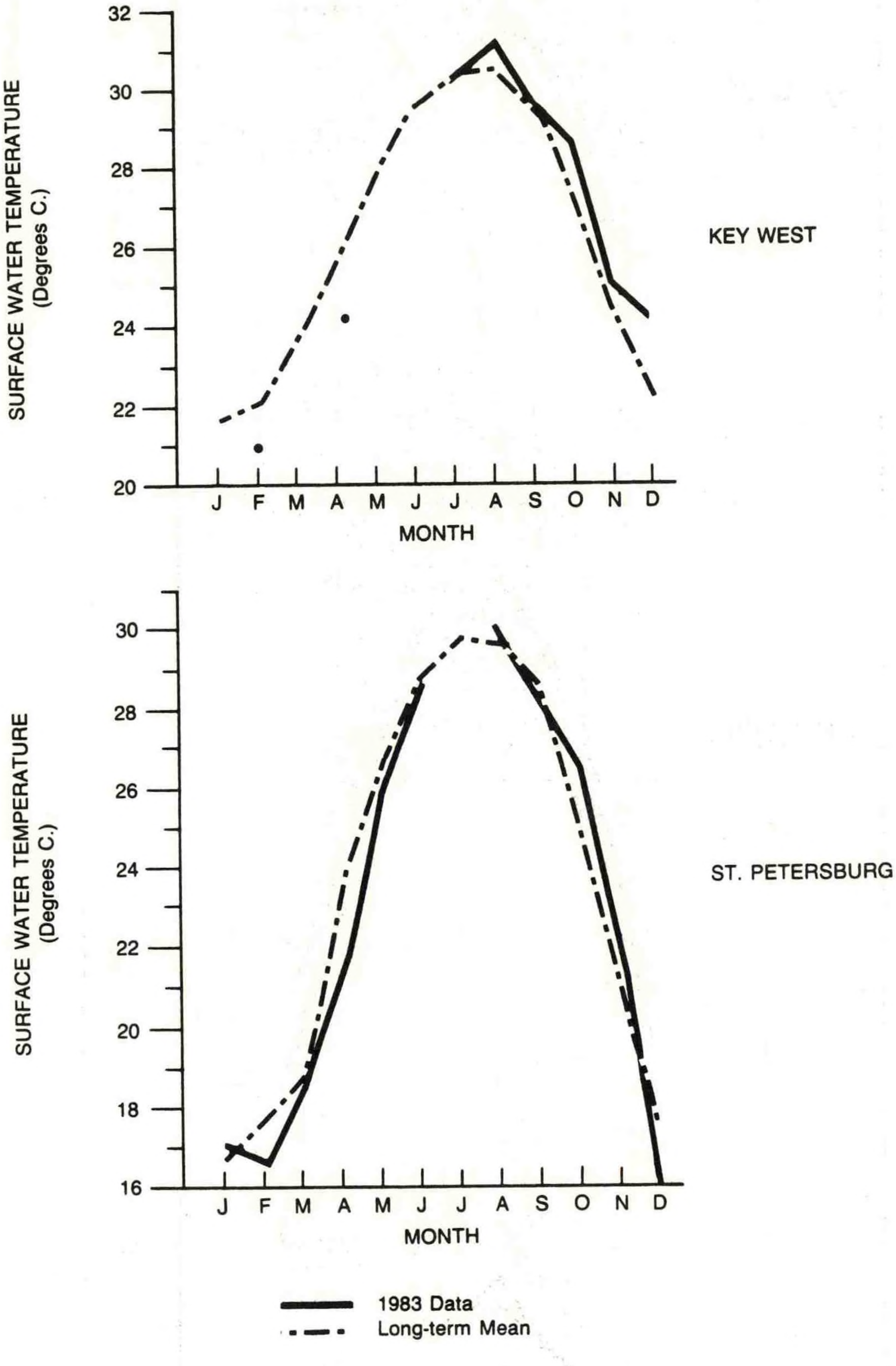

Figure 3-6.--Mean monthly surface water temperature, selected stations, Gulf of Mexico, 1983.

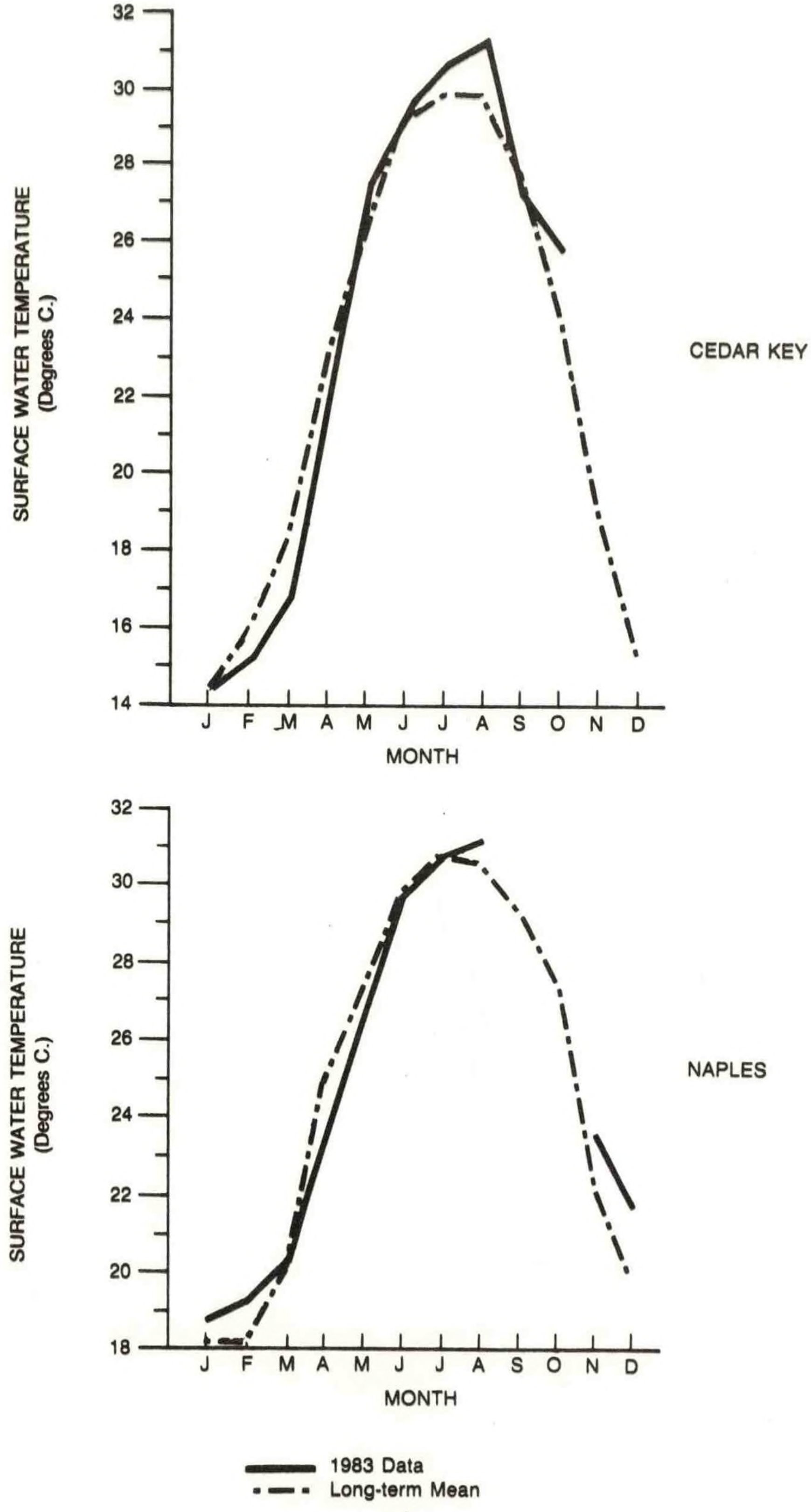

Figure 3-6 (Continued).--Mean monthly surface water temperature, selected stations, Gulf of Mexico, 1983.

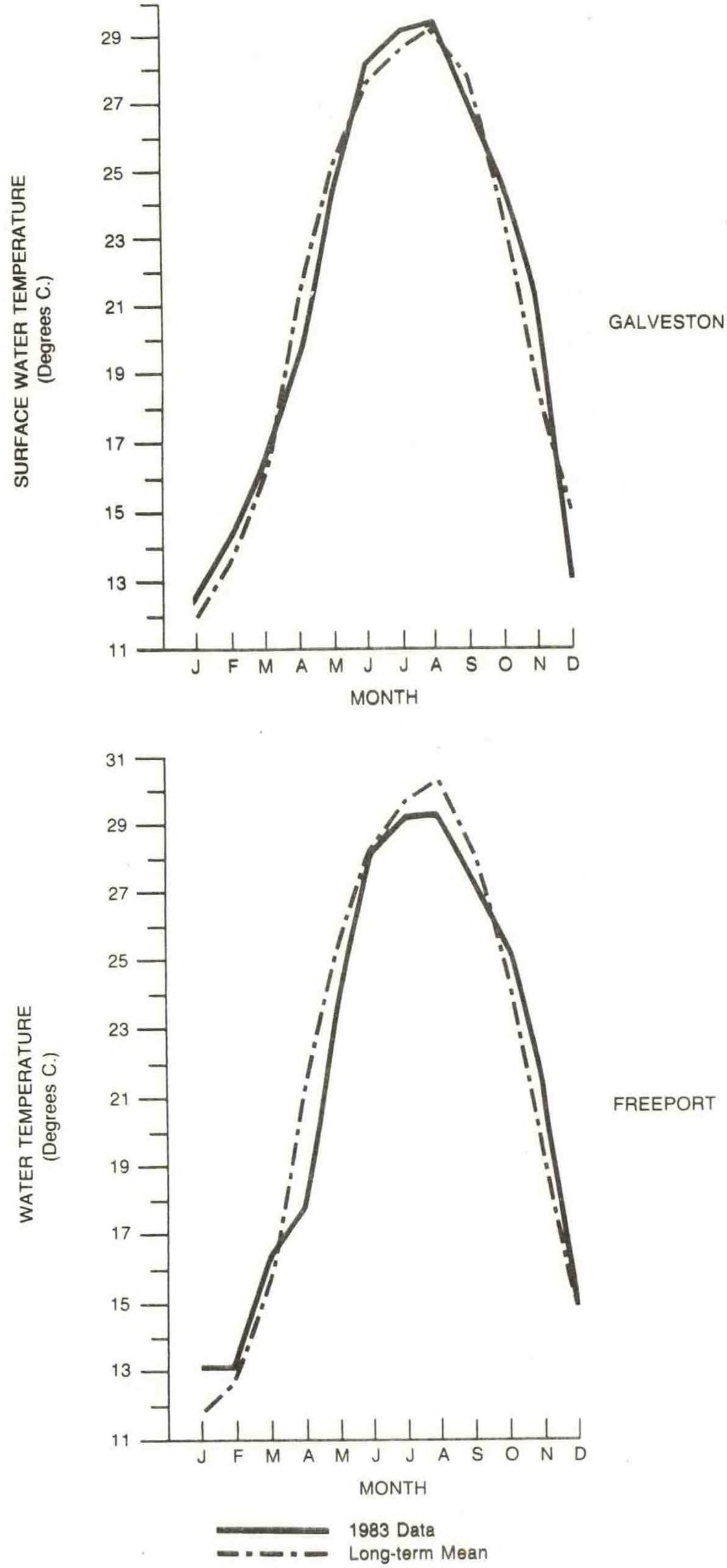

Figure 3-6 (Continued).--Mean monthly surface water temperature, selected stations, Gulf of Mexico, 1983.

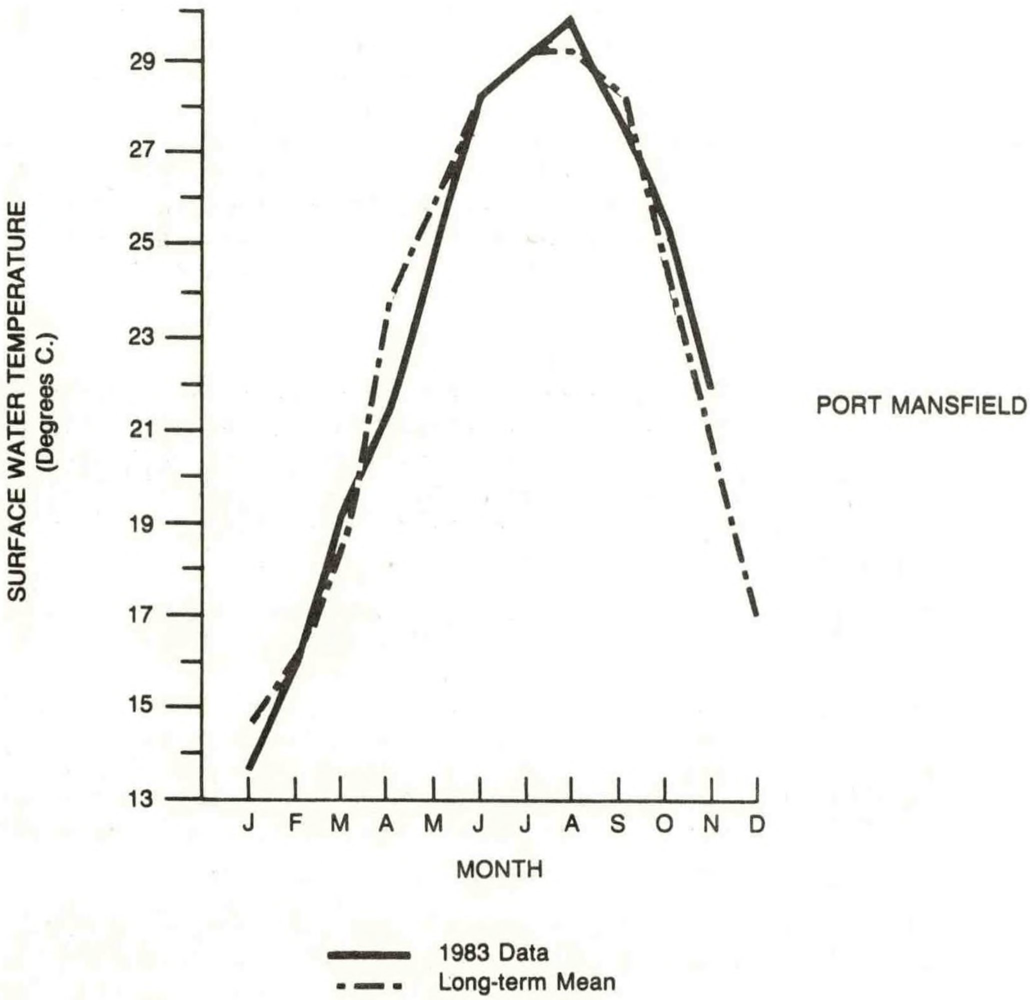

Figure 3-6 (Continued).--Mean monthly surface water temperature, selected stations, Gulf of Mexico, 1983.

air masses passed more frequently through the western Gulf than the eastern Gulf, the wintertime minimum temperatures at the western Gulf stations were lower than those measured at the eastern Gulf sites. The eastern Gulf temperatures were also modified by the Loop Current, which acted as a heat source. The summertime maximum temperatures reached were uniform at the NOS stations sampled.

3.7 Wind-Induced Mass Transport

The Assessment and Information Services Center has computed wind-driven mass transport estimates based upon the National Weather Service Limited Fine Mesh (LFM) - II dataset. The transport values are not intended as a measure of the absolute magnitudes of the transport, but as relative magnitudes and directions of transport.

Figure 3-7 shows the mean monthly transports computed for 1983 and for the six-year period 1977-1982. The units are expressed as cubic meters per second per meter of baseline length normal to the wind vector to be comparable to previous similar computations in the literature.

Regional Patterns of Wind-Induced Transport, 1983

The Gulf wind-induced circulation is divided geographically into five areas for this discussion: west coast of Florida, northeast Gulf, northwest Gulf, southeast Texas coast, and Mexican coast. The following discussion will address the regional transport picture for 1983 then will examine monthly patterns relative to 1977-82 averages.

Since only data from June 1982 through the present were available for Campeche Bay and the Caribbean, means were not computed and no comparisons of the 1983 data were made.

Along the west coast of Florida offshore flow dominated wind-induced mass transports for the months of January and February and September through December. March showed a reversal of flow direction to an onshore flow with its magnitude decreasing as it moved northward up the coast. Longshore mass transport to the north was the predominant feature in the April through June period, while northwesterly (more offshore) flow was evident in July for the southern portion of Florida. Offshore transport dominated in the north. August had a return to the longshore transport to the north. Progressing up the coast, the offshore component of the flow increased in magnitude.

Westerly (longshore) flow with a slight offshore component dominated the months of January and February in the northeast Gulf. March experienced a markedly offshore (south-southwesterly) monthly mean flow. Onshore flow with a slight easterly longshore component was evident for April. For May and June this onshore flow continued in a north-northwesterly direction. The months of July and August showed westerly wind-induced mass transport with reduced onshore components. Increasing westerly mass transports categorized the September through November time period. December showed a return to the westerly longshore flow with slight offshore components.

In the northwest Gulf of Mexico longshore flow to the west-southwest or the southwest dominated the January through March period. Compared to January and February, the March wind-induced mass transport showed a reduction in magnitude. April through November displayed an onshore (north-northwest to west-northwest) flow regime. A return to the wintertime longshore west-southwest flow was evident in December.

Wind-induced mass transports were longshore to the south-southwest during January and February on the southwest Texas coast. March showed relatively insignificant net mass transports. North-northwest flow was evident from April through June with May having the largest magnitudes. In July, more northerly flow developed with increasing northwesterly flow as one progresses up the Texas coast. The slightly northeasterly flow off the south Texas coast seen in July continued to developed in August, while the north Texas coast experienced slight northwesterly flows. September saw a return to the northwesterly flows over the entire region. Westerly flows shifting to the south-southwest occurred in October as one moved south along the Texas coast. No mass transport was evident again in November for the northern portion of the region, while northeasterly transports were evident in the southern portion. December saw the return to wintertime conditions, with large south-southwesterly flows during the month.

Along Mexico's coastline south and west into Campeche Bay, cyclonic veering of the mass transport vectors was observed during January. Southerly flow dominated the northern coastal region. The pattern changed to west-southwesterly flows in Campeche Bay. February flow directions were similar to January's, but with a marked reduction in the magnitude. Slight northerly flows in the north veering to west-southwest flows in Campeche Bay are observed in March. North-northwesterly flows dominated the entire region during April and May. The Mexican coastal region experienced a northerly mass transport in June with westerly flows in the southern portion of Campeche Bay veering to northwesterly as one progresses northward over the central and eastern portions of the Bay. In July, offshore flows (northeasterly) were observed near the Mexican coast, while the same pattern as June was seen in Campeche Bay. August showed patterns similar to July, but with the Mexican coastal regions showing increasingly offshore-directed mass transports. September appeared to be a continuation of August, except for the reduction in magnitude of the offshore flow near the coast of Mexico. Cyclonic circulation again appeared over the entire region in October with southerly to east-southeasterly flows along the Mexico coast and westerly to west-southwesterly flows in central Campeche Bay. Offshore flows along the Mexico coast were reestablished in November, and north-northwesterly flows predominated elsewhere in Campeche Bay. December saw a return to the cyclonic type wind-induced mass transport within the Mexican coastal areas and Campeche Bay.

Comparison of 1983 With 1977-1982 Mean Transport

The 1983 monthly mass transport fields for January and February did not show the uniform west to northwest wind-induced transport depicted by the 1977-1982 statistics.

In January the eastern Gulf of Mexico had vector mass transport directions similar to the six year mean, but the magnitudes were greater than the mean.

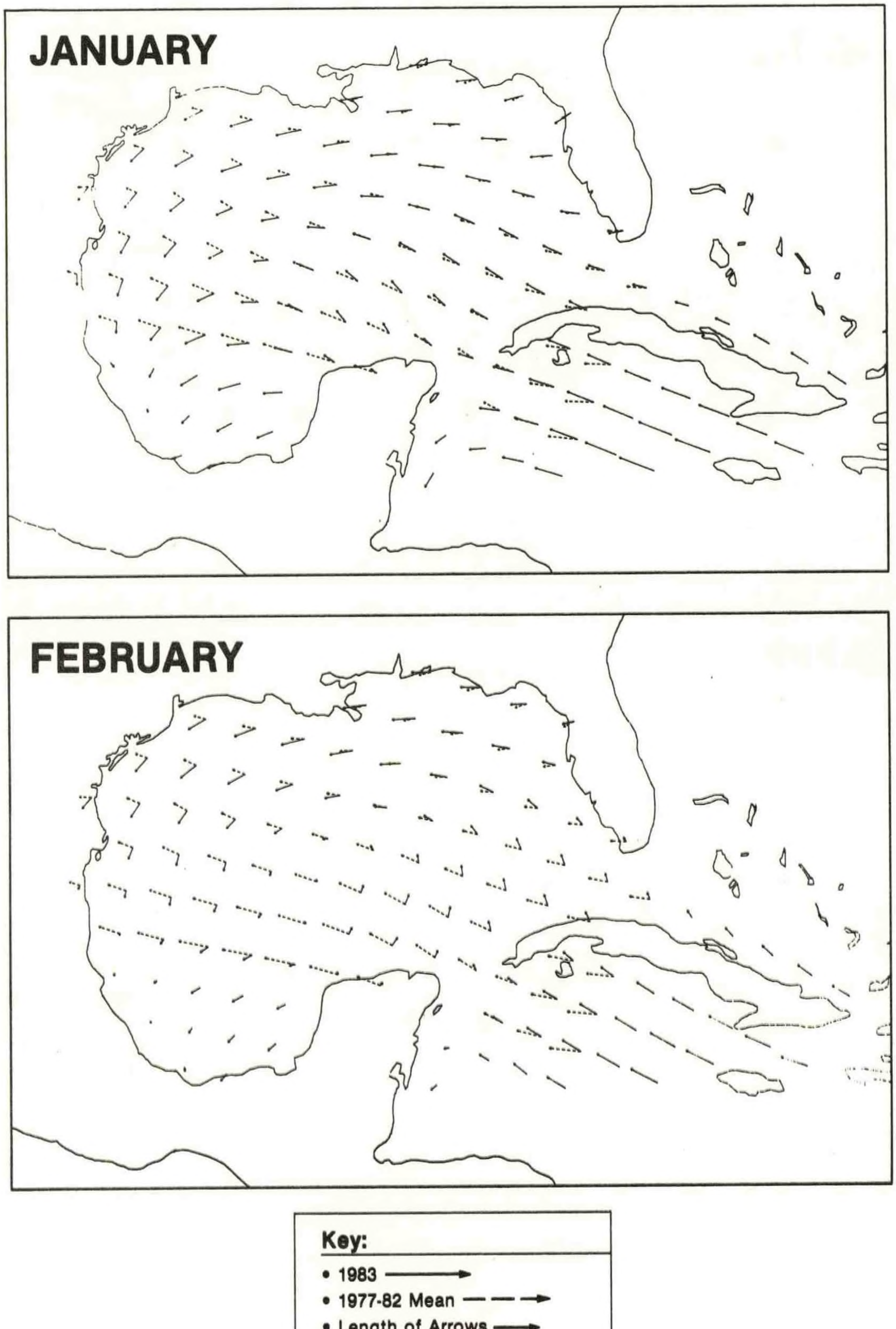

Figure 3-7.--Mean monthly mass transport, 1983, and 1977-82.

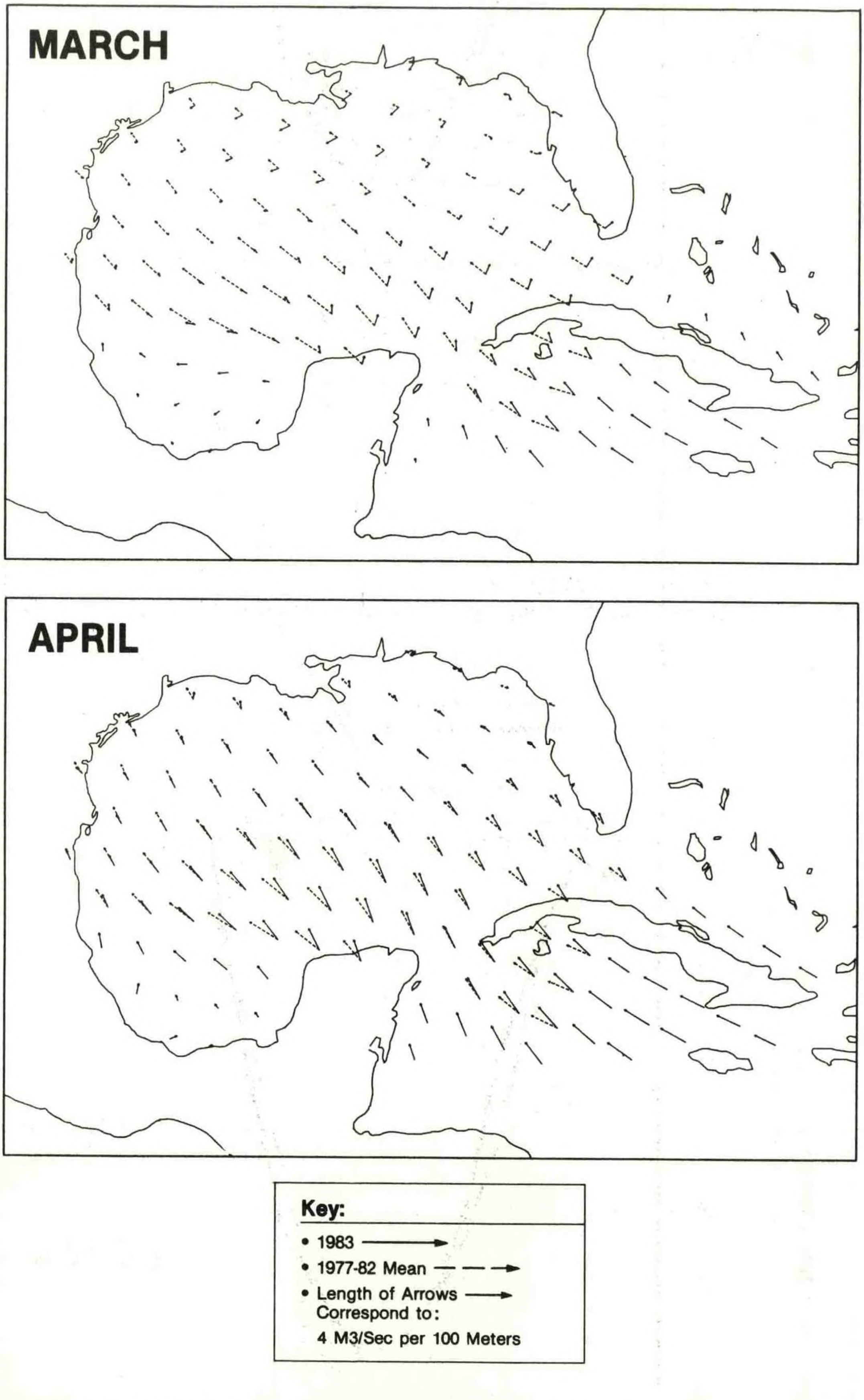

Figure 3-7 (Continued).--Mean monthly mass transport, 1983, and 1977-82.

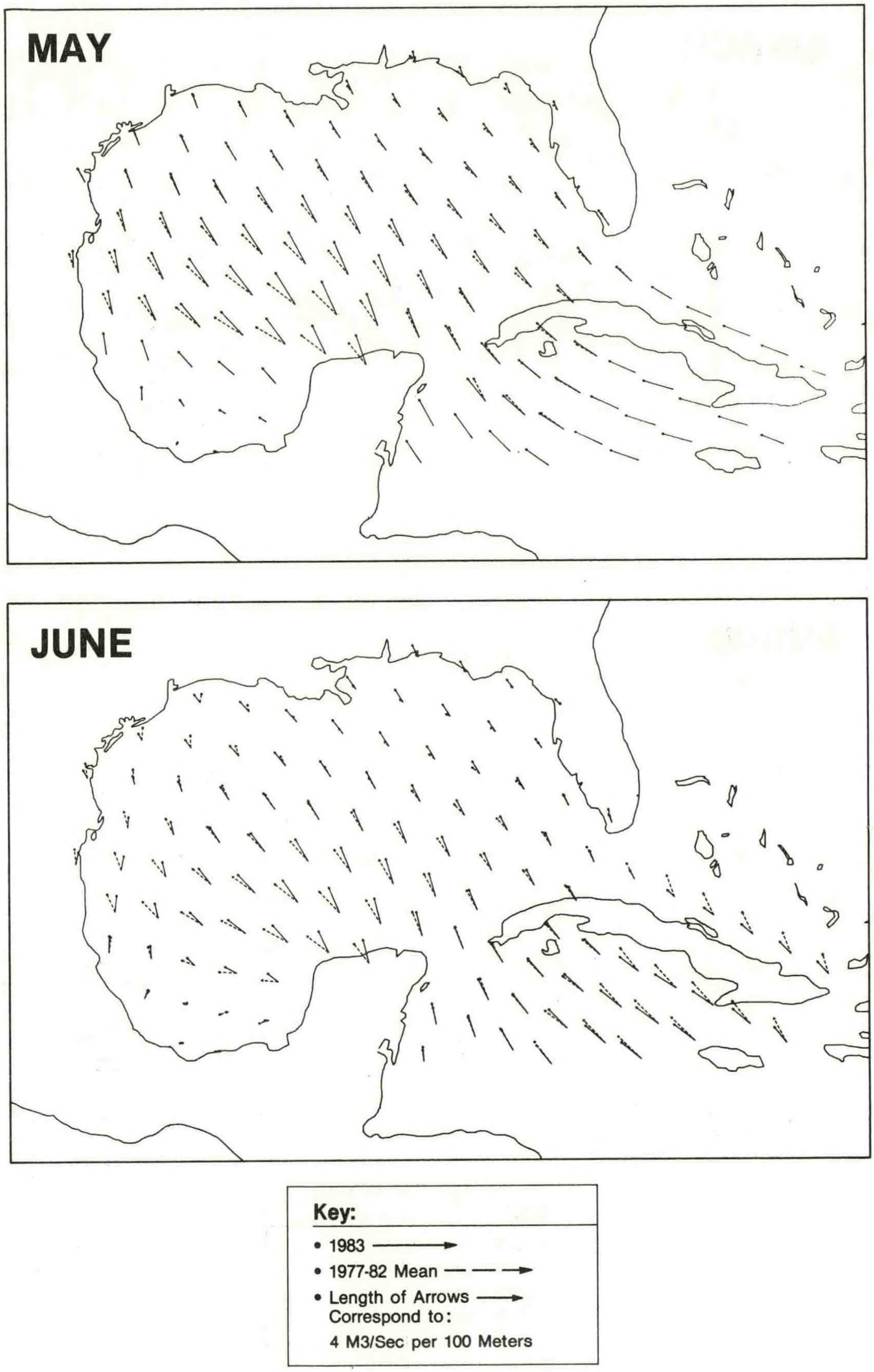

Figure 3-7 (Continued).--Mean monthly mass transport, 1983, and 1977-82.

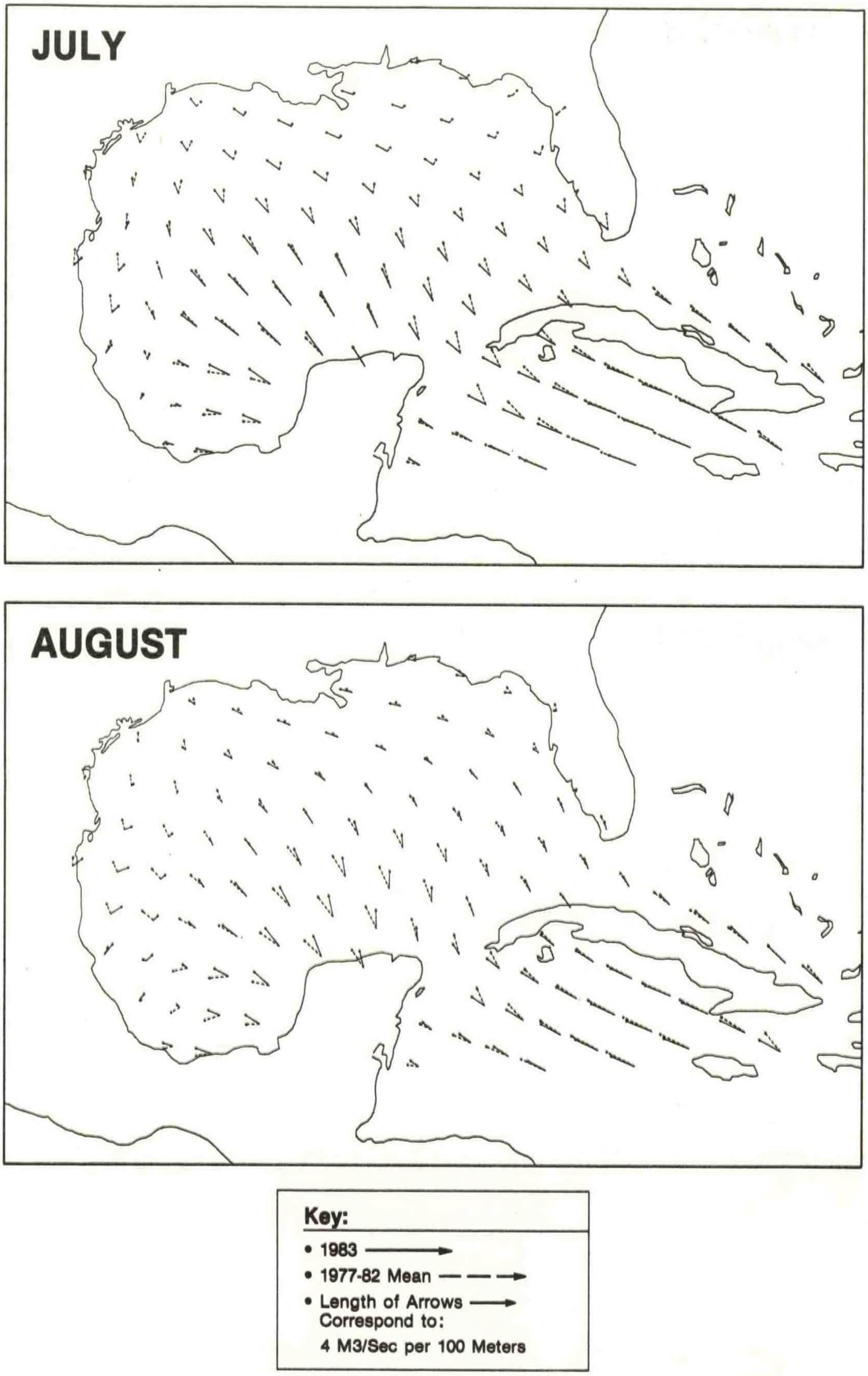

Figure 3-7 (Continued).--Mean monthly mass transport, 1983, and 1977-82.

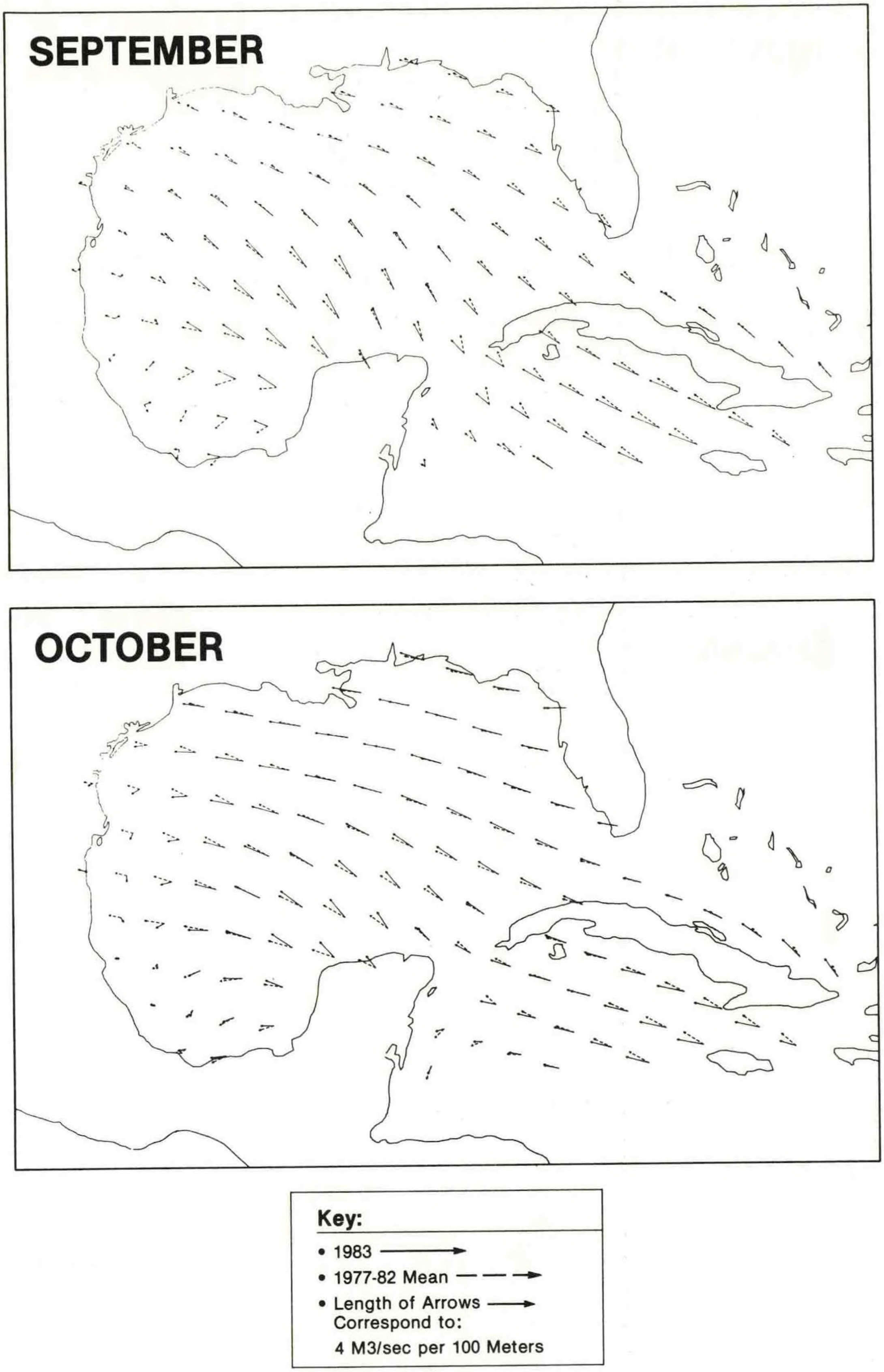

Figure 3-7 (Continued).--Mean monthly mass transport, 1983, and 1977-82.

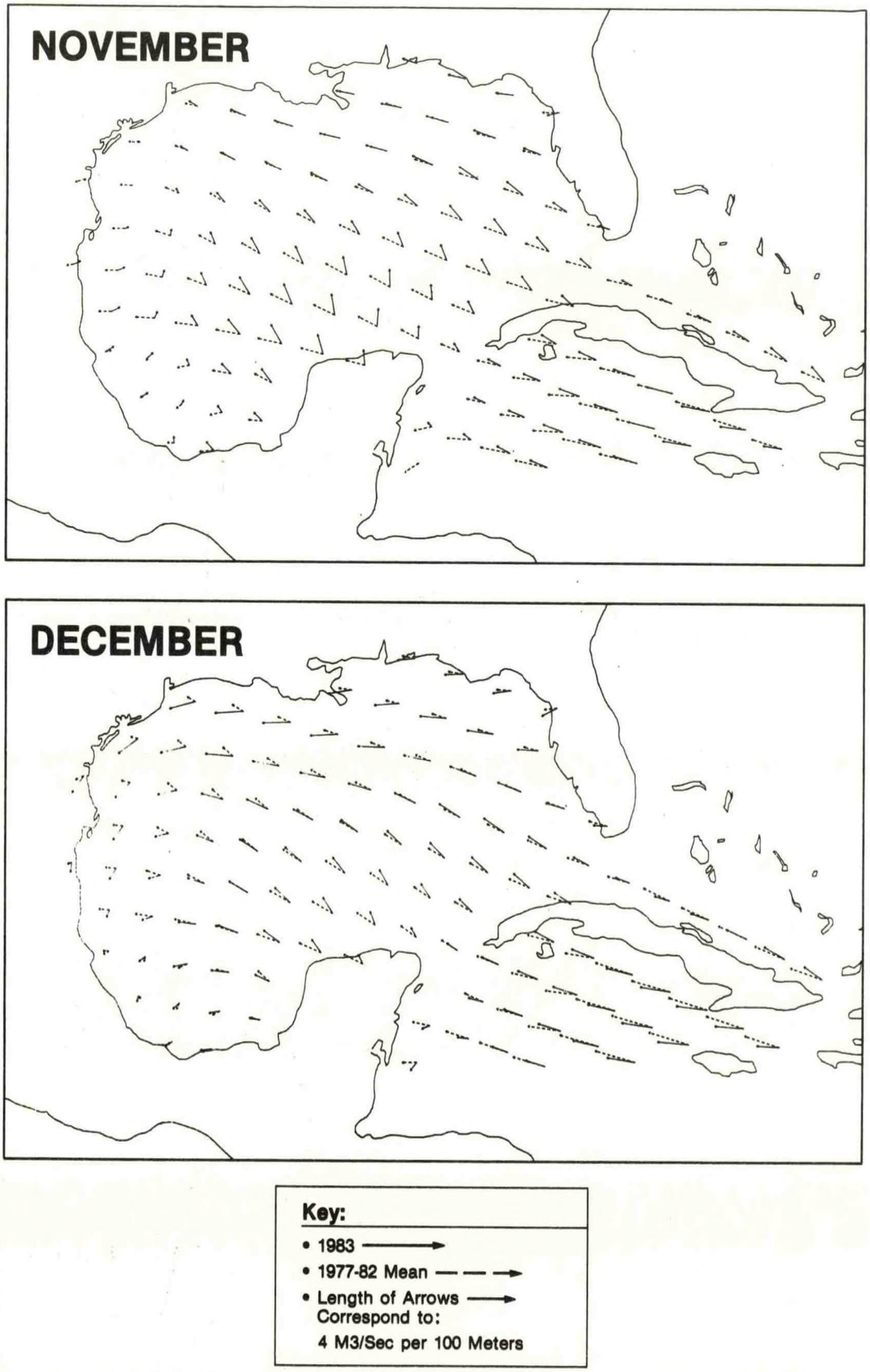

Figure 3-7 (Continued).--Mean monthly mass transport, 1983, and 1977-82.

The western Gulf mass transports had larger southerly components than normal. This southerly transport increased in magnitude progressing westward toward the Texas and Mexican coastline.

In February the Gulf was dominated by a cyclonic wind-induced mass transport circulation pattern with the low centered to the south of the South Pass of the Mississippi River. An increase in the northerly component of the mass transport vectors in the eastern Gulf progressing from the Florida - Louisiana coastal region south to Cuba and Yucatan was evident. The magnitude of the transport also decreased from north to south. The western Gulf had a westerly to southwesterly dominant flow direction, not the expected westerly-northwesterly direction.

March presented a pattern of 90 degree rotations to the north, i.e., onshore transport for the Florida Shelf region, instead of northwesterly transport. Little net transport was calculated by the model for the central portion of the Gulf westward to the Texas-Mexican coastline. Southwesterly flow, compared to the expected northwesterly flow, along the entire northern Gulf was evident. Two high pressure cells appeared to be present in the Gulf: one high pressure cell dominated the Apalachicola to Yucatan region, and the other cell, centered over the continental U.S., drove the northern Gulf flow. The small net transports resulted from the periodic north-south shifting of these cells.

April and May showed a return to the normal wind-induced mass transport pattern of northwesterly to north-northwesterly flow over the entire Gulf.

June continued to follow the normal uniform northwesterly mass transport pattern except in two areas: in the northeastern Gulf onshore mass transport increased, and northerly longshore, not northeasterly onshore, flow occurred off the Mexican coast.

July net transports differed from normal with offshore, instead of onshore, flow along the Gulf coast of Florida and westerly, instead of northeasterly, transport in the northeastern Gulf. The normal July reversal in wind-induced flow along the northeastern Gulf did not occur in 1983. Onshore (northwesterly) transport occurred along the northwestern Gulf. As in the 1977-82 mean, northerly longshore transport occurred along the south Texas coast. The northeasterly (offshore) flow along the Mexican coast was in contrast to the normal northerly flow.

In August the eastern Gulf followed the normal pattern, except south of the Florida panhandle, which showed reduced onshore transport and increased longshore west-northwest transport. The northwestern Gulf had increased westerly components to the mass transport vectors compared to the mean. The Texas coast had very reduced onshore transport in the north and increased offshore transport in the south. The central Gulf transports were not significantly different from the mean.

The net transport patterns of September and October were similar to the mean throughout the Gulf, except near the Texas-Mexico border. In September this region had reduced transport which was onshore shifting to offshore, while October was characterized by reduced onshore transport, but with augmented southwesterly flow.

From the northwestern Gulf eastward through the Florida coastal regions November mass transports were similar to the mean. The Texas coastal region showed no net mass transport for the month in contrast to the expected westerly onshore flow. Throughout the central Gulf more northerly mass transport vectors were evident compared to the expected northwesterly flow of the mean.

In December, 1983, mass transport vectors near Florida resembled the mean values, while the northeastern Gulf showed a slight increase in the westerly longshore flow. In the northwestern Gulf large increases in the downcoast (west-southwest) transport were evident. These increases in downcoast flow reduced the onshore transport normally observed for this month. Large downcoast transports with slight onshore components occurred along the Texas coast in contrast to the small onshore flow of the 1977-82 mean. The December central Gulf data resembled the six year mean.

3.8 Loop Current Activities

The circulation in the Eastern Gulf of Mexico is dominated by the Loop Current. This current is a continuation of the Caribbean Current which enters the Gulf between the Yucatan Peninsula and Cuba (Figure 3-8). The following discussion of the 1983 monthly pattern of the Loop Current and warm core eddies within the Gulf of Mexico was derived from the Oceanographic Monthly Summary published by NOAA/NWS/NESDIS. Figure 3-9 is a series of line drawings of the monthly northern limit of the Loop Current.

The Loop Current appears to follow a seasonal pattern. Its intrusion begins in late winter or early spring and reaches its northern limit in summer. In late summer or early fall it broadens, and an anticyclonic (warm core) eddy detaches from it. Later in the fall or in early winter the Loop Current regresses to its southern limit, exits the Gulf via the Florida Straits, and becomes part of the Gulf Stream.

The seasonal variation of the maximum intrusion of the Loop Current and the eddies and filaments which are produced by this current dominates the circulation in the eastern Gulf of Mexico and Florida Shelf. The eddies which become detached from the Loop Current slowly migrate westward into the western Gulf. Their fate is in doubt and under investigation. One scenario is that this eddy continues its westward movement and then impinges off the Mexican coast where it slowly decays. Two other eddy-like features are observed in the western Gulf. An anticyclonic eddy-like feature has been observed south of Galveston, TX, as well as a cyclonic eddy-like feature in Campeche Bay.

In January, two eddies were present in the western Gulf, and a third one (designated as eddy g), which recently detached from the Loop current, was located in the eastern Gulf. The spring time intrusion of the Loop current appeared to start this month with a 1/2 degree increase in its northern extreme location.

February showed a partial reabsorption of eddy g by the Loop current. This resulted in a 2 degree increase in the northern limit of the Loop current. A reduced eddy g moving northwestward was again observed by the end of the month.

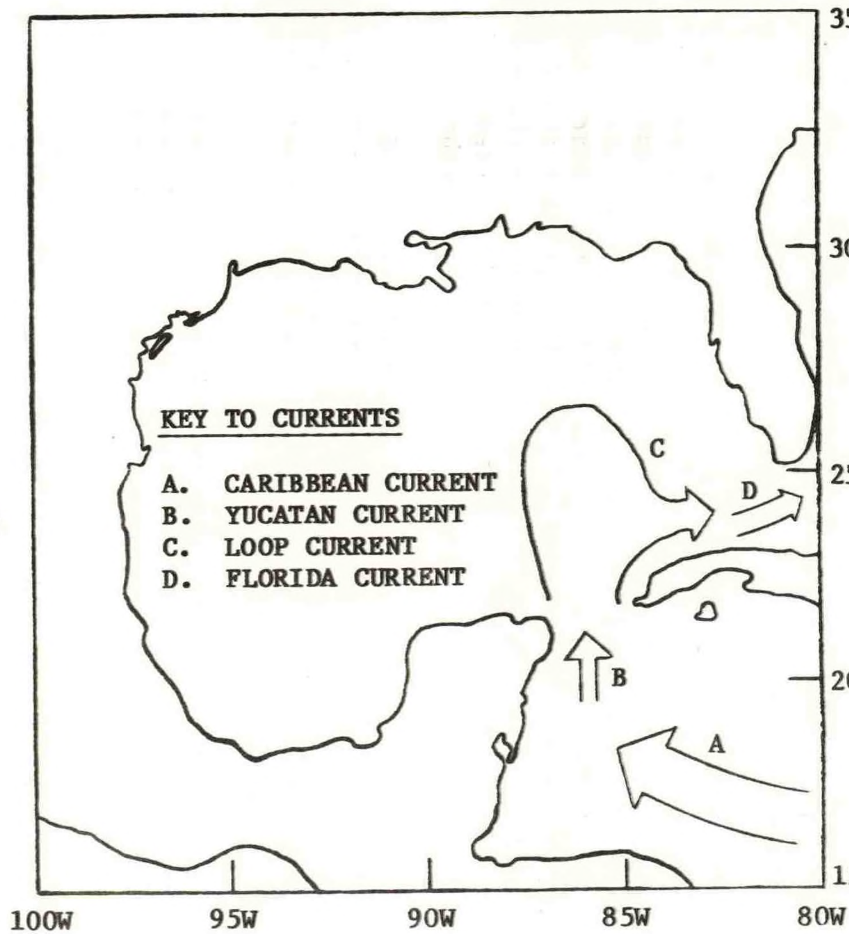

Figure 3-8.--Schematic of major density-driven mass transport in the Gulf of Mexico.

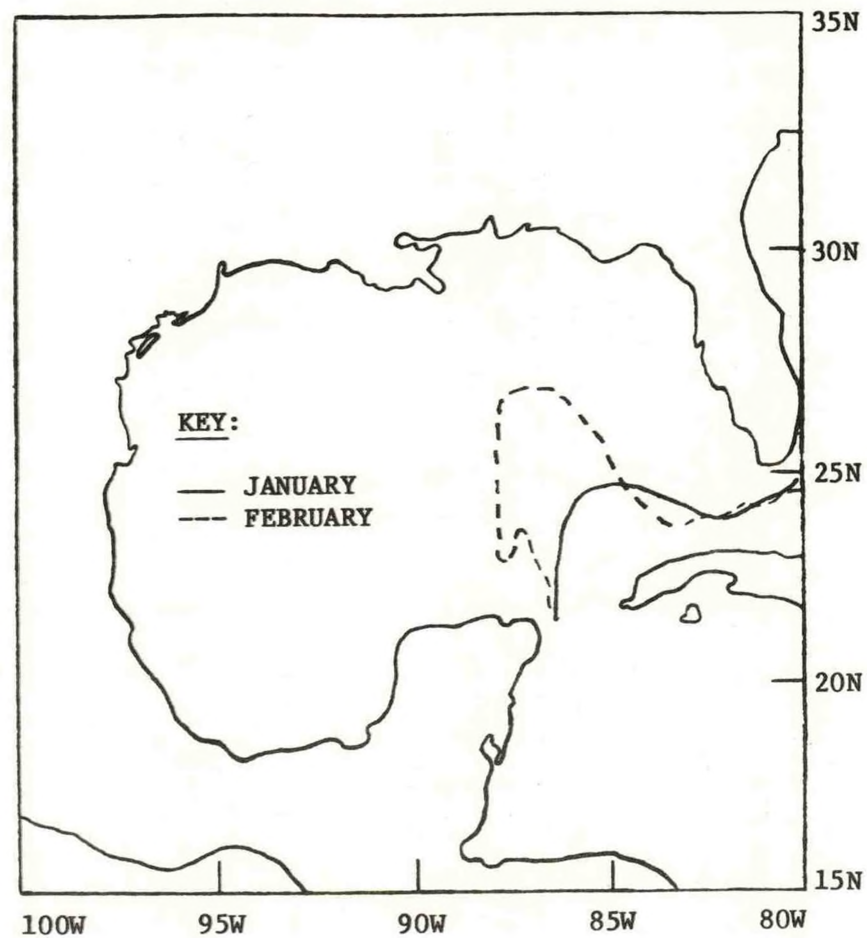

Figure 3-9.--Northern extent of the Loop Current. Figure drawn from material in Oceanographic Monthly Summary: January and February, 1983.

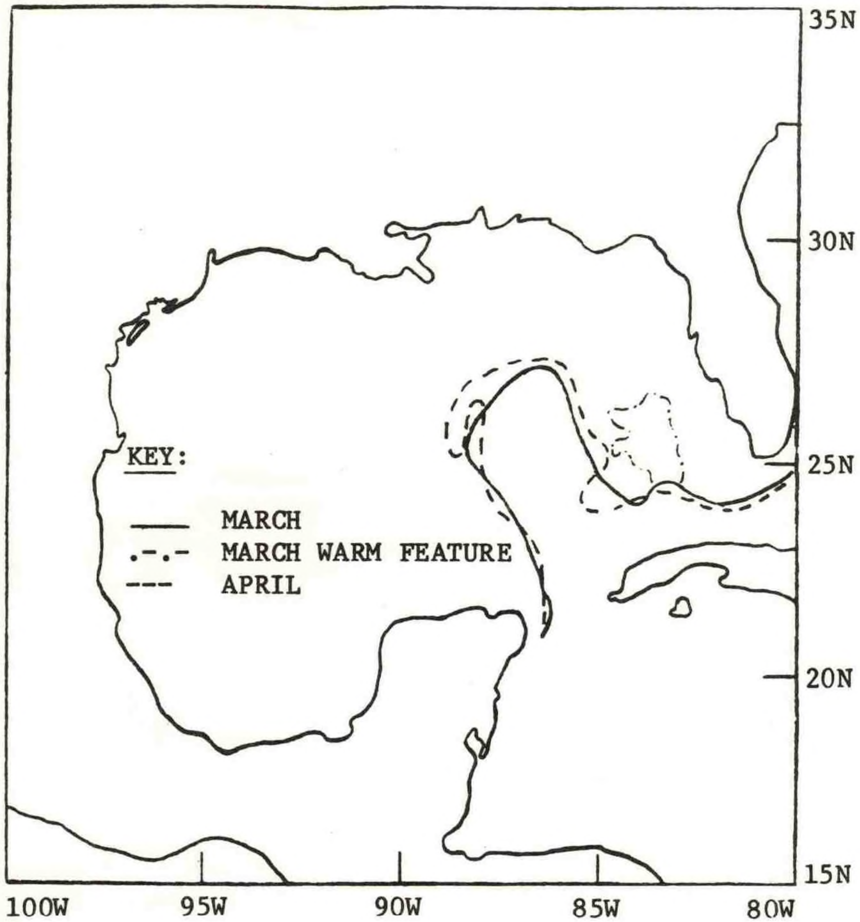

Figure 3-9.--(Continued). Northern extent of the Loop Current. Figure drawn from material in <u>Oceanographic Monthly Summary</u>, March and April, 1983.

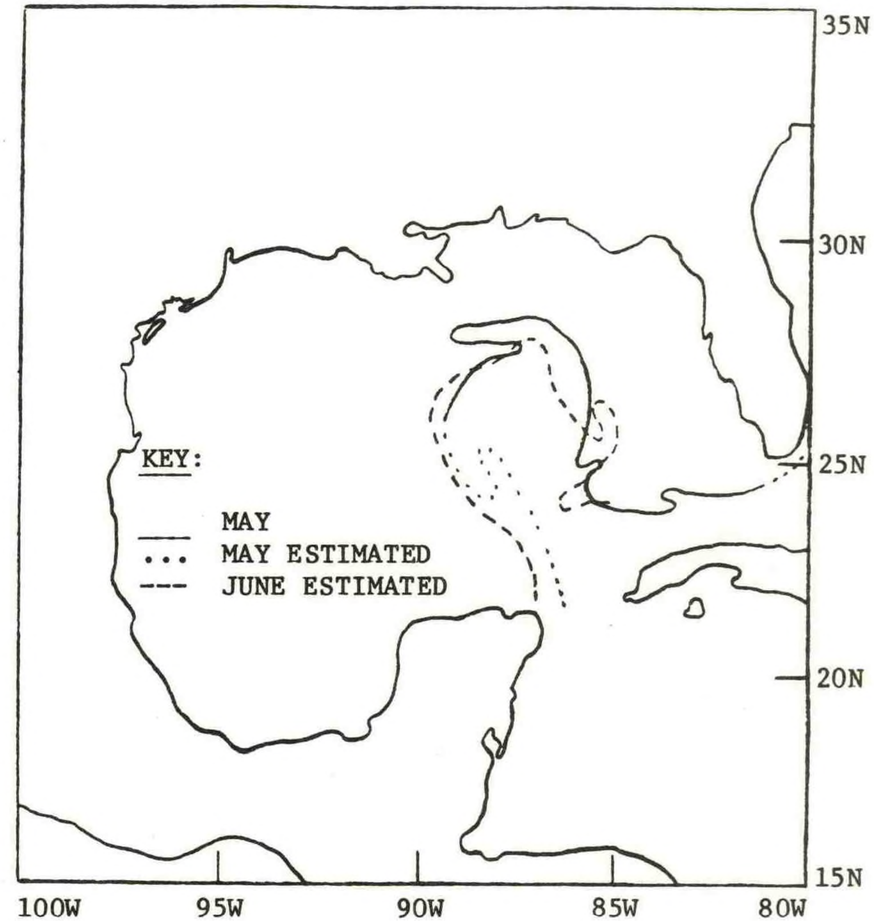

Figure 3-9.--(Continued). Northern extent of the Loop Current. Figure drawn from material in <u>Oceanographic Monthly Summary</u>, May and June, 1983.

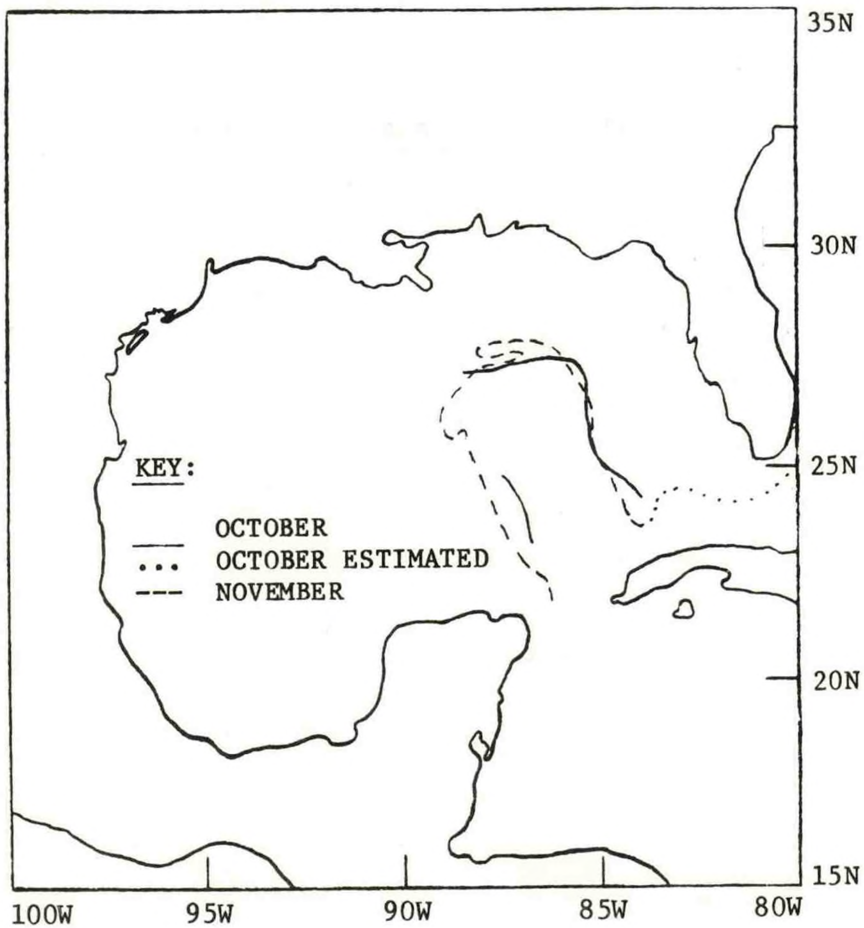

Figure 3-9.--(Continued). Northern extent of the Loop Current. Figure drawn from material in Oceanographic Monthly Summary, October and November, 1983.

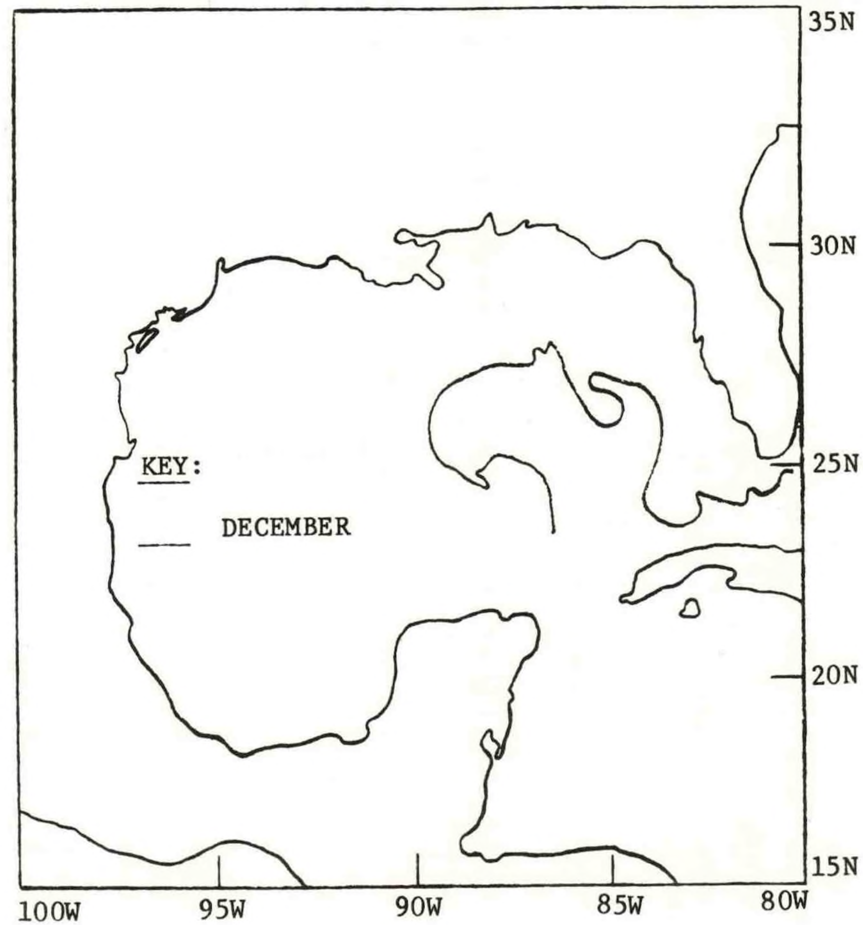

Figure 3-9.--(Continued). Northern extent of the Loop Current. Figure drawn from material in Oceanographic Monthly Summary, December, 1983.

The Loop current northern limit did not change in March, but a warm feature was observed on the Southern Florida Shelf. Eddy g continued its westward movement.

April saw a small increase in the northern limit of the Loop current. Eddy g continued a westerly translation.

The Loop current moved slightly northward by the end of May compared to April. Eddy g continued its movement into the western Gulf, but was last observed May 4.

The spring/summer heating of the surface waters makes the delineating of thermal features of the eddies and Loop current difficult.

June saw a continued slight increase of the northern limit of the Loop current. The summertime pinching of the Loop current for the generation of a warm core eddy is evident in the June 20 data processed by the Miami Satellite Field Service Station.

August's nearly isothermal surface structure prevented thermal delineation of eddy and Loop current frontal locations. NOAA Data Buoy Center deployed a drifting buoy into eddy g. The buoy showed that eddy g moved 225 km in a south-southwestern direction in August.

Since near-isothermal conditions prevent distinction of the Loop current and eddy structure from the surrounding Gulf water, eddy g apparently disappeared after moving 80 km in the west-southwestern direction during the September 1-20 time period.

Partial delineation of the Loop current occurred at the end of October with its northern limit at 27.5°N latitude and 86°W longitude.

A slight increase in the northern limit of the Loop current occurred in November.

December saw a new eddy detach and reattach to the Loop current without affecting the Loop's northern limit. An intrusion onto the Florida shelf and a broadening of the Loop in the westerly direction were observed.

3.9 Atmospheric Circulation - Water Mass Transport Comparison, 1982-83

The mean monthly mass transport in the Gulf in 1983 had several months with vectors considerably different from 1982 - January, February, March, November, and December. (See "Marine Environmental Assessment - Gulf of Mexico Annual Summary 1982.") Mass transport responds to the surface-wind flow which can be inferred from the monthly mean sea level pressure (slp) charts produced by the Long Range Prediction Group (NMC/NWS/NOAA).

The January, 1982, water transport was toward the northwest in the Gulf, while the January, 1983, transport showed a cyclonic turning toward the southwest. The slp for January, 1982, had a closed high-pressure cell over the southeast United States giving flow toward the northwest over the Gulf. The January, 1983, slp flow was more toward the west with an indication of southwest flow in the Bay of Campeche. The February, 1982, water transport showed an anticyclonic circulation with strong flow northwest of the Yucatan peninsula. The February, 1983, water transport was more anticyclonic, but weaker. The slp flow in February, 1982, gave good qualitative correspondence. In February, 1983, there was only a hint of the anticyclonic flow on the slp chart. The March, 1982, water transport showed large northwest vectors over the Gulf, compared to March, 1983, that had no net transport direction. The March, 1982, slp showed well-defined flow toward the northwest, whereas the March, 1983, slp had an ill-defined circulation, but with some indication of anticyclonic flow in the eastern Gulf and cyclonic flow in the Bay of Champeche.

The November, 1982, water transport was strong toward the northwest and west over the Gulf. The 1983 transport had a more northerly component in the mid-Gulf. The 1982 slp chart showed a strong, well-defined east to west circulation over the Gulf compared to the weaker, less well-defined November, 1983, circulation. The major December, 1982, transport was toward the northwest over most of the Gulf. The December, 1983, transport, however, had a cyclonic pattern to it, particularly in the western Gulf. The slp for December, 1982, showed the flow toward the northwest. The 1983 pattern clearly showed the effect of the Arctic high pressure that pushed down east of the Rockies. There is an indication of the cyclonic turning in the circulation from east to west across the Gulf.

SECTION 4

FISHERIES

The Gulf of Mexico region yielded the nation's largest commercial fishery landings by weight in 1983. Over 2.4 billion pounds of finfish and shellfish, worth more than $615 million (Table 4-1), were harvested. Only the combined Pacific coast and Alaska region exceeded the dollar value of the landings, although at 30 percent lower weight. The Gulf of Mexico region landed 38 percent of the total U.S. catch by weight and 25 percent by value. Louisiana led all states in the nation with record landings of 1.8 billion pounds, while Mississippi ranked fifth at 444.7 million pounds. In dollar value, Louisiana ranked third nationally with $230.3 million, and Texas ranked fifth with $186.2 million.

4.1 Finfish

Menhaden is the dominant fishery by weight in the Gulf of Mexico. It is an industrial fishery that uses the menhaden for the production of oils and meal. In 1983 over 2.0 billion pounds of menhaden, worth $82.4 million, were harvested. This was the second consecutive record year for menhaden landings, exceeding the 1982 catch by 8 percent. Fishery biologists in the National Marine Fishery Service think it is unlikely that the fishery will continue to sustain these record levels of catch.

Finfish landings (Table 4-1) exceeded 2.1 billion pounds, an increase of over 9 percent from 1982. Catch value reached $136.2 million, an $11.7 million increase from 1982. Based on the total finfish catch by weight the Gulf state rankings are as follow: Louisiana, Mississippi, Florida (west coast), Texas, and Alabama (Figure 4-1a). The menhaden catch dominates these statistics. When the menhaden catch is excluded, a far different distribution of the landing weights results (Figure 4-1b). Louisiana drops from first with 77.3 percent of the landings to a distant third with 6.8 percent.

Mullet, grouper, and snapper are other leading fisheries in the Gulf of Mexico (Table 4-2). Excluding menhaden landings, finfish landings increased by more than 44.1 million pounds and $2.0 million from 1982.

4.2 Shellfish

The Gulf of Mexico shellfish fishery is dominated by three penaeid shrimp species: the brown, white, and pink shrimp. The three species are aggregated in the landings data (Table 4-3). Other important species are blue crabs and oysters. In Florida there are also major spiny lobster and stone crab fisheries.

Shellfish landings were 271.2 million pounds in 1983 (Table 4-1), a decline of 9.6 million pounds from 1982. Total landings value was $479.3 million, a decrease of $6.7 million. Oyster landings totaled 27.7 million pounds, worth $3.1 million. This was an increase of 3.5 million pounds of oysters and $3.2 million over 1982 levels. Shrimp landings continued to decline from record 1981 levels (Figure 4-2). Gulf landings dropped from 210.0 million pounds of shrimp in 1982 to 198.5 million pounds in 1983. The 1983 shrimp catch was valued at $416.9 million, a loss of $8.8 million from 1982.

Table 4-1.--Commercial landings of finfish and shellfish, by state in 1983 for the Gulf of Mexico.

State	Finfish (pounds x 10^3)	Shellfish (pounds x 10^3)	Total Weight (pounds x 10^3)	Total Value ($ x 10^3)
Texas	4,125	85,401	89,526	186,506
Louisiana	1,678,700	105,443	1,784,143	225,229
Mississippi	423,379	15,911	439,290	48,412
Alabama	3,563	17,173	20,736	42,464
Florida (west coast)	61,916	47,287	109,203	112,853
Total	2,171,683	271,215	2,442,898	615,464

All data are preliminary from National Marine Fisheries Service. Catch from high seas or off foreign shores is not included.

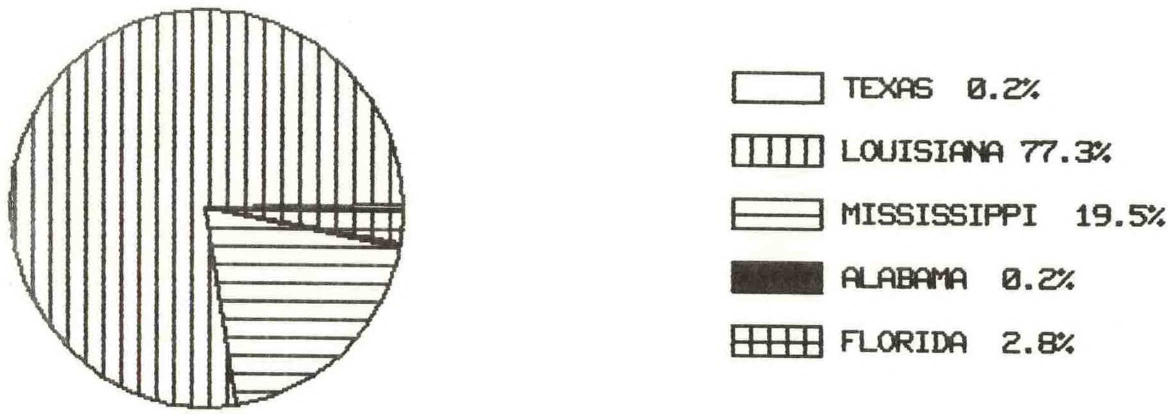

Figure 4-1a.--Gulf of Mexico 1983 total finfish landings: percent by weight by state.

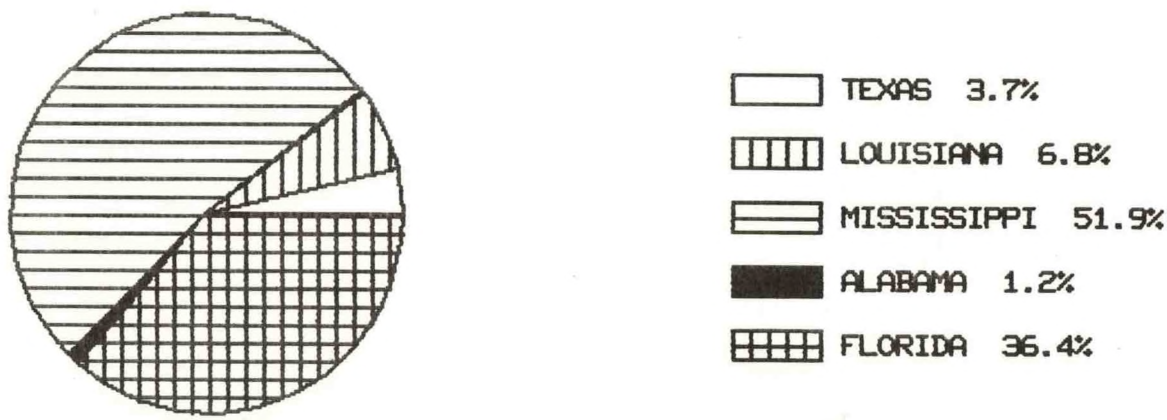

Figure 4-1b.--Gulf of Mexico 1983 finfish landings (excluding menhaden): percent by weight by state.

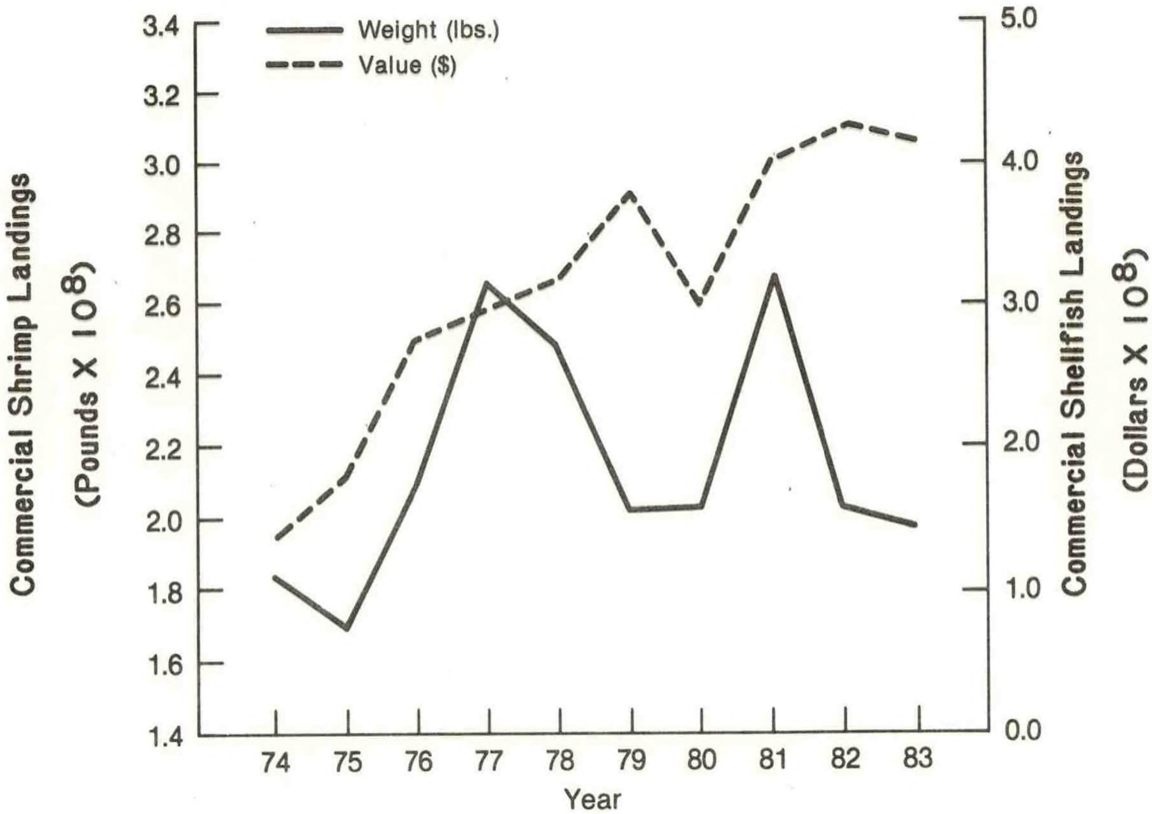

Figure 4-2.--Gulf of Mexico shrimp landings, 1974-1983.

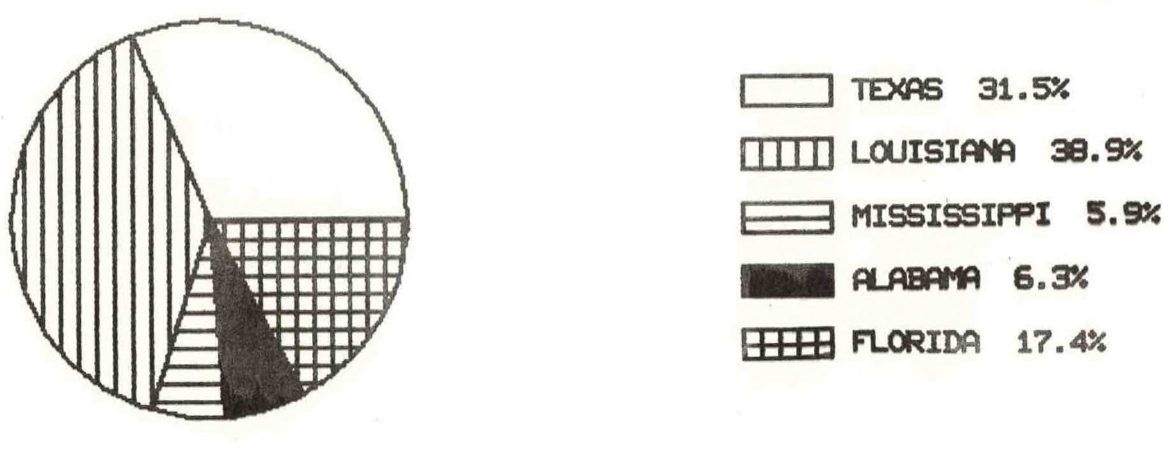

Figure 4-3.--Gulf of Mexico 1983 shellfish landings: percent by weight by state.

Table 4-2.--Total finfish landings by species for the Gulf of Mexico Region, 1983.

Species	Distance from U.S. Shores: From 0 to 3 miles, Thousand Pounds	From 0 to 3 miles, Thousand Dollars	Between 3 and 200 miles, Thousand Pounds	Between 3 and 200 miles, Thousand Dollars	Total, Thousand Pounds	Total, Thousand Dollars
Alewives	141	22	0	0	141	22
Bluefish	500	90	130	22	630	112
Bonito	35	3	280	24	315	27
Croaker	257	101	628	223	885	324
Flounders	1,016	803	570	291	1,586	1,094
Groupers	128	152	9,294	11,034	9,422	11,186
Mackerel, King	252	233	2,340	2,116	2,592	2,349
Mackerel, Span	106	27	39	10	145	37
Menhaden	1,835,597	74,484	200,525	7,961	2,036,122	82,445
Mullet	22,251	5,269	16	2	22,267	5,271
Scup or Porgy	90	47	113	52	203	99
Sea Trout, Spot	3,004	2,777	41	38	3,045	2,815
Sea Trout, White	257	86	352	90	609	176
Sharks, Unc.	159	71	630	287	789	358
Snapper, Red	24	29	6,493	11,365	6,517	11,394
Snapper, Other	750	915	1,584	1,930	2,334	2,845
Swordfish	0	0	716	2,055	716	2,055
Tilefish	0	0	260	205	260	205
Tunas	0	0	416	624	416	624
Fish, Other	42,417	8,730	40,272	3,953	82,689	12,683
Total Fish	1,906,984	93,839	264,699	42,282	2,171,683	136,121

All data are preliminary from National Marine Fisheries Service. Catch from high seas or off foreign shores excluded.

Table 4-3.--Total shellfish landings for the Gulf of Mexico Region, 1983.

Species	Distance from U.S. Shores					
	From 0 to 3 miles		Between 3 and 200 miles		Total	
	Thousand Pounds	Thousand Dollars	Thousand Pounds	Thousand Dollars	Thousand Pounds	Thousand Dollars
Shrimp	82,019	149,188	116,438	267,723	198,457	416,911
Oyster Meat	27,687	33,156	0	0	27,687	33,156
Crabs, Blue	36,153	11,607	0	0	36,153	11,607
Lobster, Spiny	1,650	4,092	2,200	5,456	3,850	9,548
Crab, Other	700	1,064	3,964	6,025	4,664	7,089
Shellfish, Other	168	629	100	200	268	829
Scallop, Bay	22	74	0	0	22	74
Scallop, Calico	0	0	25	70	25	70
Clam, Hard	15	38	0	0	15	38
Squid	17	6	57	15	74	21
Total Shellfish	148,431	199,854	122,784	279,489	271,215	479,343

All data are preliminary from National Marine Fisheries Service. Catch from high seas or off foreign shores is not included.

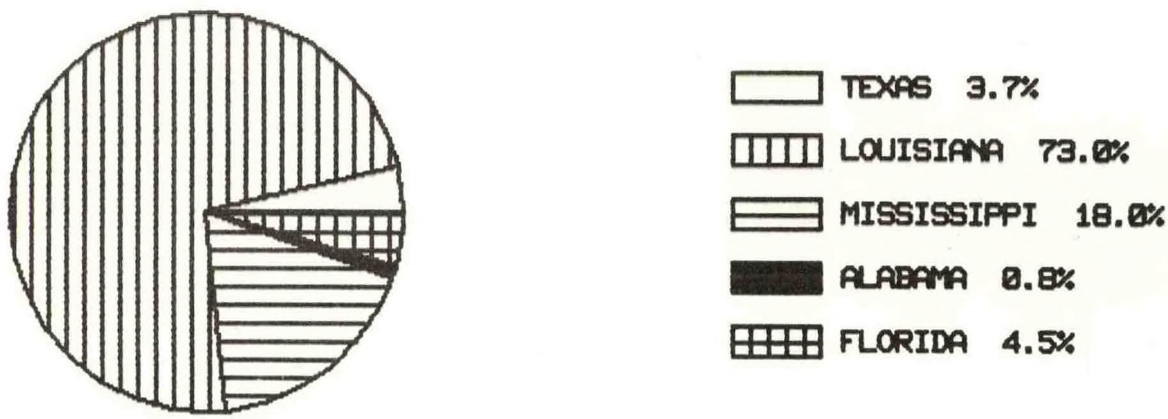

Figure 4-4.--Gulf of Mexico 1983 total finfish and shellfish landings: percent by weight by state.

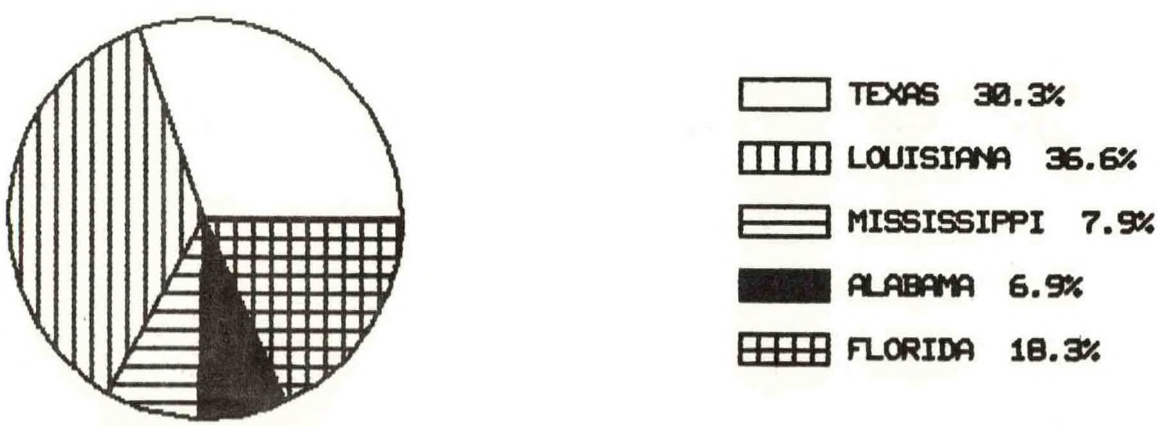

Figure 4-5.--Gulf of Mexico 1983 total finfish and shellfish value: percent of total dollar value by state.

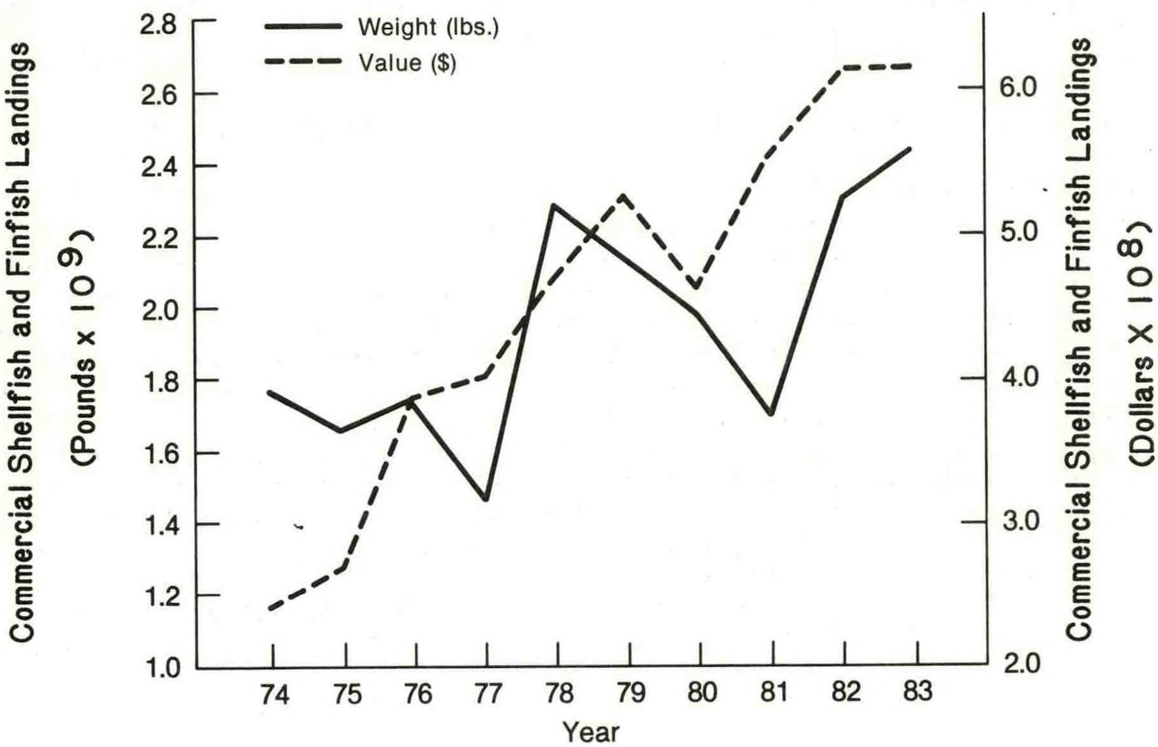

Figure 4-6.--Gulf of Mexico shellfish and finfish landings, 1974-1983.

Table 4-4.--Commercial fishery landings and value at major Gulf of Mexico ports, 1980 through 1983.

Port	Quantity (Million Pounds) 1980	1981	1982	1983	Value (Million Dollars) 1980	1981	1982	1983
Cameron, LA	479.8	447.6	714.7	743.9	33.3	29.9	40.4	39.5
Pascagoula-Moss Point, MS	291.9	220.5	331.6	380.2	18.9	16.8	18.5	23.2
Empire-Venice, LA	275.4	221.5	267.3	281.9	31.0	30.5	36.4	31.8
Dulac-Chauvin, LA	265.8	203.9	265.6	269.2	50.0	51.5	51.7	47.7
Brownsville-Port Isabel, TX	21.6	28.9	19.0	21.0	42.2	48.4	52.0	55.0
Aransas Pass-Rockport, TX	22.1	24.4	18.0	21.0	40.2	41.0	41.0	50.0
Bayou La Batre, LA	19.9	25.1	17.8	13.6	23.7	31.4	33.8	28.5
Galveston, TX	--	8.1	7.0	12.0	--	13.3	15.0	16.0
Key West, FL	15.4	18.0	10.0	11.7	18.3	27.0	19.0	18.6
Apalachicola, FL	11.6	12.0	9.0	10.8	11.3	12.3	10.2	14.1
Lafitte-Barataria, LA	11.1	14.7	11.9	9.4	14.8	20.8	21.9	16.5
Golden Meadow-Leeville, AL	15.4	18.5	14.2	9.3	12.2	19.9	21.5	15.2
Fort Myers, FL	13.5	15.0	9.2	7.3	10.9	18.0	11.9	8.6
Grande Isle, LA	--	7.1	5.6	6.4	--	7.8	5.7	7.7
Freeport, TX	10.1	14.9	9.0	6.0	19.9	26.8	26.0	17.0
Port Arthur-Sabine, TX	--	--	--	6.0	--	8.2	10.0	12.0
Delacroix-Yscloskey, LA	--	--	10.6	6.0	--	--	9.8	9.0
Port Lavacca, TX	--	--	--	6.0	--	--	6.0	9.0
Bon Secour-Gulf Shores, AL	--	7.0	5.9	--	7.7	11.6	12.4	11.8
Palacios, TX	--	--	--	--	--	--	9.0	11.0
Delcambre, LA	8.6	11.0	10.4	--	13.3	18.8	17.6	6.2

Data from National Marine Fisheries Services. Blank entries indicate data unavailable. To avoid disclosure of private enterprise the following ports were not included: Intracoastal City, LA; Morgan City, LA; Berwick, LA; and Biloxi, MS.

Blue crab landings for the Gulf of Mexico were unusually low during the spring quarter. This was due to the interruption of normal harvest activities by persistent inclement weather. The Gulf region experienced excessive precipitation (Table 3-2) and cooler-than-normal temperatures (Table 3-3) during most of 1983, but by year's end the 1982 landings had been exceeded by 261,000 pounds and $1.2 million. Total 1983 blue crab landings exceeded 36.1 million pounds and $11.6 million.

The Gulf of Mexico regional landings by weight were led by Louisiana with 38.9 percent of the total (Figure 4-3). Louisiana ranked first in both oyster and shrimp landings. Although total Gulf shrimp catch decreased, both Florida and Mississippi had increased shrimp landings, by weight, of 16 percent and 5 percent respectively.

4.3 Summary of Commercial Fishing

Combined shellfish and finfish landings in the Gulf of Mexico exceeded 2.4 billion pounds and were worth $615.5 million (Table 4-1). Despite the decline in shellfish landings, the record menhaden catch increased the combined fishery landings by 187.0 million pounds and $4.7 million and enabled Louisiana and Mississippi to dominate the combined fishery landing weights (Figure 4-4). The low commercial value of menhaden ($0.04/lb) resulted in a more equitable market distribution of the combined fishery landings by value among the states (Figure 4-5).

The commercial fishing industry of the Gulf of Mexico is an important part of the regional economy. A ten year summary (Figure 4-6) of landings by weight and value indicates a relatively steady growth in dollar value despite large fluctuations in landing volumes. The first four ports listed in Table 4-4 were ranked as the top four national ports based on landings by weight in 1983. Brownsville-Port Isabel and Aransas Pass-Rockport ranked fourth and fifth, respectively, for 1983 national landings by value.

SECTION 5

RECREATION

The Gulf of Mexico is a major recreational area of the United States, particularly for boating, saltwater fishing (bay, surf, and pier), and beach activities. The coasts of Texas, Louisiana, Mississippi, Alabama, and Florida display a diversity of natural landscapes and seascapes. Barrier islands, coastal beaches, bays, sounds, river deltas and marshes, together with a subtropical climate, provide an ideal setting for outdoor recreation and tourism. Tourism within the Gulf region encompasses such activitites as sightseeing, swimming, sunbathing, bird watching, hiking, boating, amusement parks, conventions, sports, and festivals. Activities are widespread over the region and contribute to its economic well-being. Although the exact relationship between the weather and the economy associated with recreation is not clear, prolonged periods of inclement weather (i.e., rain and cold) and episodes of severe weather (tornadoes, hurricanes, etc.) will impact the regional economy.

5.1 National and State Park Visits

The National Park Service of the Department of the Interior manages a number of national parks, national historical parks, national monuments, wildlife and wilderness areas, and national seashores in the states surrounding the Gulf of Mexico. Only those coastal sites for which data are available have been chosen for analysis. Four parks are located along the coast of Florida, and there is one park in each of the other Gulf states, except Alabama (Table 5-1). Total visits to national parks in the region have grown since 1980, despite the recession of 1982 and early 1983 which hit the recreation sector particularly hard. Visits increased from 5.0 million people in 1981 to 5.4 million in 1982 and 6.0 million in 1983. These changes correspond to growth rates of 6.9 percent and 12.3 percent in 1982 and 1983, respectively.

A state-by-state look at visits to national parks indicates substantial variability from site to site and from year to year. Although some changes are related to the weather, others are the result of factors that are somewhat independent of the weather. Total visitations to Texas's sites, for example, rose 20 percent in 1982, but suffered a loss of 4 percent in 1983. The major factor in this decline was a 16 percent reduction in visits to Padre Island National Seashore. Attendance at this park, which draws a majority of its visitors from the Corpus Christi area, was probably affected by the preference of the local populace for some of the newer and improved facilities which opened at county beaches during the year.

By contrast, total visits to Mississippi's national parks improved from 1982's 1 percent decline to an increase of 21 percent in 1983. Attendance at Gulf Islands National Seashore rose 6 percent in 1982 and 16 percent in 1983.

The same growth rate of 16 percent occurred at Florida's Gulf Islands National Seashore. De Soto National Memorial Park gained 12 percent in recreational visits in 1983. The 14 percent growth in visits to Florida's Gulf coast parks compared favorably to the overall state growth in national park visits of 9.5 percent.

Table 5-1.--National park visits (in thousands) to Gulf sites, 1981-1983.[1]

	1981	1982	1983
FLORIDA (state total)	5800	6030	6608
De Soto National Memorial	165	197	221
Everglades National Park	564	550	577
Fort Jefferson National Monument	10	10	11
Gulf Islands National Seashore	2653	2806	3248
Total (Florida Gulf)	3392	3563	4057
LOUISIANA (state total)	373	377	535
Jean Lafitte National Historic Park and Preserve	373	377	535
MISSISSIPPI (state total)	10284	10159	12331
Gulf Islands National Seashore	663	701	812
TEXAS (state total)	3968	4747	4561
Padre Island National Seashore	620	731	630
Total in Gulf region national parks	5048	5372	6034

[1]No Gulf coastal national park site is located in Alabama.

Data from National Park Service, Denver Service Center, Statistics Office.

Table 5-2.--Monthly national park visits (in thousands), Gulf sites, 1983.[1]

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
FLORIDA	391.8	376.6	633.0	653.1	713.9	660.4	755.3	644.4	547.4	464.5	396.6	371.7
De Soto National Memorial	22.3	22.8	33.7	26.7	15.4	13.1	13.6	14.6	12.7	15.5	16.1	14.2
Everglades National Park	72.1	80.0	84.4	59.2	44.6	27.6	30.3	26.2	23.0	28.8	40.7	60.5
Fort Jefferson National Monument	.5	.7	.9	1.4	2.1	1.2	1.1	.7	.6	.6	.5	.6
Gulf Islands National Seashore	103.8	127.4	267.7	312.6	392.4	380.5	409.7	379.4	342.3	234.4	165.7	132.5
Total Florida Gulf	198.7	230.9	386.7	399.9	454.5	422.4	454.7	420.9	378.6	279.3	223.0	207.8
LOUISIANA	46.6	33.3	45.9	66.8	63.3	55.7	40.3	32.9	39.0	42.8	42.5	26.0
Jean Lafitte National Historic Park and Preserve	46.6	33.3	45.9	66.8	63.3	55.7	40.3	32.9	39.0	42.8	42.5	26.0
MISSISSIPPI	888.7	848.7	983.8	1021.2	1010.6	950.7	1008.5	1029.4	1010.9	1003.1	1161.2	1414.5
Gulf Islands National Seashore	25.9	31.8	66.9	78.2	98.1	95.1	102.4	94.8	85.6	58.6	41.4	33.1
TEXAS	172.2	187.2	337.0	447.1	521.8	589.4	745.3	505.7	353.3	292.7	274.0	135.5
Padre Island National Seashore	23.8	27.6	58.0	48.4	67.6	95.4	106.4	78.2	46.0	37.1	26.6	15.0
Total Gulf Sites	295.0	323.6	557.5	593.3	683.5	668.6	703.8	626.8	549.2	417.8	333.5	281.9

[1]No Gulf coastal national park site is located in Alabama.

Data from National Park Service, Denver Service Center, Statistics Office.

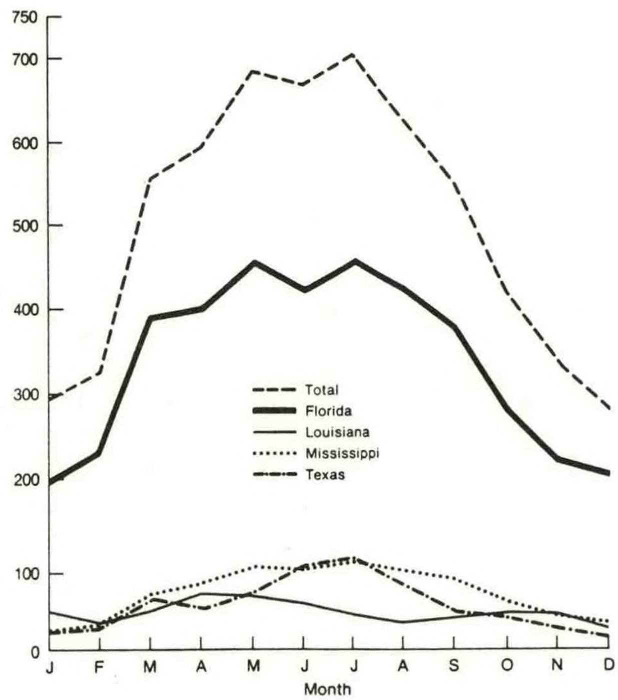

Figure 5-1.--Monthly national park visits (in thousands) Gulf sites, 1983.

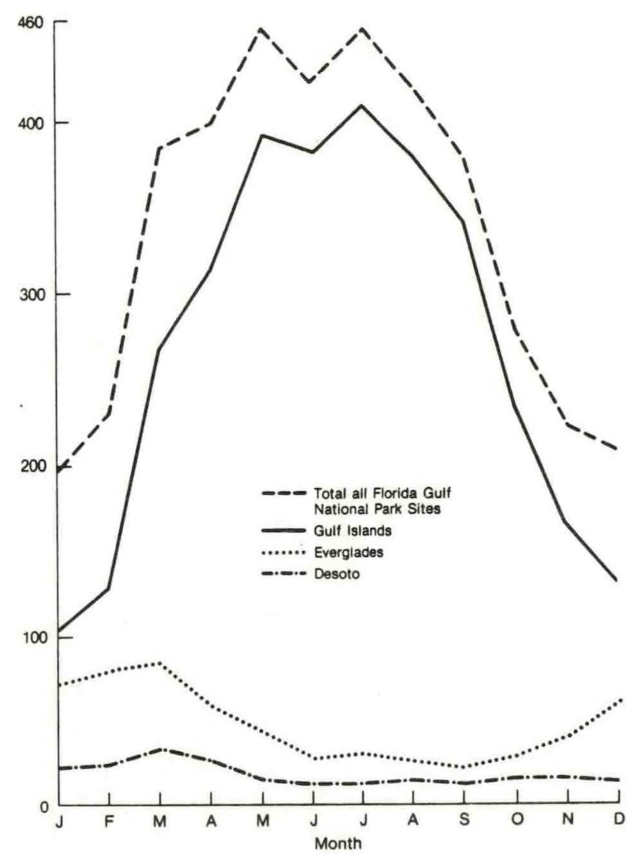

Figure 5-2.--Monthly Florida (Gulf coast) national park visits (in thousands), 1983.

The largest increase at any national park in the Gulf coast region was at Louisiana's Jean Lafitte National Historic Park and Preserve where attendance rose 41 percent from 1982 to 1983. This rise was partly attributable to the inauguration of user facilities in the Barataria area of the park.

A look at 1983 national park visits by month (Table 5-2) reveals seasonal variations in visitation patterns from park site to park site. For example, the peak three months of visits at Everglades National Park occurred from January through March; at De Soto, February through April; at Fort Jefferson and Jean Lafitte, April through June; and at all the others, May through July (Figure 5-1). About 80 percent of all Gulf coast visits occurred at the two Gulf Islands National Seashore parks in Florida and Mississippi and at Padre Island National Seashore in Texas. Figure 5-2 shows the distributions by state of monthly Gulf national park visits. Total visits for the region peaked during July at a level of 703,800 in a high season extending from March through August. The lowest level of regional visits was recorded in December, when the total dipped to approximately 282,000.

State park attendance levels also displayed varied patterns across the Gulf region (Tables 5-3 through 5-7). Florida's parks had considerable growth in 1983 with an increase of 51.6 percent. This was largely due to the 133 percent growth in visits to Honeymoon Island, which opened in 1982. In contrast, attendance at state parks in Louisiana coastal parishes declined 10 percent from 1982 to 1983, and Mississippi's Gulf coast park attendance was virtually unaffected between 1982 and 1983. During this time period, Texas Gulf coast parks attendance grew 1 percent, while the growth rate for all Texas state parks was about 7 percent. The figures for Gulf State Park in Alabama showed a 21 percent growth in visits between 1982 and 1983, as the park began a comeback from the destruction caused by Hurricane Frederic in 1979.

Within each state there is substantial variability at specific park sites and in different seasons. These variations could be due to a wide range of factors including site improvements and expansions, as well as the weather. For example, the opening of Honeymoon Island in 1982 was the major factor in the 67 percent increase in visits to Florida's Gulf sites in 1982. Attendance there also contributed greatly to the 52 percent increase in visits the following year. One of the things that causes variation in attendance figures is the method of collection of these data. Not all jurisdictions or parks have automatic counting equipment and must rely on estimates or samples by park personnel.

5.2 Boating Registrations

The Gulf of Mexico presents an inviting setting for the recreational boater. Warm temperatures, low tides, and low winds most of the year and a variety of species for recreational fishing beckon boaters to the Gulf. Boating registrations in the five states of the Gulf of Mexico region in 1983 were approximately 18 percent of the national total of boating registrations.

The number of boat registrations experienced a modest growth rate of 1.8 percent in all Gulf states (Table 5-8). This compares favorably to the increase in the national rate of 1 percent. With the exception of Louisiana which suffered a decline of 9.2 percent, all Gulf states had more boat registrations

Table 5-3.--Florida (Gulf coast) state park visits (in thousands), 1981-1983.*

	1981	1982	1983
Big Lagoon**	28.0	33.7	67.3
Calodesi Island**	142.4	132.5	125.3
Grayton Beach**	38.3	40.2	43.3
Honeymoon Island	--	957.1[1]	2225.0
Rocky Bayou**	34.9	40.8	43.5
St. Andrews	549.3	553.6	550.5
St. George Island**	70.7	75.4	91.2
St. Joseph Peninsula**	88.9	91.6	99.8
Scherer, Oscar	102.2	90.9	100.2
Wiggins Pass	426.5	462.2	411.7
Total Florida Gulf parks	1481.2	2478.0	3757.8

*For FY ending June 30.

**Estimated attendance (based on automobile traffic or seasonal sample counts).

[1]Opening year.

Data from Florida Department of Natural Resources, Division of Recreation and Parks.

Table 5-4.--Alabama (Gulf coast) state park visits (in thousands), 1981-1983.*

	1981	1982	1983
Gulf State Park	1,589	1,476	1,793

*For FY ending September 30.

Data from Alabama Department of Conservation, Parks Division.

Table 5-5.--Mississippi (Gulf counties) state park visits (in thousands), 1981-1983.

	1981	1982	1983
Hancock County	515.1	509.1	530.1
Harrison County	161.2	178.2	156.9
Total Gulf county sites	676.3	687.3	687.0

Data from Mississippi Department of Natural Resources.

Table 5-6.--Louisiana (coastal parishes) state park visits (in thousands), 1981-1983.

	1981	1982	1983
Cypremort Point	116.4	149.0	103.1
E.D. White	1.6	1.3	.7
Fairview-Riverside	206.7	275.2	151.3
Fontainebleau	197.6	210.4	251.8
Fort Pike	121.7	78.0	184.6
Grand Isle	403.7	225.8	193.7
Longfellow-Evangeline	367.6	335.9	202.2
Old Arsenal	64.4	67.5	64.4
Plaquemine Locks	--	.6	1.4
Port Hudson	not open		63.7
Sam Houston Jones	403.9	386.0	328.2
St. Bernard	69.7	83.1	80.6
Total (All Louisiana state parks)	3535.1	3187.2	2751.2
(Gulf coast parks only)	1953.3	1812.8	1625.7

Data from Louisiana Department of Culture, Recreation, and Tourism, Office of Tourism.

Table 5-7.--Texas state park (parks fronting saltwater) visits (in thousands), 1981-1983.*

	1981	1982	1983
Bryan Beach	16.0	15.2	17.6
Copano Bay St. Park	84.3	52.2	37.8
Galveston Island	637.2	724.8	688.8
Goose Island	294.6	319.4	410.3
Mustang Island	357.5	764.3	1068.3
Port Isabel	35.9	35.6	30.3
Port Lavaca Causeway	28.5	15.2	10.2
Queen Isabella Fish Pier	136.8	134.2	131.4
Sabine Pass Battleground	101.6	165.2	123.4
San Jacinto Battleground	1439.0	1530.7	1321.3
Sea Rim	218.6	227.9	201.2
Total (All Texas state parks)	14776.9	17035.2	18310.3
(Gulf parks only)	3350.0	3984.7	4040.6

*FY ending August 31.

Data from Texas Parks and Wildlife Department.

Table 5-8.--Boating registrations (in thousands), Gulf of Mexico states, 1981-1983.

	1981	1982	1983
ALABAMA	227.0	227.3	227.6
FLORIDA	512.6	483.7	526.5
LOUISIANA	300.0*	333.8	303.0
MISSISSIPPI	117.4	117.4	123.2
TEXAS	567.1	581.9	594.9
TOTAL GULF	1724.1	1744.1	1775.2
TOTAL U.S.	8905.1	9074.0	9165.1

*Estimate.

Data from U.S. Coast Guard.

than in the previous year. Florida, in particular, showed a reversal in registration from a decrease of 5.6 percent in 1982 to an 8.8 percent increase in 1983.

5.3 Marine Accident Statistics

An indirect indicator of the level of boating activity is the number of emergency search and rescue (SAR) missions conducted by the United States Coast Guard. A detailed study of the accidents reported throughout the Gulf region during the first nine months of 1982 and 1983 (Table 5-9a) indicated that more than 63 percent of the cases involved recreational vessels. Reported boating accidents continued to decline (Table 5-9b), as an 8.3 percent decrease in 1983 followed a 4.2 percent decrease in 1982. The Coast Guard estimates that they receive only 10 percent of non-fatal accident reports, whereas they receive nearly all involving fatal accidents. Because of this low reporting rate, a small change in reporting may drastically alter the statistics.

5.4 Recreational Fishing in the Gulf

Its favorable environment makes the Gulf of Mexico an attractive fishing ground for the sport fisherman. In 1979 the National Marine Fisheries Service (NMFS) implemented a new methodology for conducting surveys of marine recreational fishing. Catch data (weight and number of fish) and information on the number of fishing trips and number of participants are obtained by intercept surveys, in which fishermen are interviewed on site, and independent telephone surveys of households. Table 5-10 lists the data for 1979 and 1980 for the Gulf of Mexico. These are the latest data available. These data show that an estimated 162.8 billion pounds of fish were caught in 1979, and that about 154.2 billion pounds were caught in 1980. The five most frequently caught species in the Gulf in these years were sea catfishes, Atlantic croakers, spotted seatrout, pinfish, and sand seatrout.

The frigid weather reported in the western Gulf in mid-to-late December, 1983, killed hundreds of thousands of fish in the shallow bays and inland waterways. Some of these areas are the favorite fishing grounds of the recreational fisherman. The air temperature at Corpus Christi and Galveston, TX, dipped to 14°F on December 25 and remained in the teens and low twenties for several days, forcing the water temperature below 40°F, the critical survival temperature for species that normally inhabit coastal waters. The Washington Post (December 28, 1983) reported: "... that in one quarter-mile stretch near Corpus Christi, game wardens counted 1,000 dead speckled trout every 100 feet." Whether this fish kill will have more than a short-range impact on the recreational fishing in these areas will not be clear until analyses of the data are complete.

Participation in marine recreational fishing in the Gulf seemed to remain constant during 1979 and 1980 with approximately 3.75 million residents participating during each year of the NMFS survey. Coastal residents accounted for 80 percent of the estimated 21 million trips in 1979 and 75 percent of the estimated 24 million trips in 1980 in the Gulf.

The impact of this level of recreational fishing activity on the economy of the Gulf coastal regions is unquestionably large. According to a special marine recreational socioeconomic survey conducted by NMFS in 1981 on the

Table 5-9a.--Recreational versus non-recreational Search and Rescue Operations, U.S. Coast Guard, Gulf of Mexico, January-September, 1982 and 1983.*

	1982			1983		
	Recre-ational	Non-recre-ational	Total	Recre-ational	Non-recre-ational	Total
January	311	243	554	272	264	536
February	338	181	519	224	229	453
March	426	248	674	324	226	550
April	525	205	730	481	209	690
May	810	314	1124	569	257	826
June	839	366	1205	604	285	889
July	830	336	1166	739	339	1078
August	705	277	982	510	276	786
September	470	228	698	395	246	641
Totals	5254	2398	7652	4118	2331	6449

*Data for October-December are available as totals, only.

Table 5-9b.--Total Search and Rescue Operations, U.S. Coast Guard, Gulf of Mexico, 1981-1983.

	1981	1982	1983
Total Gulf Search and Rescue Operations	9157	8766	8034

Data from U.S. Coast Guard.

Table 5-10.--Estimated total number (in thousands) of fish caught in the Gulf of Mexico by marine recreational fishermen by species group, 1979-1980.

SPECIES GROUP	1979	1980	SPECIES GROUP	1979	1980
Barracudas	51	63	Mackerel, Spanish	2,384	2,278
Basses, Sea	3,231	2,084	Mackerels and Tunas	275	148
Bluefish	2,455	1,291	Mullets	6,914	4,471
Blue Runner	573	639	Perch, Silver	2,181	4,620
Catfishes, Sea	20,840	21,771	Pinfish	11,977	12,826
Catfishes, Freshwater	310	54	Porgies	164	647
Croaker, Atlantic	19,055	21,637	Puffers	166	151
Dolphins	47	1,294	Searobins	206	94
Drum, Black	3,384	2,277	Seatrout, Sand	10,466	11,701
Drum, Red	6,179	4,893	Seatrout, Spotted	22,799	16,197
Drums	603	1,122	Sharks	779	764
Eels	55	159	Sheepshead	2,906	4,444
Flounders	3,779*	1,947**	Skates and Rays	405	981
Grunt, White	2,885	1,688	Snapper, Gray	2,126	845
Grunts	2,184	2,150	Snapper, Red	6,031	4,146
Herrings	3,792	2,142	Snapper, Vermillion	768	670
Jack Crevalle	1,195	1,018	Snappers	624	520
Jacks	1,435	903	Spot	756	156
Kingfishes	4,231	8,843	Toadfishes	291	268
Little Tunny	428	372	Triggerfishes/Filefishes	1,088	766
Mackerel, King	614	1,003	Other Fish	11,647	9,275
			TOTALS:	162,279	154,176

*Combined figure for summer flounder and flounders.

**Combined figure for Gulf flounder, southern flounder, and flounders.

Data from Marine Recreational Fishery Statistics Survey, Atlantic and Gulf Coasts, 1979 (Revised) - 1980, National Marine Fisheries Service, NOAA, September 1984.

Atlantic, Gulf, and Pacific coasts, most anglers were fishing for sport and relaxation. Preference for catching a particular species was not a major issue to them. Most fish caught and kept were used for food. Fish which were not kept were usually returned to the water alive. The average total expenditure per trip (excluding travel cost) was $39.

Business in the Gulf region is directly and indirectly impacted by the level of recreational fishing and boating activity. Hotels and motels, restaurants, boat charter companies, boat sales, bait and gear sales, recreational clothing stores, boat suppliers, etc., are among those enterprises feeling the effects of fluctuation in these activities. Future Gulf assessments might be able to evaluate more precisely the effects of climate on the recreation sector of the economy by looking at statistics on local businesses and by considering indirect indicators such as fishing tournaments and boat launches.

SECTION 6

TRANSPORTATION

The Gulf of Mexico is used heavily for transportation. Goods are moved by barges through the Intracoastal Waterway along the coast and through rivers in each Gulf state. U.S. Department of Interior studies show that grain and other products of the Mississippi Basin come down to the Gulf, while foreign goods and products from other parts of the country are moved back up the river and along the coast.

There are seven major ports (Table 6-1) in the Gulf of Mexico region based on U.S. Department of Commerce, Bureau of Census data. Houston and New Orleans, two of the largest ports in the U.S., ship large amounts of oil.

In addition to the intracoastal and international shipping in the Gulf of Mexico, the transportation sector also includes pipelines and related shore facilities such as refineries.

The Gulf of Mexico is among the most seriously polluted major bodies of water in the world. Oil pollution is strongly influenced by mean Gulf circulation patterns and is found to be heaviest in the eastern Gulf.

Most Gulf spills are small. U.S. Department of Interior studies show about 99 percent are less than 50 barrels, and 85 percent are less than one barrel. Studies done over several years show that most of the volume of oil spilled is contributed by a few large spills, although major spills (1,000 barrels and over) are few in number.

6.1 Shipping and Related Shore Activity

Foreign export waterborne commerce in the leading Gulf seaports during 1983 amounted to 97.0 million tons, a 6.6 percent decrease from 1982. Dollar value totalled $23.5 billion, a $4.9 billion decrease from the previous year. Foreign imports were also down in 1983, from 74 million short tons to 56 million short tons, a decline of 23.6 percent. This corresponded to a loss of $5.9 billion in 1983. Tables 6.1 and 6.2 list the foreign exports and imports at the seven major Gulf ports in weight and value.

6.2 Accidental Spills of Oil and Hazardous Substances

During 1983 a total of 1873 spills of various pollutants entered the Gulf and its tributary waters (Tables 6.3 and 6.4). The source of many of these spills was onshore plants, refineries, offshore facilities, pipelines, tugboats, and tankships. Spills with volumes greater than or equal to 10,500 gallons are listed in Table 6.5. Gasoline spilled twice during the year releasing a total of 57,950 gallons into the Gulf region. Spills of hazardous substances of 1,000 pounds or more accounted for 772,363 pounds of the total (Table 6-6). On October 3 a hazardous substance of undetermined type spilled 753,740 pounds, the largest of all spills in the Gulf of Mexico region for 1983.

Table 6-7 lists spills of oil, hazardous materials, and other substances by state in the northern Gulf of Mexico in 1983. Spills of petroleum products

Table 6-1.--Foreign export waterborne Commerce, leading Gulf of Mexico seaports, 1982 and 1983.

SHORT TONS (Thousands)

Ports	1982	1983	Percent of Change
New Orleans, LA	28,850	24,593	-14.8
Houston, TX	25,909	22,295	-13.9
Baton Rouge, LA	14,986	13,403	-10.6
Tampa, FL	13,512	16,354	+21.0
Mobile, AL	11,969	10,215	-14.7
Galveston, TX	5,596	7,142	+27.6
Corpus Christi, TX	3,066	3,036	-1.0
Totals	103,888	97,038	-6.6

DOLLAR VALUE (Millions)

Ports	1982	1983	Percent of Change
New Orleans, LA	7,793	6,541	-16.1
Houston, TX	13,358	10,301	-22.9
Baton Rouge, LA	2,345	1,993	-15.0
Tampa, FL	1,179	1,259	+6.8
Mobile, AL	1,229	791	-35.6
Galveston, TX	1,873	2,050	+9.5
Corpus Christi, TX	646	541	-16.3
Totals	28,423	23,476	-17.4

SOURCE: Foreign Commerce Statistical Report 1983, Maryland Department of Transportation. Data from U.S. Department of Commerce, Bureau of the Census.

Table 6-2.--Foreign import waterborne Commerce, leading Gulf of Mexico seaports, 1982 and 1983.

SHORT TONS (Thousands)

Ports	1982	1983	Percent of Change
Houston, TX	22,257	18,497	-16.9
New Orleans, LA	18,303	11,979	-34.5
Corpus Christi, TX	15,716	14,175	-9.8
Baton Rouge, LA	8,207	6,202	-24.4
Mobile, AL	4,072	3,148	-22.7
Tampa, FL	3,450	4,356	+26.3
Galveston, TX	2,003	1,308	-34.7
Totals	74,008	59,665	-19.4

DOLLAR VALUE (Millions)

Ports	1982	1983	Percent of Change
Houston, TX	10,603	7,652	-27.8
New Orleans, LA	6,000	4,651	-22.5
Corpus Christi, TX	2,903	2,572	-11.4
Baton Rouge, LA	1,239	772	-37.7
Mobile, AL	554	670	+21.0
Tampa, FL	655	678	+3.5
Galveston, TX	997	722	-27.6
Totals	22,951	17,717	-22.8

SOURCE: Foreign Commerce Statistical Report 1983, Maryland Department of Transportation. Data from U.S. Department of Commerce, Bureau of the Census.

Table 6-3.--Number and quantity of spills in Gulf of Mexico and in all U.S. waters, 1973-1983.

	Gulf of Mexico		All U.S. waters		
Year	Number	Quantity (thousands of pounds)	Number	Quantity (thousands of pounds)	Gulf region spills as percentage of all U.S. spills
1973	2	64.5	66	1677.9	3.0%
1974	6	40.1	42	1200.1	14.3%
1975	6	4.0	49	3134.2	12.2%
1976	3	10.0	63	13164.0	4.8%
1977	9	302.2	65	863.3	13.9%
1978	1	0.3	58	236.4	1.7%
1979	2	20.0	58	155.9	3.5%
1980	10	74.4	57	262.6	17.5%
1981	2	3.6	89	591.4	2.3%
1982	10	6.3	182	8758.5	5.5%
1983	26	774.9	176	3428.7	14.8%

Preliminary data from U.S. Coast Guard Pollution Incident Reporting System (PIRS).

Table 6-4.--Number and volume of spills in Gulf of Mexico and in all U.S. waters, 1973-1983.

	Gulf of Mexico		All U.S. waters		
Year	Number	Volume (millions of gallons)	Number	Volume (millions of gallons)	Gulf region spills as percentage of all U.S. spills
1973	3520	37.2	9655	22.1	36.5%
1974	3483	4.3	10740	19.4	32.4%
1975	3195	4.4	10089	22.2	31.7%
1976	3248	2.6	10128	31.2	32.1%
1977	3120	3.4	10275	10.9	30.4%
1978	3125	2.9	9791	13.9	31.9%
1979	2907	2.7	9194	11.2	31.6%
1980	1814	9.1	7756	14.8	23.4%
1981	1359	4.3	7055	11.7	19.3%
1982	1510	1.8	6871	13.2	21.9%
1983	1847	0.6	6913	20.7	26.7%

Preliminary data from U.S. Coast Guard Pollution Incident Reporting System (PIRS).

Table 6-5.--Spills (10,500 gallons or more) of oil, pollutants, and other materials, Gulf of Mexico region, 1983.

Material	Gallons	Date	Location	Source
Crude Oil	10,500	February 24	29°52'N 95°41'W	Onshore pipeline
	12,600	May 20	29°35'N 90°01'W	Offshore facility
	33,600	January 30	29°32'N 93°08'W	Offshore facility
	50,400	June 6	27°50'N 97°14'W	Tankship
Diesel Oil	13,700	January 20	30°14'N 89°25'W	Onshore fueling
	48,000	March 10	29°07'N 92°30'W	Tugboat
Residual Fuel Oil	18,312	March 19	28°27'N 96°21'W	Tugboat
	103,740	October 17	29°31'N 95°06'W	Onshore facility
Gasoline	19,950	February 1	27°50'N 97°25'W	Offshore pipeline
	38,000	September 4	25°21'N 97°00'W	Onshore bulk cargo
Other Oil	21,420	October 7	27°49'N 97°30'W	Onshore pipeline

Preliminary data from U.S. Coast Guard Pollution Information Reporting System (PIRS) database.

Table 6-6.--Spills (1000 pounds or more) of hazardous substances, Gulf of Mexico region, 1983.

Material	Pounds	Date	Location	Source
Ethyl alcohol	1000	May 9	29°22'N 94°56'W	Onshore plant
Aluminum sulfate	1280	April 30	28°59'N 95°23'W	Onshore refinery
Phenol	1500	January 8	29°26'N 94°55'W	Onshore bulk facility
Chlorine	1293	September 3	27°51'N 97°16'W	Onshore fueling
	1500	April 22	28°57'N 95°19'W	Onshore plant
Acrylonitrile	2000	November 2	27°50'N 97°00'W	Tank barge
Other material	10050	February 17	25°51'N 97°16'W	Land transportation facility
	753740	October 3	29°22'N 94°56'W	Onshore plant

Preliminary data from U.S. Coast Guard Pollution Incident Reporting System (PIRS).

Table 6-7.--Gulf of Mexico spills of oil, hazardous materials, and other substances by state-number, volume, and percent of U.S. total, 1983.

A. Spills by State

	OIL				HAZARDOUS			
State	Spills	Percent	Volume	Percent	Spills	Percent	Volume	Percent
Alabama	138	1.5	35443	0.4	4	1.3	1338	0.1
Florida	654	7.1	38209	0.5	3	1.0	200	0.0
Louisiana	1170	12.7	2603015	31.5	35	11.6	66812	3.7
Mississippi	71	0.8	827562	10.0	0	0.0	0	0.0
Texas	765	8.3	397026	4.8	48	15.9	15409	0.9

	OTHER				TOTAL			
State	Spills	Percent	Volume	Percent	Spills	Percent	Volume	Percent
Alabama	17	1.2	5	0.0	159	1.4	36786	0.2
Florida	93	6.4	11703	0.1	750	6.8	50112	0.2
Louisiana	76	5.2	190486	1.7	1281	11.7	2860313	13.5
Mississippi	6	0.4	25	0.0	77	0.7	827587	3.9
Texas	209	14.3	12292	0.1	1022	9.3	424727	2.0

Preliminary data from U.S. Coast Guard Pollution Information Reporting System (PIRS) Database. All volumes are in gallons.

dominates these figures, constituting 93 percent of the total volume of pollutants spilled in the Gulf. This represents almost one-half (47 percent) of the volume of oil spilled in the U.S. in 1983. Each state showed an increase in spills from the previous year. Louisiana had the most spills with 1,281, followed by Texas, 1,022; Florida, 750; Alabama, 159; and Mississippi, 77. The state of Mississippi had no hazardous materials spilled in 1982 or 1983.

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