

**Ships of Opportunity (SOOP)
History**

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What today is the Ecosystems Monitoring Group began as two components of the Marine Resources Monitoring and assessment (MARMAP) Program in 1970, the Atlantic

Environmental Group (AEG) in Washington, D.C. and the MARMAP Field Group (MFG) located in Narragansett. The MFG developed and implemented design standards during the program start-up. The MFG began a long standing collaboration with agencies in the United Kingdom for the extension of the Continuous Plankton Recorder (CPR)

Survey into the western North Atlantic and for the development of the Undulating Oceanographic Recorder (UOR), both using ships of opportunity (SOOP). The Atlantic Environmental Group (AEG) focused on the Atlantic-and Gulf of Mexico- wide sampling and analysis of physical and chemical oceanographic features in support of MARMAP.

An important component of the group involved a cooperative effort with the US Maritime Administration (MARAD) to use merchant, and other ships of opportunity for the collection of oceanographic data, in particular via expendable bathythermographs.

In 1976 the AEG moved to Narragansett and at that time MARMAP and AEG were merged to form one program dealing with fisheries related research. At its peak nearly 40 SOOP vessels were employed monitoring Atlantic continental shelf areas from Canada to Mexico for temperature, salinity, meteorology, neuston, tar and plastics, phytoplankton and zooplankton. Through the years the program has had a variety of names, and has interacted with a large number of institutions with regard to funding, logistics, personnel, and scientific analyses (Table 1).

In the early years, approximately 1974-1980, the program was known as the NMFS/MARAD and utilized those vessels in the Middle Atlantic Bight, which had MARAD cadets on board. Later an agreement was established with the US Coast Guard at Governor's Island N.Y. to increase utilization of Coast Guard Cutters for XBT/CPR and neuston work. During this period responsibility for operations, logistics, maintenance and supply of equipment was the responsibility of AEG (SOOP). The US Navy was supplying XBT's .

In 1985 NOAA's National Ocean Service (NOS) developed the Volunteer Observing Ships Program (VOS). Since it was modeled after SOOP, Narragansett's program became a member of the NOS VOS program. SOOP then became a part of a global monitoring effort under this VOS umbrella. During this period the NOS supplied probes, equipment, and software. SOOP Narragansett was responsible for installation, training, and additional field support from Maine to New Jersey, including the Great Lakes. Travel money for meeting, training and outfitting additional ships came from NOS. In 1996 the NOS VOS program was moved to AOML Miami and is currently under the Global Ocean Observing Systems (GOOS) center.

In 1997 a Thermosalinograph program was established at the GOOS center. It tasked the VOS program with a global effort to collect transect based sea surface salinity. It's funding expired in 1998 and has been unsupported since that period. Under this program the NMFS Narragansett was responsible for data processing, while AOML GOOS was responsible for all other support. We assisted in all vessel installations but the lead was clearly within the GOOS center.

From 1961 through 1974 the Oceanographic Laboratory in Edinburgh, Scotland, conducted monthly monitoring of the zooplankton and larger phytoplankton between Cape Sable, Nova Scotia and Boston, Massachusetts using the Hardy Continuous Plankton Recorder (CPR) (Hardy 1939). In 1972 the U.S. National Marine Fisheries Service

(NMFS), and the U.K. National Environmental Research Council developed an Aide Memoir for the extension of the long-term CPR survey into additional areas of the western North Atlantic, and for the joint development of instrumented towed bodies to use in this survey. On the U.S. side the resulting monitoring program has been designated as the MARMAP Ships of Opportunity Program, or SOOP. In the U.K. the program is termed the Continuous Plankton Recorder Survey, and is now managed by the Sir Alister Hardy Foundation for Ocean Science (SAHFOS) in Plymouth, England. Three monthly sampling routes along the U.S. northeast coast (Fig.1) have resulted from this cooperation. These routes are meant to supplement the time and space coverage of the “Research Vessel” surveys, and to allow examination of spatial and temporal variations at scales smaller than those permitted using “Research Vessel” data. The year 2000 marks the 40th since sampling began on the Gulf of Maine, the 30th on the Middle Atlantic Bight, and the 8th on the Georges Bank routes.

In 1991, through SAHFOS, 10 m temperature, salinity, and chlorophyll measurements were added to the Georges Bank route. Since it’s beginning on the Northeast Continental Shelf, more than one hundred commercial, military, academic and private vessels have participated. The enthusiasm and dedication of hundreds of officers and crew, and the generosity of the owners have been the major factor in this program’s success. Collaborators for the current northwest Atlantic SOOP routes are Bermuda Container Lines, Hamilton, Bermuda (since 1980); and Eimskipafelag, Icelandic Steam Shipping Company, Reykjavik, Iceland (since 1931); NOAA National Weather Service; NOAA National Ocean Service; NOAA Environmental Research Laboratories (AOML); and Sir Alister Hardy Foundation for Ocean Science, Plymouth, U.K. The current three sampling routes are shown in Figure 1. Because they are sampled by merchant ships, the areas covered are best described by polygons rather than a straight line transect.

Route MC extends from the Massachusetts/New Hampshire coast of the United States to Cape Sable, Nova Scotia, a distance of approximately 450 km, crossing Massachusetts Bay, Wilkinson Basin, the central Gulf of Maine ledges, Crowell Basin, and the western Scotian Shelf.

Route MB extends from Ambrose Light off New York City toward Bermuda for a distance of approximately 450 km crossing the continental shelf, passing through shelf water, and usually extending into Gulf Stream water. This route is extended further than the 450km by a co-operative XBT program with URI/GSO. Narragansett currently process all of GSO’s XBT data.

Route EB begins off Nantucket Shoals, Massachusetts and extends along the outer flank of Georges Bank (approximately at the 100 m isobath) towards Halifax, Nova Scotia.

Current Status

Table 2 summarizes the current agencies involved with SOOP monitoring of the US northeast shelf ecosystem and details the nature of the collaborations, each party’s responsibilities, and sources and amounts of funding. As you will note from Table 2 there are fewer funded resources, and many fewer participants than in previous years. Funding for equipment, software design, deep water XBT probes, and TSG unit calibrations comes totally from AOML GOOS in Miami. Shallow water, (<200m), T-10 probes have been supplied by the US Navy.

Changing relationships with collaborating organizations, and anticipated changes in funding sources are expected. Table 3 summarizes where immediate planning is required. As of December 6, 2000 the GOOS Center has agreed to support equipment for the TSG program if we supply 1) data and calibration sample processing, and 2) a website or ftp location for data dissemination **. TSG calibration samples have historically been processed by Miami but due to the lack of technical assistance that process if it is to continue will have to be provided by Narragansett. No increase of workload would be involved as we were processing the surface samples prior to the TSG installation, and the number of samples is approximately the same.

**Pending Group Leader approval, and upon arrival of a Memo of Understanding from AOML.

For additional information visit the following web pages:

SEAS – [HTTP://dbcp.nos.noaa.gov/seas/seas.html](http://dbcp.nos.noaa.gov/seas/seas.html)

SOOPIP – [HTTP://www.ifremer.fr/ird/soopip](http://www.ifremer.fr/ird/soopip)

AOML/GOOS – [HTTP://aoml.noaa.gov/general/phod](http://aoml.noaa.gov/general/phod)

Table 1. Interagency Coordination, Cooperation and Contracts during the Establishment of the MARMAP Program. (From: Jossi et al in review)

Nature of Interaction	Institutions	(* = contract)
<p>Technical assistance for MARMAP surveys- Manuals, gear, gear tests and demonstration, laboratory methods</p>	<ul style="list-style-type: none"> • NOAA /NMFS: NWAFC, SWFC, GCFC, SEFC, AEFC, NEFC • NOAA / ERL: OCSEAP, AOML • U.S. Mar. Admin. • U.S. Coast Guard • States: ME; MA; RI; SC*; FL; AK • Universities: Miami*; ME Vocational Inst.; RI; WA; ME Mar. Acad.; MA Mar. Acad.; VI Inst. of Mar. Sci.; CT; Hokkaido U., Japan; Sail Education Assoc.; Cape Fear Tech. Inst.; MI.; Southern ME Tech. Inst. • Industry: Normandeau Assoc.; Raytheon Corp.; Marine Research Inc.; Pandullo Quirk Associates; Ichthyological Assoc.; TRIGOM; TRW Corp.* • International: Poland*; United Kingdom*; Spain; France; Mexico; Venezuela; Columbia; UN /F.A.O; Smithsonian Inst.*; Coop. Invest. Of the Caribbean and Adjacent Regions (CICAR); Coop. Invest. NE Central Atlantic (CINECA); Coop. Studies of the Kuroshio (CSK); E. Gulf of Mexico Coop. Invest. (EGMEX); Fish. Res. Bd. of Canada, St. Andrews; ICNAF; Mexican Oceanic Sorting Center 	
<p>Collection and analysis of biological, oceanographic, and marine pollutant data</p>	<ul style="list-style-type: none"> • NOAA /NMFS: NWAFC ; SWFC; GCFC; SEFC; AEFC; NEFC • NOAA /NWS, NOS, EDS • U.S. Coast Guard • U.S. Mar. Admin. • UNations IOC /WMO • States: SC* • Universities: Harvard.; OR.; FL; ME*; RI*; TX A. & M*; SUSIO*; Sail Education Assoc.; Rutgers U.*; Bowdoin C.*; Lehigh U.*; MIT.* 	
<p>Development of MARMAP Information System</p>	<ul style="list-style-type: none"> • NOAA /NMFS: MARMAP Field Group; Atlantic Environ. Group • NOAA / Environmental Data Service • Smithsonian Inst.* • U. of Rhode Island* 	
<p>Bionumeric code development</p>	<ul style="list-style-type: none"> • NOAA /NMFS: MARMAP Field Group; SEFC • NOAA / Environmental Data Service 	

Development of Undulating Oceanographic Recorder	<ul style="list-style-type: none"> • NOAA/NMFS: MARMAP Field Group; • NOAA/Engineering Development Lab.* • Inst. For Marine Environmental Research, United Kingdom* • Plessey Ltd., United Kingdom*
Development of opening-closing device for plankton samplers	<ul style="list-style-type: none"> • NOAA/NMFS: MARMAP Field Group; NEFC • U. of Washington*

Table 2. Current agencies involved with the SOOP located in Narragansett and there committed responsibilities. Lead agency indicated by a *

Data type	Data and Samples	Data processing	Collaborators on Analysis	Funding Amount Annual figures
CPR-NMFS*	NMFS Narr.*	NMFS Narr.*	NMFS Narr.*	\$12K NMFS Narr.
XBT-NMFS*	NMFS Narr.*	NMFS Narr.*	NMFS Narr.*	\$32k AOML GOOS/Navy
TSG-AOML GOOS*	NMFS Narr.**	NMFS Narr **	NMFS Narr. AOML,GOOS*	\$1.2k AOML GOOS
ADCP-URI GSO*	URI GSO*	URI GSO*	URI GSO,* NMFS Narr.	\$120k URI GSO

** Pending approval by Group Leader. This is a request from AOLM and a MOU is forthcoming.

Table 3. Summary of area where budget planning for FY 2002 will need to be addressed.

Organization	Equipment	Travel	Expendable Bathythermograph Probes	Total funds required
NMFS Narr.	\$9k 3-Mk22a* \$6k CPR silk \$6k CPR parts	Oleander \$3k	\$9.8k Deep Blues	\$33.8**
AOML GOOS	TSG calibration \$1.5k	Miami \$3k		\$4.5
US Navy			\$12.6k T10's	\$12.6k
URI GSO	Unknown	Unknown	Unknown	\$120k
			TOTAL	\$170.9k

** represents a net increase of \$18.8k

* The MK22a is a replacement for the MK 12 card, which is currently used with SEAS version 4.54. Over the next year a newer Windows 95/98 version of SEAS is being developed this will necessitate an upgrade to the Windows compatible MK22a. We may have an option not to upgrade but we need to plan ahead in case we do.

References

Hardy, A. C. 1939. Ecological investigations with the Continuous Plankton Recorder: Object, plan, and methods. Hull Bulletin of Marine Ecology, 1:1-57.

Jossi, J. W.; Benway, R.L.; Goulet, J.R. In Review. MARMAP Ecosystem Monitoring: Program Description. NOAA Technical Memorandum NMFS-F/NEC, 1-30.

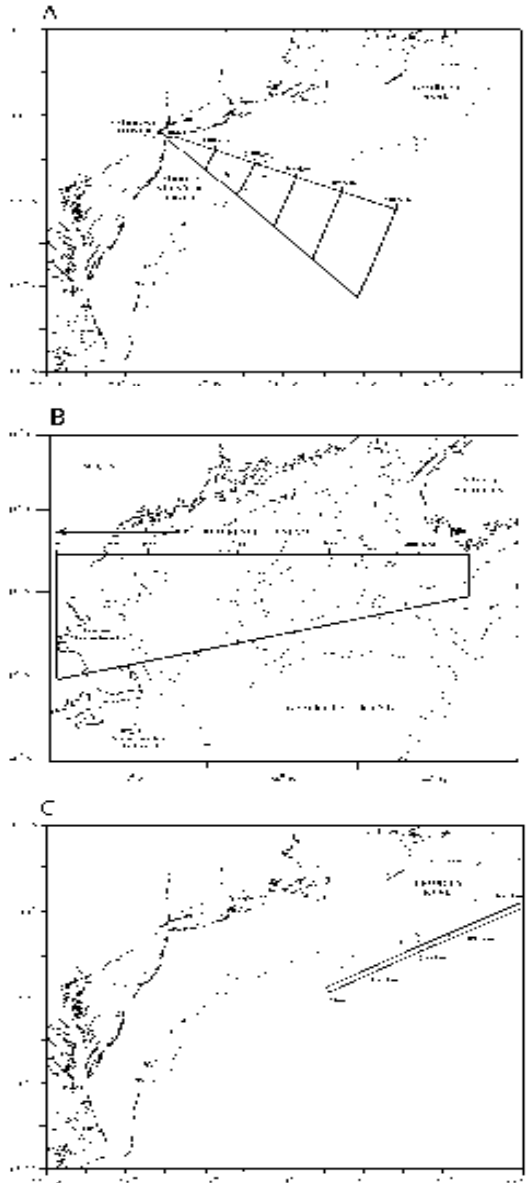


Figure 1. United States/United Kingdom cooperative ships of opportunity (SOOP) routes across the US Northeast Shelf Ecosystem. From Jossi, Benway, and Goulet, 2000.