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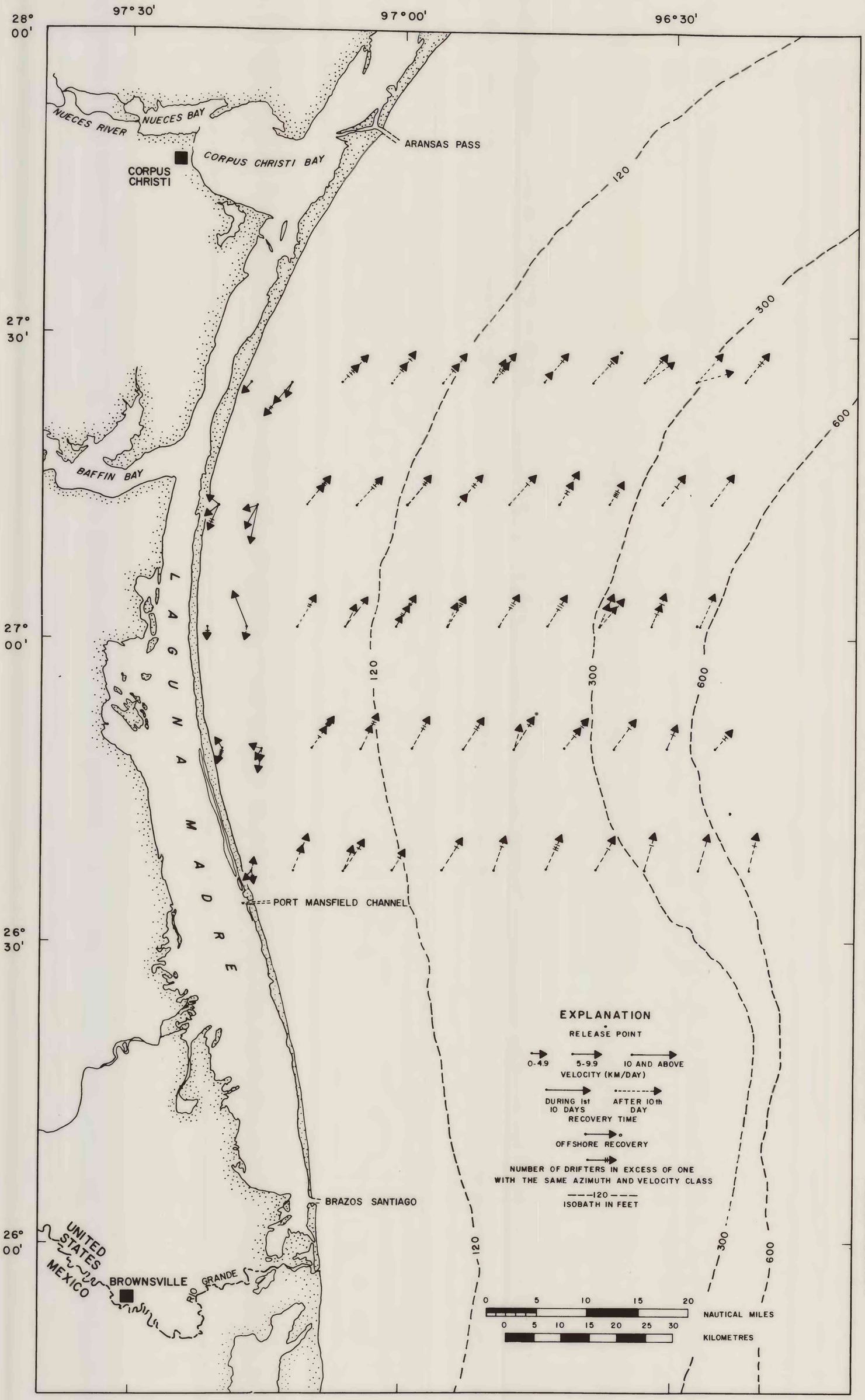

INTRODUCTION

As part of a program to study depositional processes and sediment movement off the Texas coast, a multiyear investigation designed to study the rates and directions of current drift in the northwestern Gulf of Mexico was initiated in January 1970. The drift study was divided into several phases. Phase I (Hunter and others, 1974) studied coastal drift off south Texas (26°00' N. to 27°50' N.) from 1970 to 1973. Phase II (Hill and others, 1975; Hill and Garrison, in press) began when the study area was shifted to the coast off north-central Texas (27°30" N. to 29°00' N.) where drift observations were made from July 1973 to April 1975. Through the use of both surface and bottom drifters, these studies showed a yearly cycle of coastwise water movement which was controlled largely by seasonally changing winds. Observed drift patterns off south Texas were characterized by complex convergences and layered structure, in contrast to the much simpler drift patterns observed off the north-central coast.

From the results of the studies between 1970 and 1975, an area of complex drift structure was defined generally between 26°30' N. and 27°30' N. Phase III was conducted in July 1975 to study this area in more detail and to extend the observations seaward to the edge of the continental shelf. This report presents the first results of Phase III.

METHODS

Ballasted drift bottles were used to measure surface drift. The use of seabed drifters to measure bottom drift was not employed in this study because of their low recovery rates during summer months in the previous studies. Ten surface drifters were released at each of 55 stations by dropping them from an airplane whose location was fixed by Loran A or by Tacan. The release points were 12 nautical miles (22 km) apart along 11 lines which generally paralleled the coast between 26°30' N. and 27°30' N. These lines were spaced 5 nautical miles (9 km) apart beginning 1 nautical mile (2 km) off the beach and extending 55 nautical miles (99 km) offshore in water depths ranging from approximately 30 to 600 feet (9-180 m). The drifters were released July 2, 1975.

Most of the information for this report was furnished from drifters recovered on open beaches by the public. A few recoveries were made by shrimp boats at sea.

RESULTS

Thirty-four percent of all drift bottles were recovered, although percentage returns from individual stations ranged from 10 to 70 (fig. 1). Generally, drifters released in the center of the study area were recovered in greater numbers than those released nearshore or further offshore. Recoveries of drifters from the two lines nearest shore were usually made within 10 days of release, while most of those returned from the outer lines were recovered within 60 days of the release date. Recoveries made more than 60 days after release were disregarded. The overall percentage of surface drifters recovered was less than the average overall percent recovery for surface drifters released during July in Phase I and II (45%). Most drifters were found on the Gulf of Mexico beaches between Port O'Conner, Texas and Marsh Island, Louisiana, although a few were returned from beaches to the south and east of these points or in the lagoons and bays.

The net-drift velocities were calculated from the straight-line distance and elapsed time between release and recovery and thus are minimum velocities. Calculated values ranged from 0.70 to 25.2 km/day.

The drift pattern indicated by the July 2, 1975 release of surface drifters was much less complex than that observed in Phase I for the same general area. Offshore surface drift was uniformly northeast while nearshore drift was southwesterly. Surface drift in the outer release lines had a decidedly seaward-directed component in contrast to the shoreward component in the nearshore. Drift rates were generally higher and more uniform offshore than inshore.

DISCUSSION

Results of this study appear to be consistent with the concept of seasonal drift patterns controlled by seasonal winds as observed in previous studies. The contrast between the simple drift patterns observed in this study and the more complex patterns seen in Phase I probably results from variations in wind circulation in the years studied. Kimsey and Temple (1974) have noted that the pattern characteristic of a given season can be delayed, stopped prematurely or modified by winds atypical of the season.

Two distinct differences were noted in this study compared to Phase I. First, the nearshore drift was much more uniformly southwest than in earlier studies. Secondly, the present study showed the surface drift to have a decidedly seaward component in the offshore as opposed to a shoreward component in the summer drift of the earlier studies. This difference can be attributed to the more northerly wind direction during the month following the July 1975 release date (fig. 2). A discussion of rates and directions of drift relative to seasonal variation in wind direction, drift convergences, and onshore-offshore components of drift may be found in Hunter and others (1974).

ACKNOWLEDGMENTS

We are greatly indebted to the United States Coast Guard for providing the air-drop support and to the officers and airmen who flew the missions. The Miller Brewing Company continued their invaluable logistic support by contributing bottles to the project for which we are grateful. Mr. Ronald J. Miller and Mr. Michael E. Dorsey are thanked for the assistance during this investigation.

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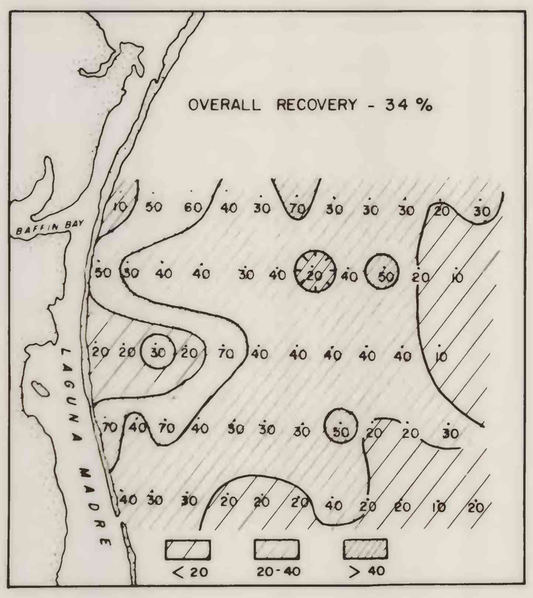


Figure 1.-- Percent recovery at each release point

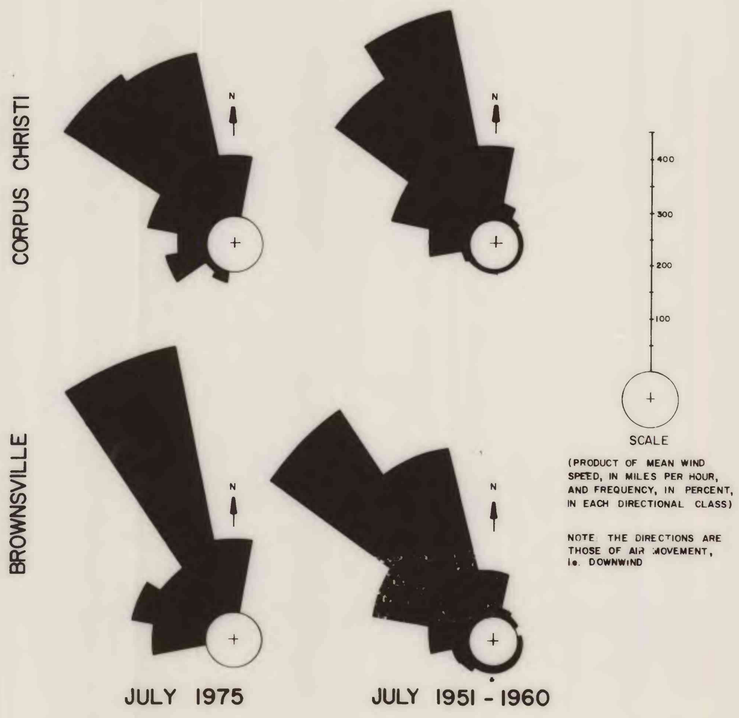
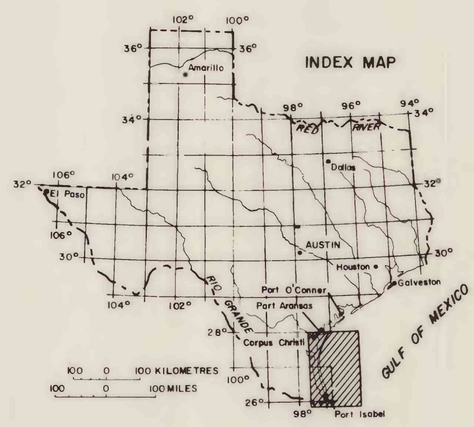


Figure 2.-- Comparison of July 1975 wind patterns with those of July 1951-1960 at Corpus Christi and Brownsville, Texas (NOAA,1975a,b; U.S. Weather Bureau,1962,1963)



MAP SHOWING
SUMMER DRIFT PATTERNS OF SURFACE WATERS OVER THE SOUTH-CENTRAL TEXAS CONTINENTAL SHELF

By

Gary W. Hill, Carroll A. Pyle, and Louis E. Garrison

1976

U.S. Geological Survey
OPEN FILE MAP
This map is preliminary and has not been edited for conformity with Geological Survey standards or nomenclature