SECTION 91

FISHERIES RESOURCE IDENTIFICATION AND ASSESSMENT STUDIES

by

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INTRODUCTION

With the establishment of a Fisheries Engineering Laboratory at the Mississippi Test Facility in 1970, the NMFS fisheries resource identification and assessment studies gained considerable momentum. These studies are an integral part of a broad program designed to accelerate the application of advanced technology to fisheries resource assessment, development and prediction. Program coordination activities were shifted from the Space Oceanography Program of NAVOCEANO to the National Environmental Satellite Service as part of NOAA in October 1970. Program activities in remote sensing have continued in several areas. (Figure 1). These areas are the development of low-light-level image intensifiers, spectrometers, aerial photography, and lasers for the location, identification and quantification of living marine resources at or near the sea surface. Other studies have included the development of a biologically controlled impoundment for remote sensor investigations and limited activities in fish oil film research. In addition to these remote sensing studies, the NMFS program at MTF is participating in space oceanography studies related to fisheries and in the ERTS-A and Skylab experiments. This report will deal with those aspects of the NMFS program related to fisheries resource identification and assessment during the period 1970 and 1971.

RESULTS AND DISCUSSION

FISH OIL FILM STUDY

Development of techniques to locate and identify fish oil films on the surface of the ocean were terminated in 1971 with the conclusion of a feasibility study conducted by Government Systems Division, Baird Atomic, Inc. Although these studies indicated a measurable reflectance

of the materials tested, it was considered as being impractical to continue instrumentation development until such time as the understanding of the biological structure of fish oil films was established. Up to the present time, we have been unable to collect or isolate biologically generated fish oil films on the surface of a body of water. Studies are presently being initiated at MTF to establish the feasibility of generating fish oil slicks under controlled laboratory conditions. As this technique is developed, instrumentation tests to sense these films will be reinitiated. A part of the study being conducted at MTF includes an attempt to understand the relationship, if any, between naturally formed fish oil films and the occurrence of stocks of fish.

SPECTROMETRIC FISH LOCATION

Experiments of the TRW Systems Group marine resource spectrometer were successfully concluded in November 1971. These experiments, conducted over a period of several years, strongly suggest that the location and identification of fish stocks at the surface of the water will require spectrometers of a different configuration than the one utilized in these experiments (Figure 2). As reported by TRW, "Spotting fish on an instantaneous basis using a spectrometer mounted on an airborne platform is not recommended." They continue, "If additional studies are to be pursued for the development of a stock assessment and management tool, TRW recommends an instrument utilizing a selectable differential wave band technique." The NMFS is continuing investigations in the application of spectrometers to living marine resources by conducting an inhouse investigation of the physical and biological criteria necessary to spectrometrically locate and identify fish stocks at the surface of the ocean.

PHOTOGRAPHIC IMAGERY

Investigations of the application of photographic imagery as a tool for assessing living marine resources continues at MTF in cooperation with the NMFS Pascagoula Fisheries Laboratory and the NASA Earth Resources Laboratory also located at MTF. Photographs obtained in the Northern Gulf of Mexico in the summer of 1971 are being analyzed to establish reference keys and procedures for the interpretation of aerial imagery of fish schools. This project is not attempting to advance the state of the art of aerial photography. It is being conducted to determine discrete reference keys which can be utilized in resource assessment by the evaluation of aerial photography. Photographs are being analyzed to determine optimum heights of operation and to identify unique schooling characteristics which will assist in the determination of fish school type.

REMOTE SENSING TEST FACILITY

Success in the application of remote sensing instrumentation to living marine resources has been seriously retarded by the lack of a standardized biological observation area with which to gain discrete engineering data points concerning the performance of remote sensors. In 1971, a small freshwater impoundment located in one of the buildings at MTF was utilized for this purpose in aerial photography and in spectrometer tests with TRW (Figure 3). Following a series of field operations in 1970 which had limited success, it was decided that a closed tanklike impoundment was the most practical and efficient manner in which to acquire significant engineering data. This project is continuing with the conversion of the freshwater system to saltwater, and an enlargement of the impoundment system to a size necessary for reasonable simulation of biological environments. This facility is available for the testing of any instrumentation concerning biological phenomena from above the surface of the water.

LASER FISH LOCATION

Activities in the application of laser sensing techniques have been limited to monitoring the development of systems applicable to fisheries resource assessment. Experiments under controlled conditions and field tests are being designed to take advantage of any laser system as it becomes available to the NMFS.

FISH LOCATION AT NIGHT

Low-light-level image intensification application has proceeded in an orderly fashion. Several low-light-level systems were investigated and a system manufactured by RCA was selected for initial field testing. Tests were conducted off the Oregon and Washington coasts, and in the Gulf of Mexico over naturally appearing schools of fish. In addition, controlled experiments were conducted at MTF utilizing a military type system as well as the system selected for field testing (Figure 4). Saury, anchovies, euphausid shrimp and menhaden imagery was obtained and is currently under analysis. Preliminary results indicate that a video low-light-level system will be applicable to resource assessment. Commercial potential of this technique will most likely be developed by the fishing industry utilizing a direct view system to assist in locating fish concentrations. Information gained in the field tests is considered adequate for the design of a resource assessment system utilizing low-light-level television. The system design currently under way will include optimum platform, sensor instrument, data acquisition, and data analysis techniques to produce usable information in resource assessment.

CONCLUDING REMARKS

With the development of the NMFS Marine Resource Assessment, Monitoring and Prediction Program (MARMAP) the recognition of remote sensing has taken a considerable move forward. Aerial remote sensing is an integral part of the MARMAP program and with the cooperation of NASA and other agencies is anticipated to significantly accelerate the acquisition of usable information about living marine resources over the next 5 years.

REFERENCES

_____ - Study: Fish Oil Films on the Sea Surface. Final Report Prepared for U.S. Naval Oceanographic Office. Contract No. N62306-69-C-0354. October 1970. Baird-Atomic, Inc. 125 Middlesex Turnpike, Bedford, Massachusetts.

Ramsey, R.C. - Marine Resources Spectrometer Experiment. Final Report Prepared for U.S. Naval Oceanographic Office. Contract No. N62306-71-C-0153. November 19, 1971. TRW Systems Group, Redondo Beach, California.

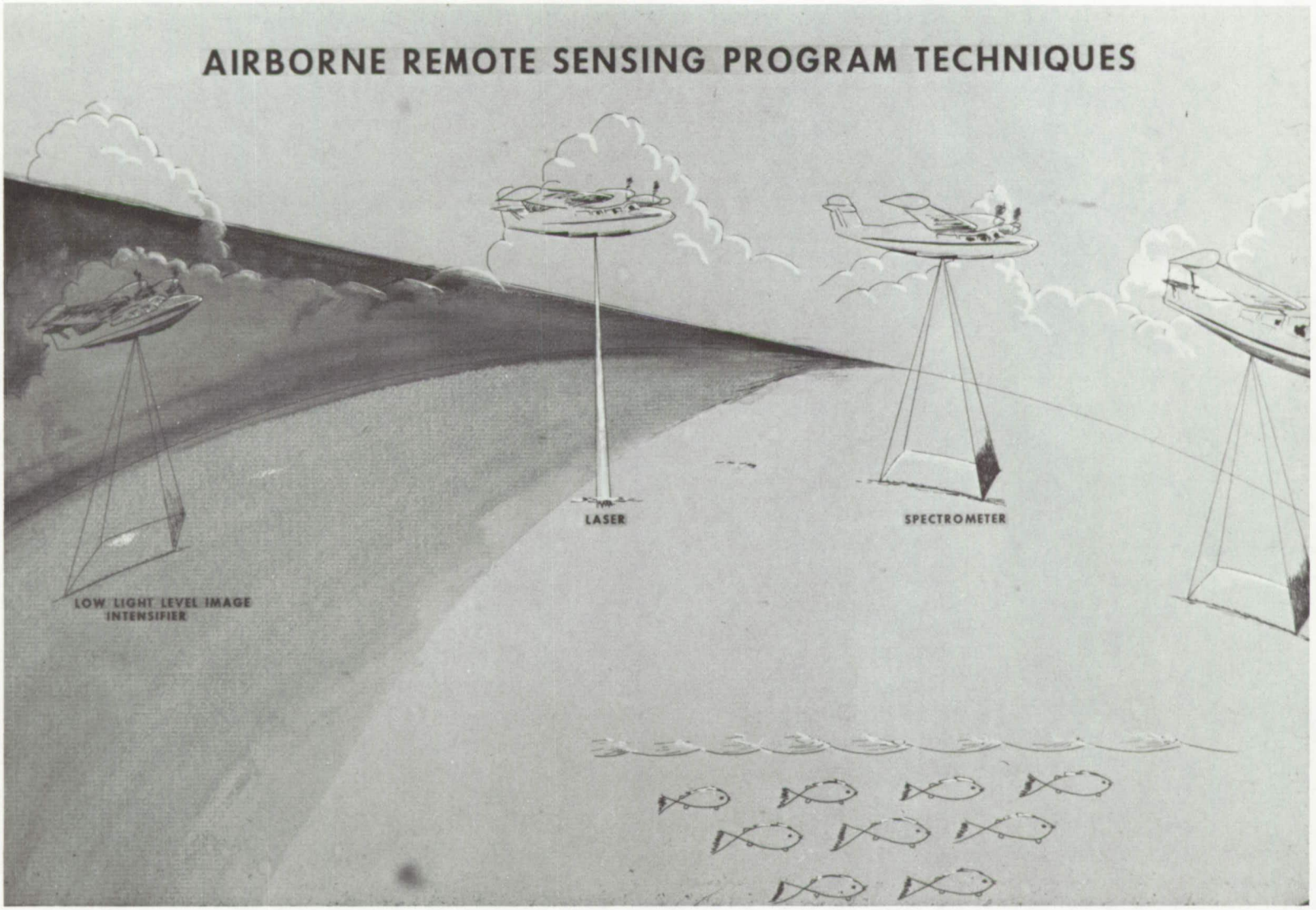
LEGENDS

Figure 1 - NMFS airborne remote sensing program techniques. Artistic depiction of low-light-level image intensifiers, spectrometers, aerial photography and lasers for the location, identification and quantification of living marine resources at or near the sea surface.

Figure 2 - Representative configuration of spectral signatures obtained with TRW Marine Resources Spectrometer.

Figure 3 - NMFS freshwater impoundment utilized in spectrometer and aerial photography tests. The tank is 22 ft. high and 15 ft. in diameter, and located in a building 110 ft. high at MTF. Test instruments were installed 84 ft. above the surface during tests utilizing known fish concentrations for targets.

Figure 4 - Bioluminescing targets of menhaden schools recorded by LLLTV system in Mississippi Sound October 1971. Motion of the fish school through luminescing plankton results in discrete outlines of entire fish school surface area.



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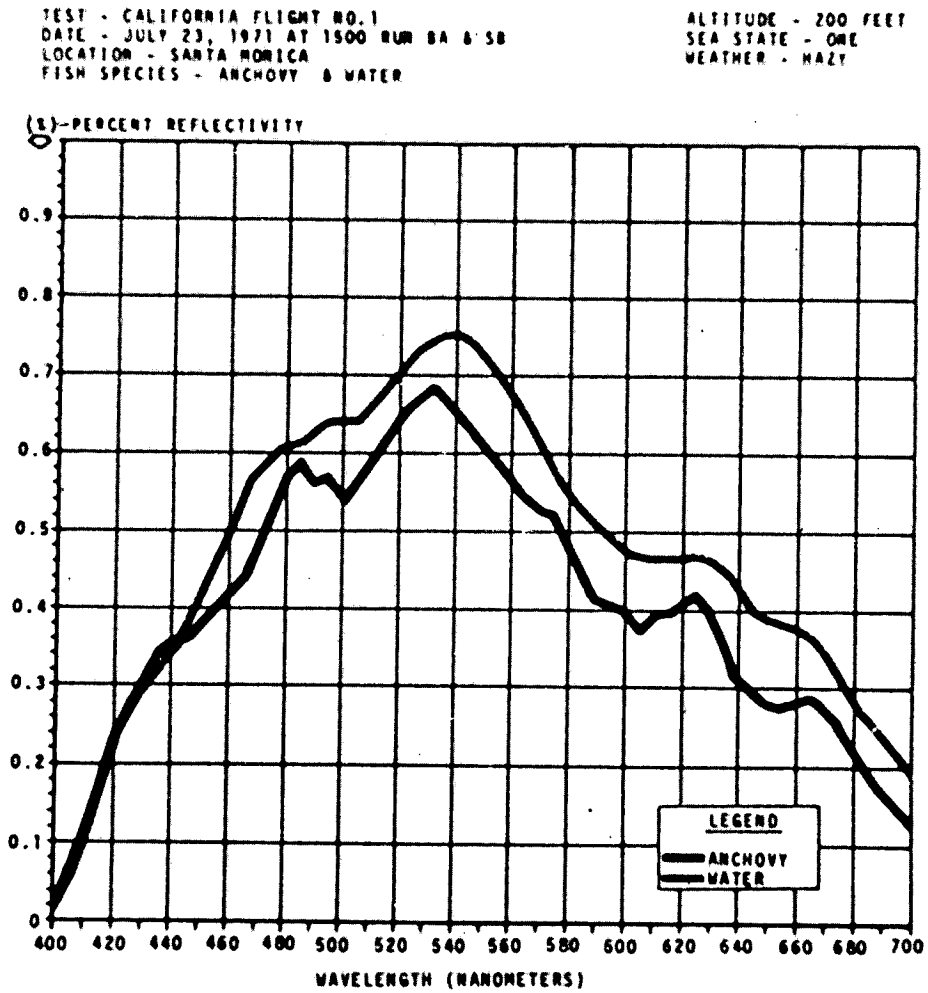
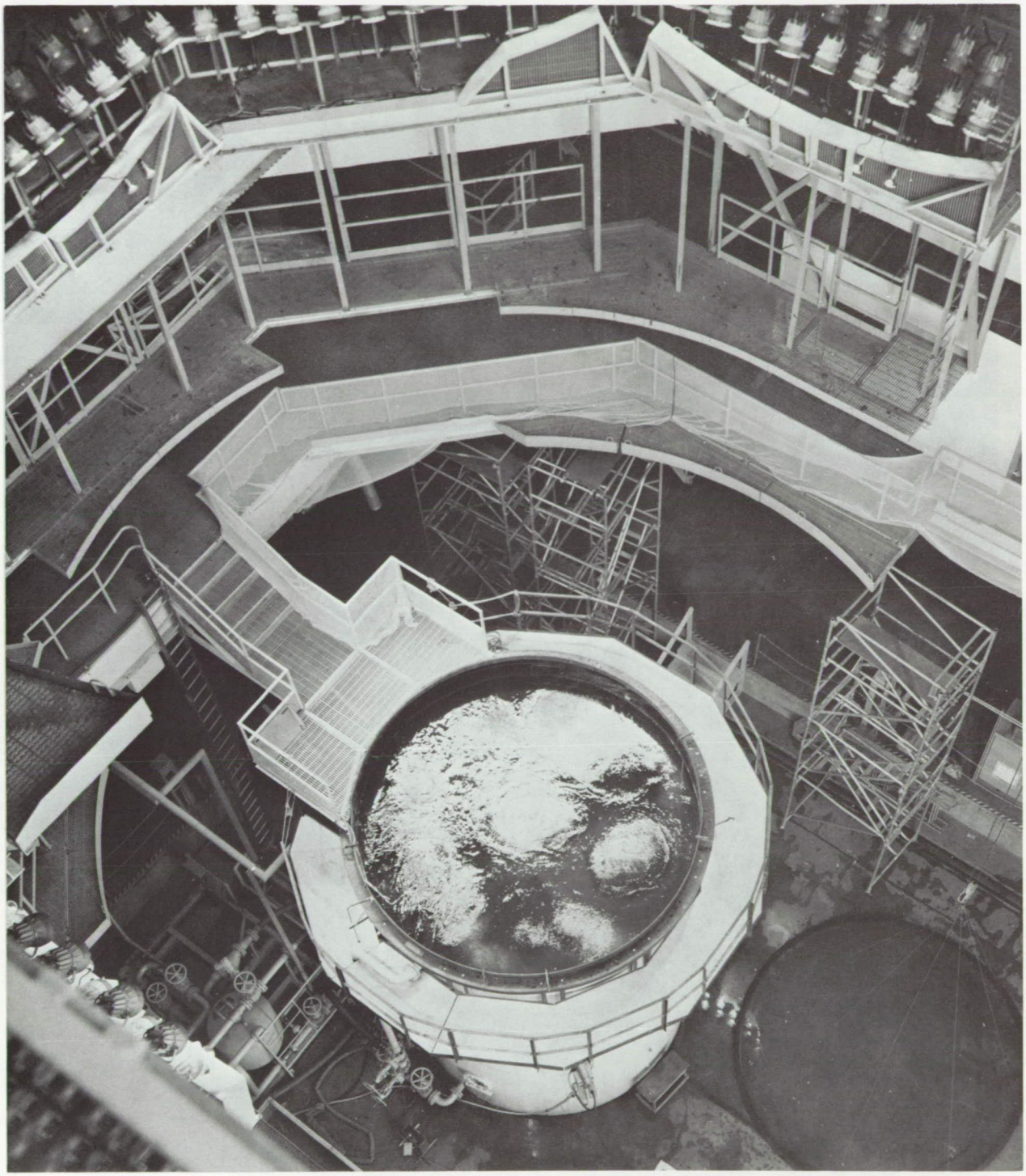


Figure 2 - Representative configuration of spectral signatures obtained with TRW Marine Resources Spectrometer.



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