

DISTRIBUTION OF BROWN SHRIMP (*Penaeus aztecus aztecus* IVES) AS RELATED TO TURBID WATER PHOTOGRAPHED FROM SPACE¹

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ABSTRACT

Visual evidence of probable relief currents in the northwestern Gulf of Mexico is provided for the first time by photographs taken from Gemini spacecraft. After rectification of photographs of the Continental

Shelf off the Texas Coast, a comparison of the position of relief currents to areas of high shrimp production indicates that photography from space can be a valuable tool for fishery research.

Oceanographers long have predicted the existence of relief or rip currents between Galveston and Corpus Christi, Tex. (Sweitzer, 1898; Smith, Medina, and Abella, 1951; Curray, 1960), and navigators have called the area the "Whirlpool of the Gulf" (U.S. Coast and Geodetic Survey, 1949). The offshore relief currents result from the convergence of southerly and northerly currents, which causes a piling up of water that is relieved by an offshore flow. The buildup and eventual release of waters in the Galveston-Corpus Christi area are continuously recurring sequences of events related to the total Gulf system.

Visual evidence of countercurrents, which have never before been documented by oceanographic techniques, is apparently provided by figure 1. This figure is a reproduction of a color photograph taken by NASA (National Aeronautics and Space Administration) from an altitude of 330 km. on November 14, 1966. In addition to showing the distribution of suspended material in bay and Gulf waters, the discharge patterns from the bays, the major eddy currents, and the relative direction of the currents, we believe it illustrates clearly the long-suspected phenomenon of rip or relief currents.

Sediments in the water provide the contrast that permits us to see the interaction of the coastal current systems. Perhaps the most obvious feature is

the discharge of sediment at the entrances to Lake Charles, La., and Sabine Lake and Galveston Bay, Tex. Large volumes of sediment in these areas are being carried into the Gulf and immediately transported southward by an alongshore current. Less noticeable but vastly larger are two areas of discolored water south of Galveston that extend eastward. These plumes of suspended material are aligned by moving water and most likely represent the areas of rip or relief currents predicted by oceanographers. The plumes, outlined in figure 2, are believed to be semipermanent features of the Gulf current system, although their locations, intensity, and dimensions undoubtedly fluctuate throughout the year. Obviously, they must have some effect on the bottom sediments and nutrient supply.

Our conclusions admittedly are conjectural because of the lack of necessary detailed physical and chemical data from oceanographic and bottom surveys made in and around the areas under consideration. A definite relation does exist, however, between the shrimp catch, trawling frequency, and the plumes shown in figure 2.

Rectification of the Gemini photograph to ONC (Operational Navigation Chart) No. 24 (fig. 3) revealed that the plumes were in BCF (Bureau of Commercial Fisheries) statistical area 19 and the lower portion of area 18 (fig. 4). The best

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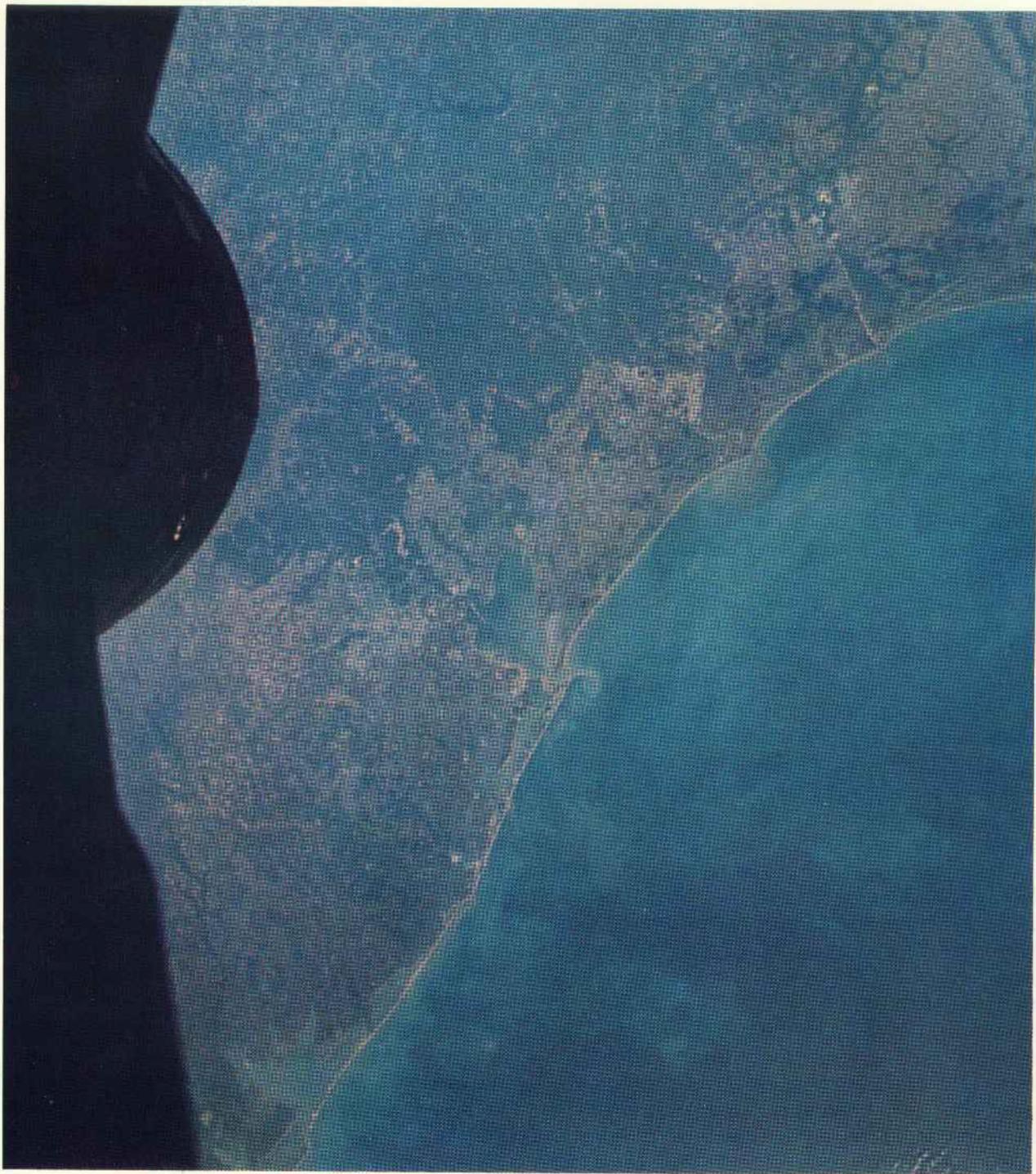


FIGURE 1.—An unrectified Gemini photograph of the northwestern Gulf of Mexico, from an altitude of 330 km. Matagorda Bay, Tex., is to the lower left and White Lake, La., to the upper right. The direction of the wind can be determined from the smoke trailing offshore near White Lake. The discharge patterns from the bays and the southerly along-shore currents are plainly visible. What appear to be offshore relief currents are evident south and east of Galveston, Tex. The white dots along the right margin are clouds; a portion of the Gemini craft is on the left margin. (NASA color photograph S-66-63034, taken by James A. Lovell, Jr., and Edwin E. Aldrin, Jr., November 14, 1966 (1300 hours local time), during Gemini Flight XII).