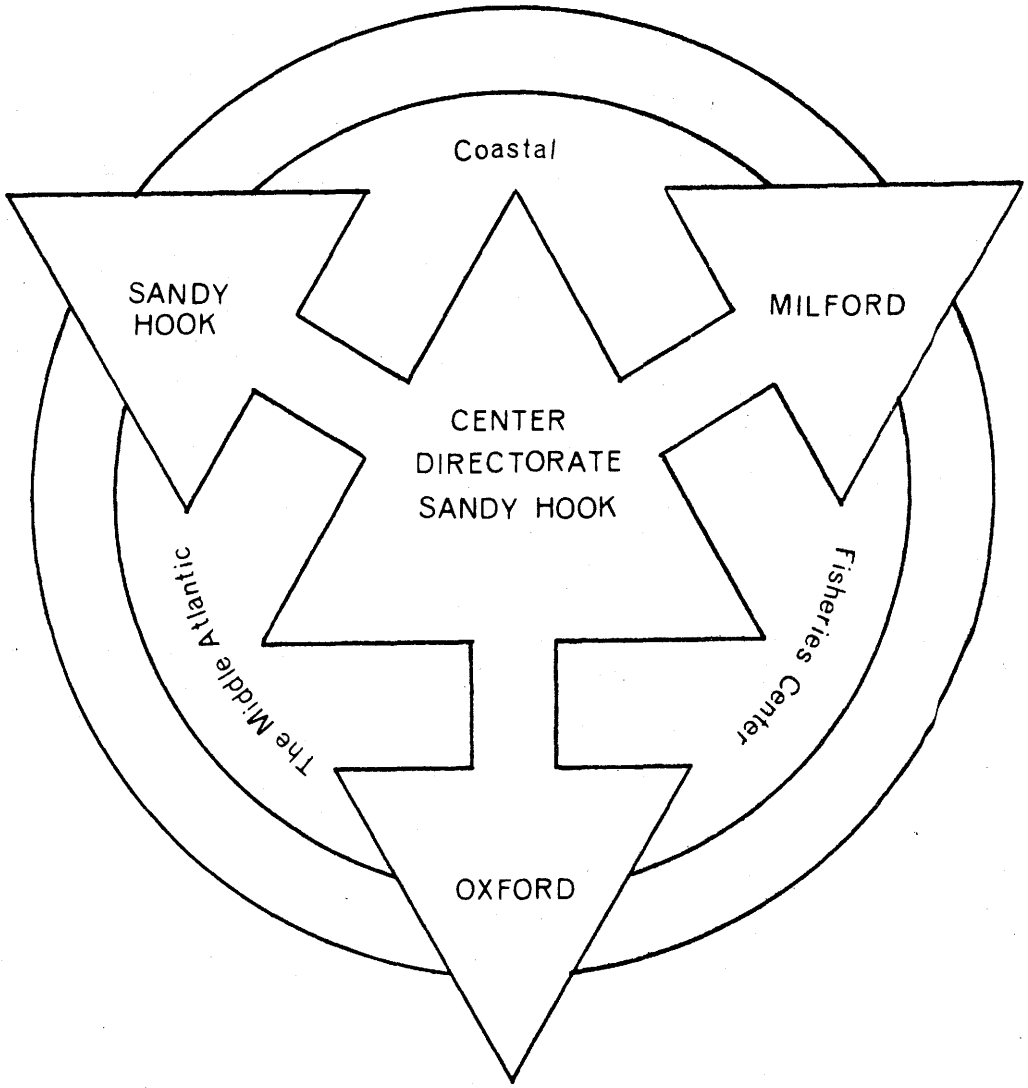
Research Proposal for Support of Studies:
PHOTOSYNTHETICALLY ACTIVE RADIATION FOR THE NEW YORK BIGHT APEX AND RARITAN - LOWER BAY AREAS

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Region

MIDDLE ATLANTIC COASTAL FISHERIES CENTER



Informal Report No. 105

March 23, 1976

Research Proposal

Submitted by

Middle Atlantic Coastal Fisheries Center
National Marine Fisheries Service
National Oceanic and Atmospheric Administration

to

MESA New York Bight Program Manager
Marine Ecosystems Analysis Program
National Oceanic and Atmospheric Administration

for support of studies:

PHOTOSYNTHETICALLY ACTIVE RADIATION FOR THE NEW YORK BIGHT APEX AND RARITAN - LOWER BAY AREAS

Total Amount Requested: $4,409.00

Date: March 23, 1976

Approved by: John B. Pearce

John B. Pearce, Director
Ecosystems Investigations

Carl Sindermann

Carl J. Sindermann, Director
Middle Atlantic Coastal Fisheries Center

Justification and Use

We propose to measure and record continuously the quantity of incoming photosynthetically active radiation (P.A.R.) reaching the earth's surface in a representative area for the New York Bight apex and Raritan - Lower Bay. To do this we plan to use the Lambda Quantum Photometer (LI-192S) and Integrator modified to record. This instrument matches our existing field instrumentation and does measure P.A.R. Such measurements have particular relevance to our research as well as to the research of others (Malone) investigating primary productivity in the estuarine and coastal waters of the New York Bight as follows:

1) The observed integral primary productivity on a particular day (g C m^{-2} day^{-1}) will largely be regulated by the total number of quanta of P.A.R. P.A.R. in turn is affected by atmospheric conditions. Generally, single daily productivity observations are extrapolated to periods of weeks or months. Extrapolations based on productivities measured under overcast or otherwise nonrepresentative light conditions will be poor. It is necessary, therefore, to know just how typical or atypical field days are relative to weekly or monthly periods.

2) A detailed knowledge of P.A.R. levels prior to primary productivity measurements may aid our understanding of dissolved organic matter (DOM) productivity. We have some evidence that DOM may contribute more to total productivity during periods of low illumination.

3) We need to know available P.A.R. integrated over time in order to relate for purposes of prediction the magnitude and timing of recurrent annual events such as spring bloom, summer red tide, and the fall collapse of phytoplankton production. Such events may be related to the maximum intensity (I max) of P.A.R., to the average intensity over a period of time, to the total daily integral, or to day length.

Other Available Sources of P.A.R. Data

There are no stations in the New York metropolitan area measuring P.A.R. In fact there are no known operating stations in the New York area measuring incident radiation on a continuing basis. The National Weather Service stations for measuring total incident radiation (not P.A.R.) using the Eppley Pyranometer have been discontinued in the New York area. The station at Newark, New Jersey, closed several years ago and the station at Central Park shut down in May 1975. The closest NWS stations for measuring total incident radiation are located at Blue Hill, Massachusetts, and Sterling, Virginia. Neither of these stations are representative of the New York Bight and Raritan - Lower Bay sampling area and neither measure photosynthetically active radiation. As a consequence no data source for P.A.R. in the New York area is available.

Location

In proposing the location for the instrument the suitability of the location was considered. That is, could meaningful measurements be obtained, would they be representative of the sampling area, could the location of the instrument be guaranteed as being reasonably permanent

during the next five years, and could the instrument be successfully operated with consideration being given to personal interest in the data obtained as well as to accessibility for surveillance, maintenance, and data retrieval?

The sensor unit of the Lambda Quantum Photometer is to be mounted at Sandy Hook 4.5 ft above the peak of the roof of building 74 (40°27'30"N, 74°00'14"W). From this vantage point the sensor would receive unobstructed input of P.A.R. between sunrise and sunset at all times of the year. Admittedly the sensor only views 180° in a horizontal plane. As a consequence due to its elevation above sea level approximately 30 seconds of the record would be lost at sunrise and 30 seconds would be lost at sunset. However, at these times the angle of the sun is so low that little P.A.R. penetrates the water surface. Thus the loss of P.A.R. information due to the sensors height above sea level would be insignificant indicating that meaningful and valid measurements could be obtained from this location.

This location is reasonably representative of the New York Bight apex and the Raritan - Lower Bay sampling areas. Data from locations to the north or west of Sandy Hook would probably be less representative of the apex area due to air pollution. An instrument located at Ambrose Light Tower would probably be most representative of the apex, but less so for the Raritan - Lower Bay area. The problem of data retrieval could be greater at Ambrose because personnel involved would not have a primary interest in the program.

The location of the instrument is expected to be permanent for the foreseeable future and should result in the accumulation of a number of years of reliable data allowing comparisons to be made from one year to another.

Operation

At this location the instrument can be successfully operated principally because of the proximity of the instrument to the personnel who are most interested in obtaining and using the data. The instrument will be mounted in such a way that not only will it provide valid readings, but also that it will be easily accessible for surveillance and maintenance on a daily basis if need be. The sensor surface must be visually inspected frequently to ensure that it is clean and unobstructed by debris (including fecal matter from birds). The instrument is battery powered and so will be independent of house current. However, the recorder must be monitored to ensure that is is functioning properly. It will be located within 100 ft of the sensor and yet where it can be viewed constantly throughout the working day. Such a location could be the new telephone switchboard to be located on the main floor of building 74. In case of malfunction Dr. Thomas, Mr. O'Reilly, or Ms. Evans would be notified. If only the recorder was malfunctioning readings could be made one each hour either by the switchboard operator or by one of the personnel listed above while a spare recorder is hooked up. If more serious malfunctions occur we do have an integrator and sensor which we use at sea that could be used while

repairs are made. The integrator, however, is not a recording type and would necessitate the presence of someone to take the readings. Our past experience with Lambda indicates that one week turnaround times for repair are realistic. Thus in our judgement adequate backup exists for the instrumentation so that few if any days of data should be lost due to equipment malfunctions.

Data Retrieval, Processing and Distribution

The printed tape from the recorder with hourly values of photosynthetically available radiation in recorder units will be sent weekly to ADP where the values will be keypunched on cards. The cards will be processed through a program which will convert the recorder units to Einsteins based on a constant. The hourly values in Einsteins will be added cumulatively to make a daily total. The daily values will be added cumulatively to provide a yearly value.

From this information a listing would be produced from a cumulative data tape at the end of each month. The listing would consist of year, month, day, Julian day, time in hours and minutes EST, hourly readings of P.A.R. in Einsteins, cumulative hourly readings for each day, a daily total reading, cumulative daily total readings for each month and year, and an annual reading. The listing would be sent to the MESA New York Bight Project Office and others as requested. An updated copy of the data tape will be sent to the MESA Office every six months; the first tape to be sent January 1977.

BUDGET

PERSONAL SERVICE

Computer Programmer GS-9 4 wks	$1037	
Data Transcriber GS-4 2 wks	306	
Total Direct Labor	$1343	
Benefits (9.6% Total Direct Labor)	129	
TOTAL PERSONAL SERVICE		$1472

OPERATIONS

Equipment (Lambda Quantum Photometer & installation	$1643	
Computer Time	100	
Supplies	100	
TOTAL OPERATIONS		1843

SUPPORT

(33% of Personal Service & Operations)	1094
TOTAL PROJECT COST	$4409