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A METHOD OF SURVEYING UNDERWATER FISHING OBSTRUCTIONS ASSOCIATED WITH

OFFSHORE OIL DEVELOPMENT (August 18, 1975)

by

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Introduction

The U.S. Government, in cooperation with various state government agencies, universities, oil and gas companies, and other organizations, is organizing to carry out multidisciplinary scientific studies of potential oil and gas lease areas. These studies include baseline assessments and field and laboratory investigations of both the chronic and acute effects of offshore oil development on the oceanic environment and particularly on living marine resources.

In 1973, the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS), other government agencies, interested fishermen, and oil and gas companies, planned and executed a survey off the coast of Louisiana in the north-central Gulf of Mexico. The operation was conducted by the NMFS Southeast Fisheries Center's (SEFC) Fisheries Engineering Laboratory, with the participation of:

Gulf States Marine Fisheries Commission  
Louisiana Shrimp Association  
Mississippi Shrimp Association  
Offshore Operators Committee  
United Gas Pipe Line Company  
U.S. Geological Survey  
U.S. Army Corps of Engineers  
U.S. Coast Guard  
U.S. Department of Defense - Navy  
Bureau of Land Management

The survey area was recommended by the Louisiana Shrimp Association, based on the location of extensive oil and gas developments and previous experience with numerous trawl hangs by members of the Association. In 1972 it was estimated that damage caused by these obstructions in the Gulf of Mexico substantially increased the price of shrimp.

NMFS was requested by fishing industry representatives to provide a means of locating and identifying underwater obstructions resulting from oil and gas exploration. A survey of available techniques revealed two possible candidate systems - a snag boat system and a hydroacoustic system. Use of the snag boat was discarded due to excessive operational expense, slow survey operations, and lack of target identification. In the case of the hydroacoustic system, a very high resolution, narrow beam array, acoustical lens system was selected. The rationale for the use of this type of system was that the obstructions could be small (5-cm pipe) and would probably be found in extremely turbid water.

As part of the Navy's Technology Transfer Program, the NMFS was made aware of the existing technology in high resolution hydroacoustical systems. Systems analyses of several commercial hydroacoustic systems revealed none to have the resolution, or the stability of the Navy's Shadowgraph System.

#### Objectives

In accordance with the mission of the NMFS-SEFC's Fisheries Engineering Laboratory, the following objectives were established for the survey operation.

- o Demonstrate the state-of-the-art in hydroacoustic technology is such that underwater obstructions on the ocean floor, capable of entangling a bottom trawl, can be located and identified.
- o Establish an effective operational survey technique, utilizing a towed submersible hydroacoustic device from a fisheries research vessel.

#### System Description (Figure.1)

The survey system selected is commonly called "Shadowgraph." It is a side-looking, high resolution sonar, which locates and classifies objects on the ocean floor. The system affords the shipboard operator a view in real-time

of the ocean floor within the sonar range, on storage type cathode-ray tubes and on paper recordings.

In its most basic configuration, the system consists of a towed submersible approximately 4.5 meters long, resembling a torpedo with wings, a multi-conductor tow cable and shipboard control console. The entire system is modular to accommodate a variety of towing vessels.

The underwater unit contains focused transducers which radiate lateral beams of ultrasonic energy over the bottom. These pulsed beams, laterally traversing the bottom, reflect from any objects lying on it. The echos returning from the targets, including the bottom, are synchronized, processed, and returned to the deck module for display.

The underwater unit is launched from the stern of the tow ship by means of a davit. The davit picks the vehicle up from its carrying cradle and lowers it over the stern.

The electrical conductors which carry the power, control signals, and sonar signals are encased in a stainless steel armored tow cable which is mounted on a winch at the stern of the vessel.

The deck module consists of a console in which the paper recorder and two storage tubes on which real-time pictures of the ocean floor are displayed. The console also contains the control circuitry for controlling the depth of the towed vehicle. Power for the complete system is supplied by a diesel generator mounted on deck.

#### Survey Operations (Figure 2)

The NOAA'S National Oceanic Survey's R/V OREGON II was used as the survey platform during the operations.

To locate the obstructions accurately,  $\pm 20$  meters, a precision navigational system was installed and operated aboard the research vessel. The obstruction survey operation took place in selected oil lease blocks off the Louisiana

Coast from July 29 through August 2, 1973 as follows:

Survey Block 128 Ship Shoal Area	29 July 1973
Survey Block 175 Ship Shoal Area	30 July 1973
Survey Block 299 Eugene Island Area	30 July 1973
Survey Block 192 Ship Shoal Area	31 July 1973
Survey Block 207 Ship Shoal Area	1 August 1973
Survey Block 160/167 Ship Shoal Area	2 August 1973

Each survey was started at the center point of the lease block (3.43 square kilometers) as located by the precision navigational system. Approximately 61-meter increments of track pattern were acquired within each selected test area (Figure 2). Oil platforms were used to calibrate the precision navigational system.

With poor visibility in the turbid waters, underwater optical systems could not be used to verify the identity of the obstructions; however, because of previously acquired experience with the Shadowgraph System, many of the obstructions could be identified with confidence. A number of targets were determined to be fish schools.

#### Results and Conclusions

The obstructions were marked with a buoy during the survey for location and removal by the appropriate government organization. A report of the survey, with location of obstructions, was given to all participating groups.

In conclusion, the feasibility of locating and identifying underwater obstructions, using hydroacoustic technology, was demonstrated satisfactorily.

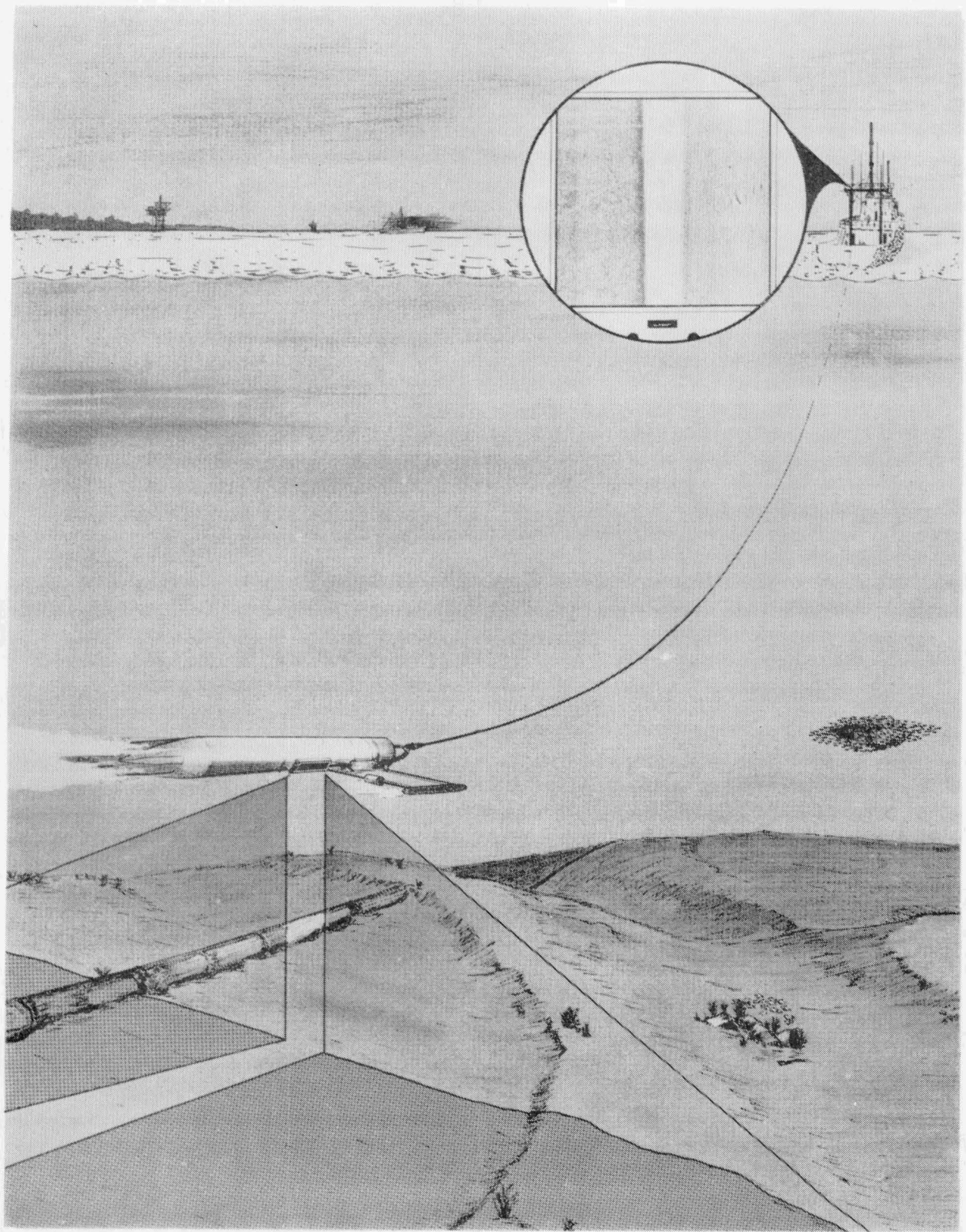


Figure 1. Shadow Graph Survey System



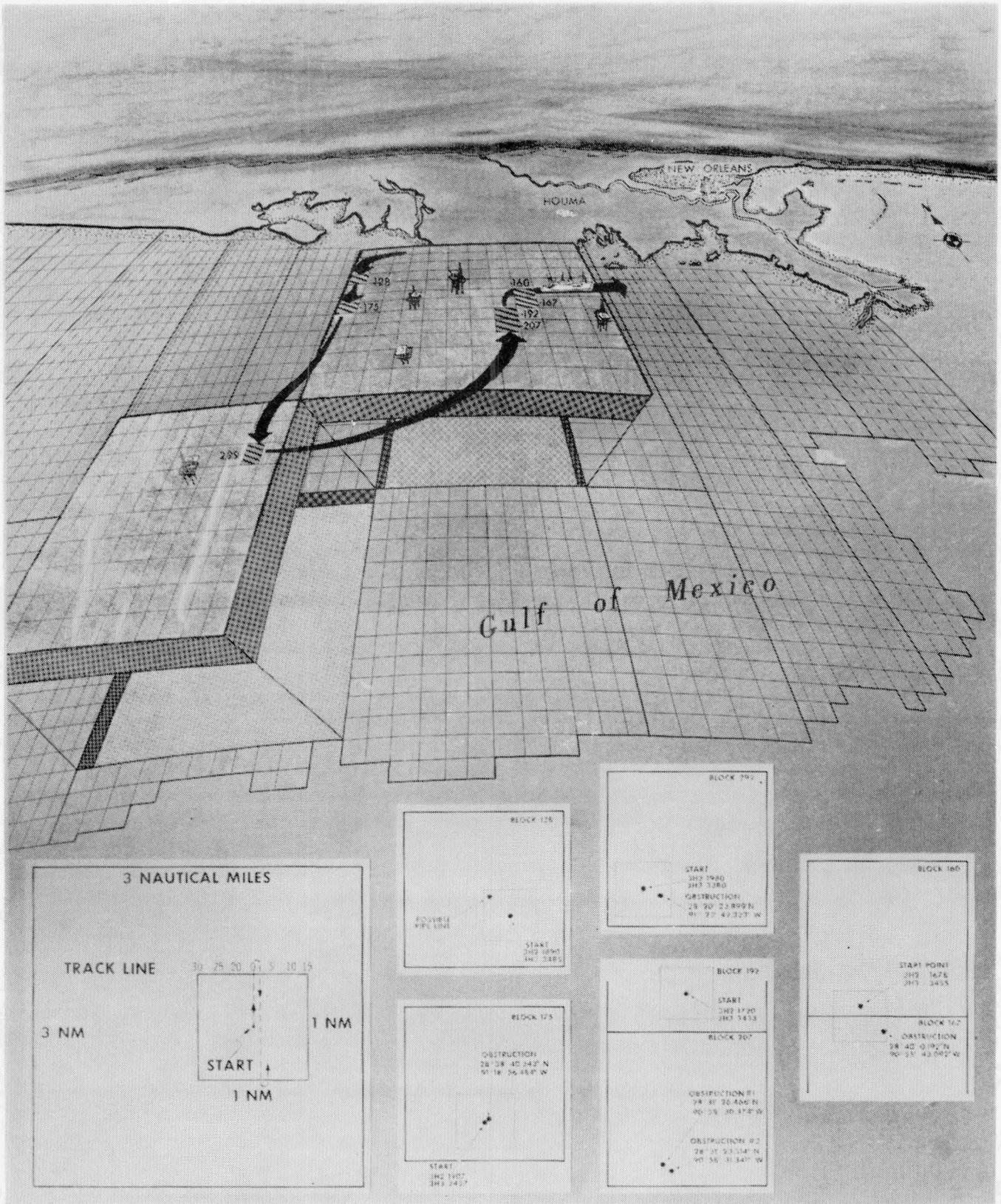


Figure 2. Survey Operations