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FISCAL YEAR

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WASHINGTON, D. C. 20390

PREFACE

Personnel of the Oceanographic Surveys Department, Naval Oceanographic Office, participated in 99 deep ocean and nearshore surveys during Fiscal Year 1968. The surveys were conducted for seven Office designated operational projects which are under the cognizance of the Oceanographic Surveys Department. This report summarizes the objectives of the seven projects and the surveys completed in Fiscal Year 1968.

The report is arranged by projects and includes brief descriptions of the projects, the surveys conducted, and the work accomplished on the surveys. Twenty-six figures are presented showing the ships' cruise tracks and/or survey area locations. The centerpiece is a composite of the ocean areas surveyed in Fiscal Year 1968. Table I lists the cruises and the data collected, and Table II lists the unclassified publications reported during the fiscal year.

The numbered paragraphs are informative descriptions of each cruise or survey. Included are the names of chief scientists and/or project coordinators, information as to where the data are located, and what kind of report, if any, is planned or being prepared. The paragraph number is a reference number assigned which corresponds with the ships' tracks or area locations in the figures and the cruise summaries in Table I.

This report was compiled and edited by Mr. Lloyd W. Wilson, Survey Information Branch, Nearshore Surveys Division.

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I. ASW/USW OCEANWIDE SURVEY: Project 101

The purpose of the ASW/USW Oceanwide Survey Project is to obtain information in strategic areas for the support of Navy weapon systems that must operate in the ocean medium. The information gathered will also support scientific and economic needs.

The project provides for the collection, processing, analysis, storage, display, and dissemination of oceanographic information to assist the U.S. Navy in fulfilling its mission. The general theme of the project is to conduct multipurpose surveys to support multiple Navy needs by using the oceanographic survey ships (AGS type) full time for the purpose that they were designed: namely, survey. Further, an attempt is made to place data acquisition on a production basis at sea and to effectively utilize ships, facilities, manpower, and money.

To meet the goals of the project, a new class of surveying ships has been designed specifically for efficient and systematic investigations of the oceans. The new ships are being built solely for NAVOCEANO oceanographic and hydrographic projects. Installed aboard the new ships is the automated electronic oceanographic surveying system, designated the Shipboard Oceanographic Survey System (SOSS). Two of the new ships, USNS SILAS BENT (T-AGS 26) and USNS KANE (T-AGS 27), have been delivered and were in operation during FY 1968.

In addition to the surveys of SILAS BENT and KANE, surveys for the ASW/USW Project also were performed aboard USS SAN PABLO (AGS 30) and a charter ship the R/V F.V. HUNT.

Sixteen cruises were completed for Project 101 during FY 1968, reference numbers 1 through 16. The BENT and HUNT cruises were in the Pacific Ocean, and the KANE and SAN PABLO cruises were in the Atlantic Ocean. Track charts of the cruises are shown in Figures 1 through 6.

1. Operation No. 938002, Figure 1.

BENT departed Hakodate, Japan, on 8 August 1967 prepared to conduct extensive oceanographic surveys in the North Pacific Ocean east of Kamchatka. Mr. F. A. Anderson was chief scientist. On 12 August, BENT was diverted to an area south of Amchitka Island, Alaska, to assist in the search for USS ROBERT L. STEVENSON (CHASE VI SALVOPS). BENT located STEVENSON with a deep-towed magnetometer and the Narrow Beam fathometer. Positive identification was accomplished with a deep sea camera. BENT returned to Japan, conducted a limited oceanographic survey in the Sea of Okhotsk, and proceeded to San Francisco, California, arriving there on 30 October. The BT and Nansen station data are on file at NODC under BT reference numbers 021183 and 021526

and cruise reference number 311160, respectively. All other data are on file at NAVOCEANO. A report, SP-120, has been published on the CHASE VI SALVOPS phase of the survey. Results of the Sea of Okhotsk phase of the survey will be combined with other survey data and incorporated in a final report for that area.

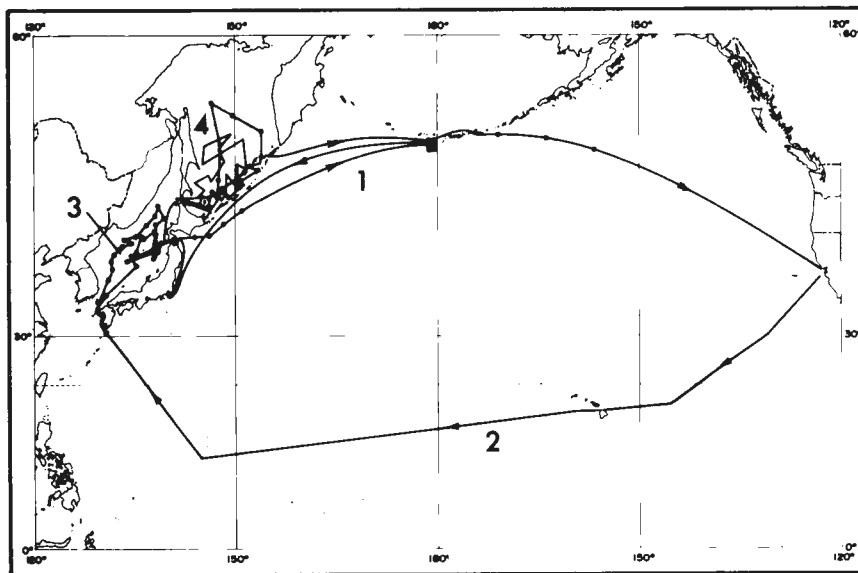


FIGURE 1. BENT Cruises, North Pacific

2. Operation No. 938010, Figure 1.

An oceanographic cruise was conducted in the Pacific Ocean aboard BENT from 15 to 28 March 1968. Mr. R. G. Engler was chief scientist. The cruise began at San Francisco, California, and ended at Sasebo, Japan. The purpose of the cruise was to obtain underway data from Guam to Sasebo and to plant buoy arrays in the Sea of Japan. Three current meter arrays and three thermistor arrays were planted. The BT data are on file at NODC under BT reference number 022083. The other data are on file at NAVOCEANO. An oceanographic cruise summary informal report and a final report will be prepared in FY 1969.

3. Operation No. 938023, Figure 1.

BENT surveyed in the Sea of Japan from 11 April to 14 May 1968. The objective of the survey was to collect oceanographic/geophysical and acoustic data. BENT operated in company with HUNT and was listening ship during acoustic operations. The two ships traveled slightly different tracks when collecting oceanographic/geophysical data. The cruise ended at Sasebo, Japan. Mr. G. H. Knoop was chief scientist. In addition to the data listed in Table I, 832 hours of current and 636

hours of temperature data were obtained by buoyed arrays. The bathymetric, magnetic, acoustic, current buoy array, and normal incidence data are on file at NAVOCEANO. The BT and Nansen station data are on file at NODC under BT reference number 022220 and cruise reference number 311244, respectively. An informal report will be prepared in FY 1969.

4. Operation No. 938029, Figure 1.

BENT and HUNT departed Sasebo, Japan, and collected oceanographic and acoustic data in the Sea of Okhotsk from 22 May to 14 June 1968. Locations of the tracks and stations were dictated by acoustic requirements for the ASW/USW Project. Following a 48-hour stopover at Soya Wan to monitor VLF/OMEGA, the primary navigational control, the ships entered the Sea of Okhotsk collecting underway and station data along separate tracks. For the acoustic work, HUNT served as shooting ship and BENT as receiving ship. The cruise terminated at Yokohama. Mr. F. A. Anderson was chief scientist aboard BENT, and Dr. H. C. Eppert, Jr., was chief scientist aboard HUNT. The data are on file at NAVOCEANO. A final report will be prepared in FY 1969.

5. Operation No. 938003, Figure 2.

An oceanographic survey was conducted north of Hawaii aboard HUNT from 13 July to 22 August 1967. Mr. C. L. Davis was chief scientist. The objective of the survey was to collect continuous seismic profiles, bathymetry, and sound velocities. These data are being used by the Underwater Surveillance Oceanographic Center (USOC) for a comparison with predicted oceanographic conditions based on historical data. The collected data are on file at NAVOCEANO. An oceanographic cruise summary informal report will be published in FY 1969.

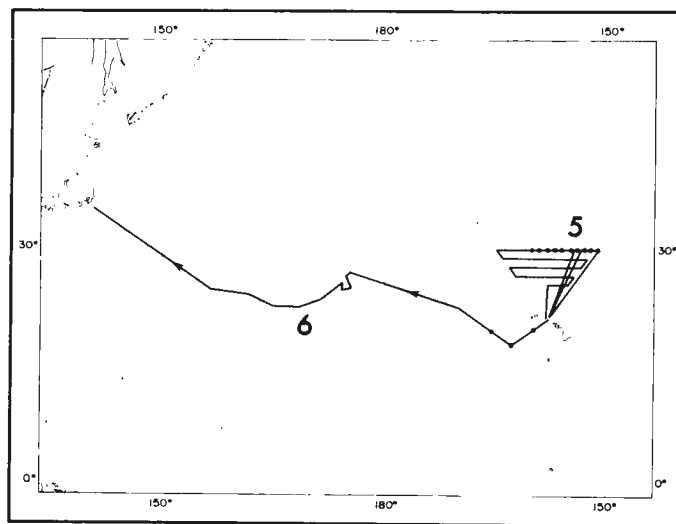


FIGURE 2. HUNT Cruises, North Pacific

6. Operation No. 938004, Figure 2.

An oceanographic cruise was conducted en route from Hawaii to Japan aboard HUNT from 22 August to 13 September 1967. Dr. H. C. Eppert, Jr., was chief scientist. The purpose of the cruise was to conduct a reconnaissance survey for the ASW/USW Project. Continuous bathymetric and seismic subbottom profiles were collected while underway, and sound velocity-depth-temperature (S/V-D-T) measurements were made at three stations. Radar, Loran A, and celestial methods were the means of navigation. Loran A was good only in the vicinity of Hawaii, therefore, celestial navigation was used most of the time. The data are on file at NAVOCEANO. An oceanographic cruise summary informal report and a final report will be prepared in FY 1969.

7. Operation No. 938005, Figure 3.

HUNT surveyed in the Sea of Japan from 14 September into October 1967. Mr. C. B. Duff was chief scientist. The purpose of the cruise was to conduct a reconnaissance survey for the ASW/USW Project. Continuous seismic and bathymetric profiles were obtained. The data are on file at NAVOCEANO. An oceanographic cruise summary informal report will be prepared in FY 1969.

8. Operation No. 938019, Figure 3.

HUNT participated in a survey in the Sea of Japan from 9 November to 12 December 1967. The survey was a continuation of a reconnaissance survey for planning an acoustical survey. Mr. R. H. Feden was chief scientist. The BT data are on file at NODC under BT reference number 022408. All other data are on file at NAVOCEANO. An informal report will be prepared in FY 1969.

9. Operation No. 938021, Figure 3.

An oceanographic cruise was conducted in the Sea of Japan aboard HUNT from 16 February to 1 March 1968. Mr. J. M. Wageman was chief scientist. The cruise was a reconnaissance survey for the ASW/USW Project. Continuous seismic profiles, bathymetry, 3.5 KHz Normal Incidence records, and expendable BT data were obtained. BT data are on file at NODC under BT reference number 021875. All other data are on file at NAVOCEANO. An oceanographic cruise summary and informal report will be published in FY 1969.

10. Operation No. 938025, Figure 3.

HUNT surveyed in the Sea of Japan from 11 April to 14 May 1968. The objective of the survey was to collect oceanographic/geophysical and acoustic data. HUNT operated in company with BENT and was source ship during acoustic operations. Dr. H. C. Eppert, Jr., was chief scientist. In addition to the data listed in Table I, 636 hours of buoyed array temperature

observations were collected. The data are on file at NAVOCEANO. An informal report will be prepared in FY 1969.

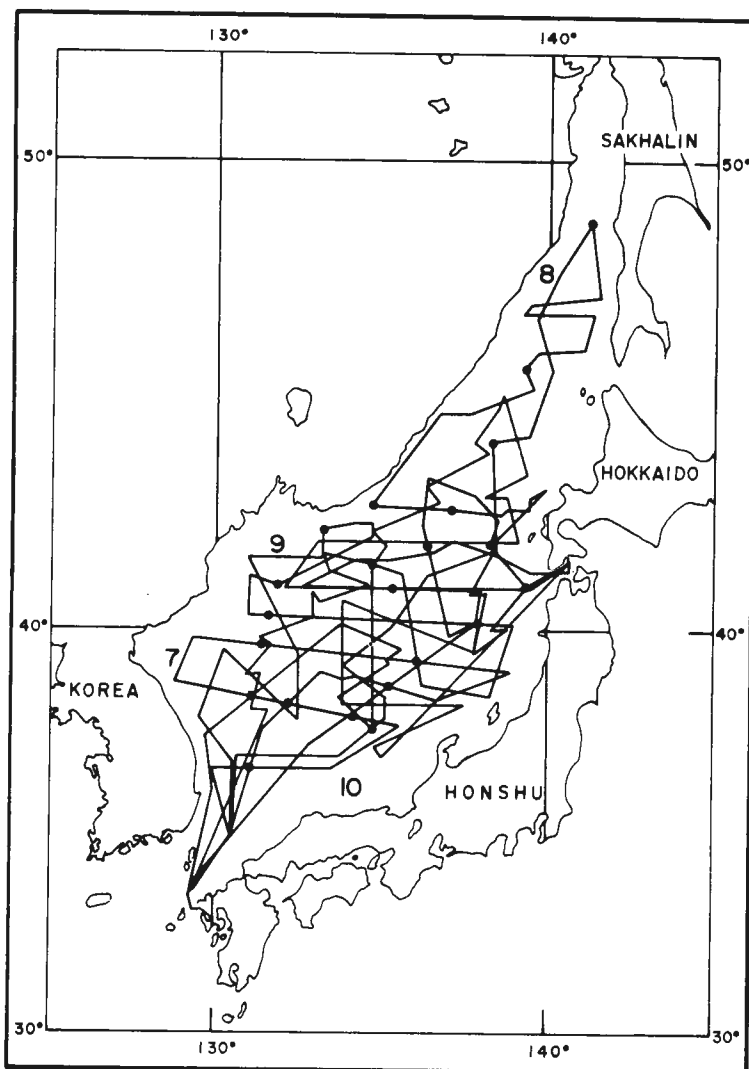


FIGURE 3. HUNT Cruises, Sea of Japan

11. Operation No. 938020, Figure 4.

An oceanographic cruise was conducted aboard KANE in the Caribbean Sea, south of Puerto Rico, from 29 November to 17 December 1967. Mr. M. W. Buell, Jr., was chief scientist. The objective of the cruise was to satisfy requirements of the Naval Undersea Warfare Center (NUWC), Pasadena, and to establish the feasibility of an area south of Puerto Rico as a test range for ships equipped with multiple sensors similar to those of the AGDE-1 class. The Nansen station data are on file at NODC under cruise reference number 311237. All other data are on file at NAVOCEANO. An informal report will be prepared in FY 1969.

12. Operation No. 938024, Figure 4.

KANE was employed for a survey northeast of Puerto Rico from 1 April to 5 May 1968. The survey was conducted in two phases; both phases were for testing and evaluating the magnetometer system. Mr. M. W. Buell, Jr., was chief scientist during the first phase, 1 through 18 April, and Mr. D. B. Smith was chief scientist during the second phase, 22 April through 5 May. The data are on file at NAVOCEANO. No NAVOCEANO report is planned.

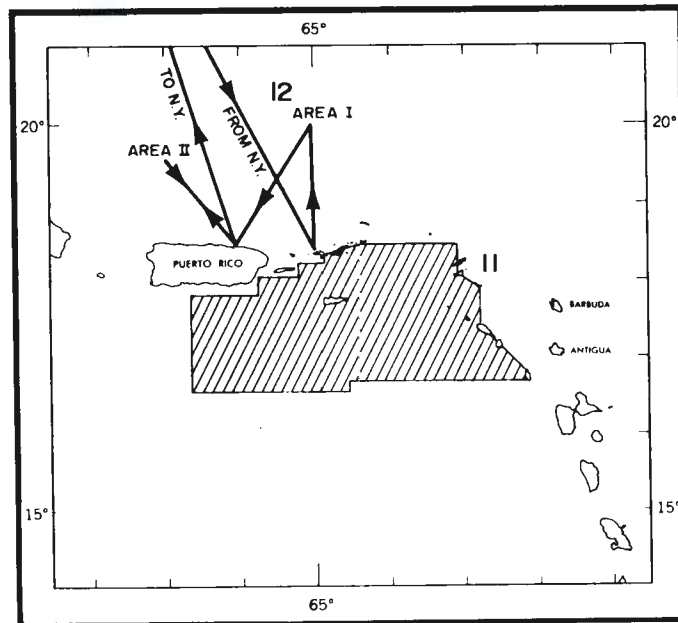


FIGURE 4. KANE Cruises, North Atlantic

13. Operation No. 938001, Figure 5.

An oceanographic survey was conducted south of Puerto Rico from aboard SAN PABLO between 11 August and 4 September 1967. Mr. R. H. Feden was chief scientist. This survey was a continuation of a special test area reconnaissance for the NUWC. The area is to be designated the AGDE-1 Test Range. Navigation was by VLF/OMEGA and Loran A. The major purpose of the survey was to continue bathymetric lines from previous surveys and to collect bottom samples to try and determine sediment transport in the area. The data are on file at NAVOCEANO. An informal report will be prepared in FY 1969.

14. Operation No. 938018, Figure 6.

SAN PABLO departed Philadelphia on 5 February 1968 for survey operations in the Gulf of Mexico. The transit to the operating area was used as a shakedown cruise for the seismic system. The seismic system produced unsatisfactory data. Only one of

three planned Nansen stations was occupied. The cruise ended at New Orleans, Louisiana, on 24 February. Dr. H. C. Eppert, Jr., was chief scientist. The Nansen station data are on file at NODC under cruise reference number 311245. The other data are on file at NAVOCEANO. An informal report will be prepared in FY 1969.

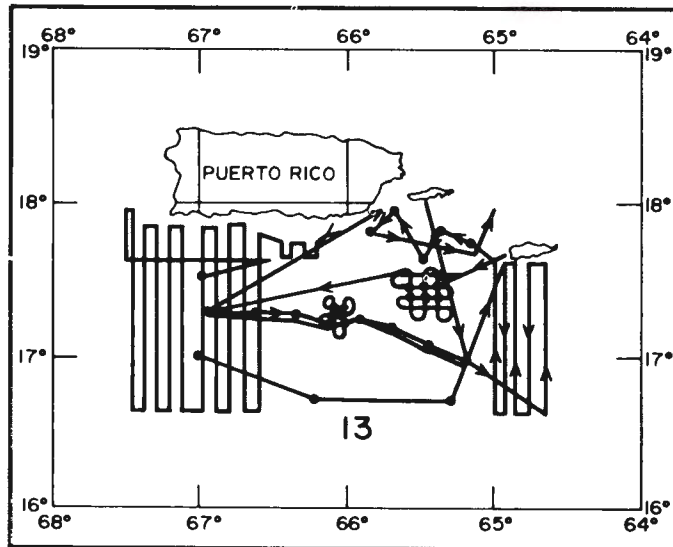


FIGURE 5. SAN PABLO Cruise, Caribbean Sea

15. Operation No. 938026, Figure 6.

SAN PABLO was used to survey in the Gulf of Mexico from 24 February to 8 April 1968. This cruise was a continuation of a five phase reconnaissance survey. Emphasis was placed on obtaining geophysical measurements, but other oceanographic data were collected. VLF was the primary means of navigation and, where possible, checks were made with Loran A and C. Weather and sea surface observations were made for the pilot project of satellite oceanography. The data collected will be used to further delineate the structural and tectonic problems associated with the geologic history of the Gulf of Mexico. Mr. R. H. Feden was chief scientist. The Nansen station data are on file at NODC under cruise reference number 311245. All other data are on file at NAVOCEANO. An informal report will be prepared in FY 1969.

16. Operation No. 938034, Figure 6.

SAN PABLO was used to survey in the Gulf of Mexico from 30 April to 3 June 1968. This cruise completed a five-phase reconnaissance survey. The purpose of the survey was to further delineate the areas of interest to be surveyed in a planned cooperative survey with the Geological Survey. A special shoal survey was accomplished off Tampico, Mexico.

A minimum water depth of 50 fathoms was found in an area where 6-1/2 fathoms had been reported. Mr. R. H. Feden was chief scientist. The BT and Nansen station data are on file at NODC under BT reference number 022227 and cruise reference number 311245, respectively. All other data are on file at NAVOCEANO. An informal report will be published in FY 1969.

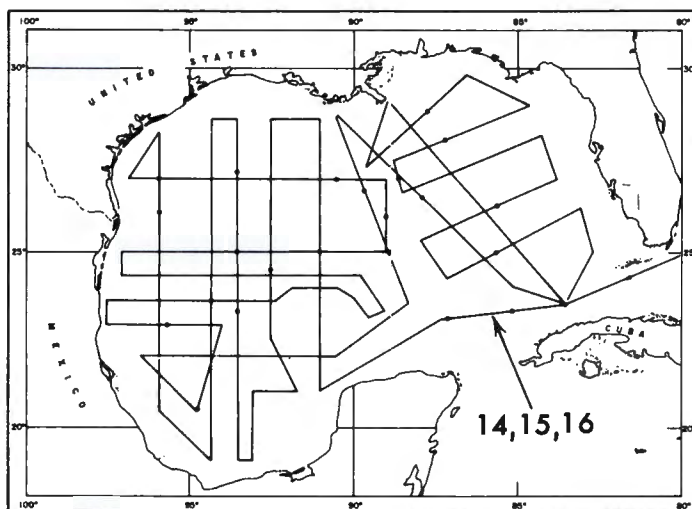


FIGURE 6. SAN PABLO Cruises, Gulf of Mexico

II. MARINE GEOPHYSICAL SURVEY: Projects 102/103

New Navy weapons systems and operating needs have established unprecedented demands for rapid, oceanwide environmental measurements. To meet these needs, the Marine Geophysical Survey (MGS) has begun an extensive survey to obtain oceanographic and geophysical data in areas of strategic importance. In addition, the efficient and systematic collection, compilation, and presentation of oceanographic and geophysical data are important to the Navy's immediate operational capability and to long range research.

The MGS is a statistical sampling of various physiographic provinces of the sea floor and the associated water masses. The underlying hypothesis of the measurement program is that the ocean is divisible into oceanographic and geophysical provinces which may be defined by a limited number of samples. This hypothesis is based on the water mass concept of oceanographers in addition to the physiographic province concept of geophysicists. The MGS type of survey provides a broad view of all survey areas from a small amount of survey time.

The MGS is conducted by contractors under the direction of the Naval Oceanographic Office. Contracts have been awarded to Alpine Geophysical Associates of Norwood, New Jersey, and to Texas Instruments, Inc., of Dallas, Texas. Nine surveys were conducted by the two contractors during FY 1968. The surveys were in both the Atlantic and Pacific Oceans. Each survey consisted of two-ship operations. All data collected were retained by the contractors. Reports were produced by the contractors and are listed in Table II.

Alpine Geophysical Associates, under contract number N62306-1688 and 2020, employed SEA SCOPE and BERTHA ANN on two surveys and SANTA MARIA and RUTH ANN on three surveys. Reference numbers 17 through 21 apply to those cruises performed by Alpine Geophysical Associates. Track charts of the cruises are shown in Figures 7 through 10.

17. Operation No. 938013, Figure 7.

From 2 July to 8 October 1967, SEA SCOPE and BERTHA ANN surveyed in the North Philippine Sea, contractor task area SEVENTEEN, and in transit from Japan to Honolulu, Hawaii. The survey consisted of two phases: A reconnaissance phase and a short acoustic phase. During the acoustic phase, two fine-grid bathymetric surveys were run. Messrs. C. W. Senicr, W. T. McComas, and R. K. Wilzer were NAVOCEANO project coordinators.

18. Operation No. 938014, Figure 8.

From 14 October to 7 December 1967, SEA SCOPE and BERTHA ANN surveyed in contractor task area SIX, a survey which began in March 1967. The ships departed Honolulu on 14 October,

made two acoustic details, and returned to Honolulu on 27 December. Messrs. J. V. Piani, C. W. Senior, and H. R. Ensminger were NAVOCEANO project coordinators.

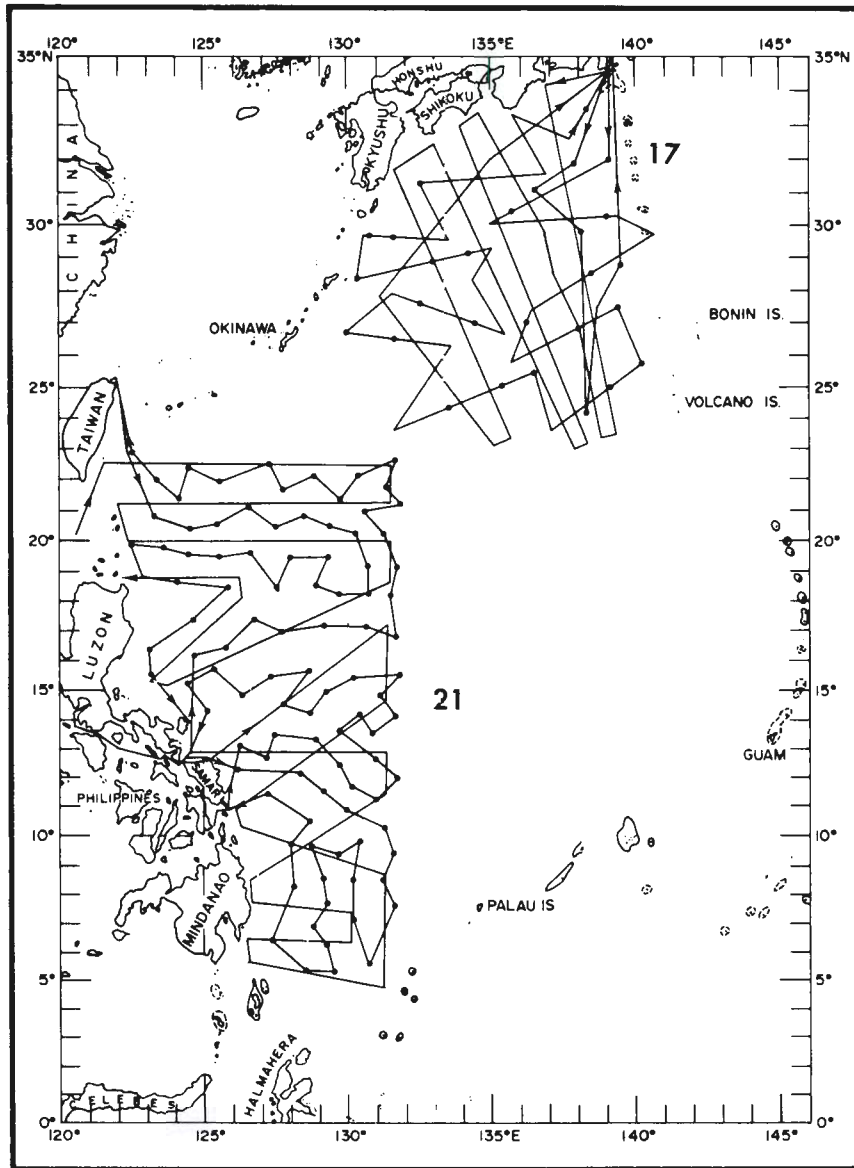


FIGURE 7. SEA SCOPE and BERTHA ANN Cruises, Philippine Sea

19. Operation No. 938011, Figure 9.

From 1 July to 3 September 1967, the MGS contract ships SANTA MARIA and RUTH ANN continued their transit voyage to the Indian Ocean. Reconnaissance (underway) data were collected throughout the cruise, and acoustic and oceanographic data were collected at selected sites. Mr. F. T. Derenge was NAVOCEANO project coordinator.

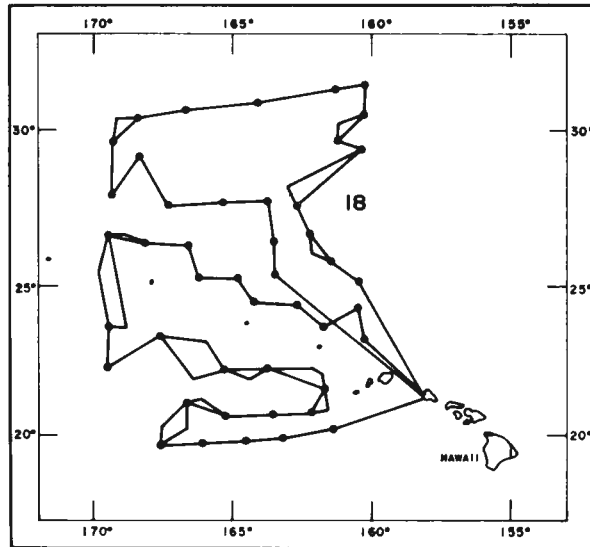


FIGURE 8. SEA SCOPE and BERTHA ANN Cruise,
North Pacific

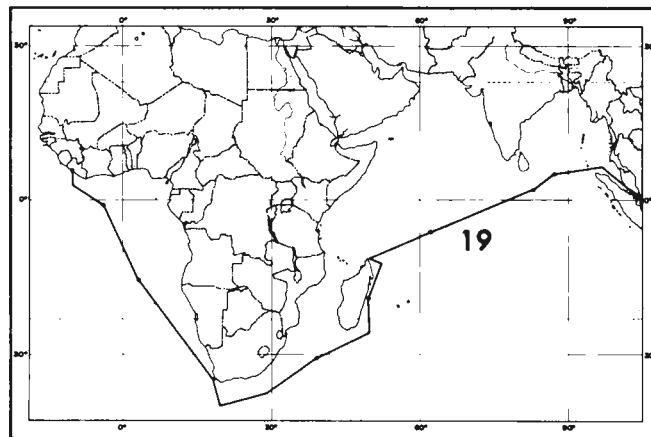


FIGURE 9. SANTA MARIA and RUTH ANN Cruise,
Liberia to Singapore

20. Operation No. 938016, Figure 10.

SANTA MARIA and RUTH ANN departed Singapore on 15 September 1967 to begin the reconnaissance cruise in contractor task area FIFTEEN (Northern half of South China Sea). The reconnaissance cruise was completed on 4 October. On 21 October, the ships departed Hong Kong for the first acoustic detail which ended at Manila on 19 November. Two additional acoustic surveys were made out of Manila. Survey operations were completed on 27 February 1968. Messrs. C. W. Senior, J. F. Crotty, Jr., and J. R. Walker, alternately, were NAVOCEANO project coordinators.

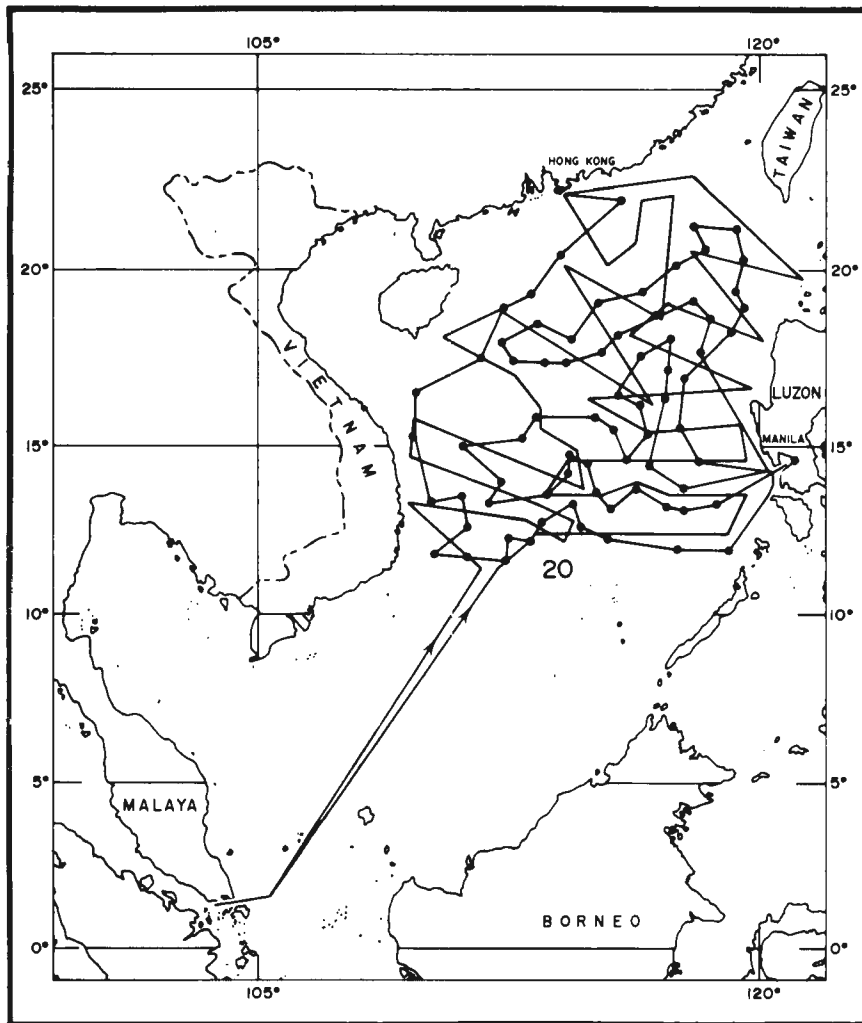


FIGURE 10. SANTA MARIA and RUTH ANN Cruise, South China Sea

21. Operation No. 938022, Figure 7.

SANTA MARIA and RUTH ANN departed Manila on 4 March 1968 for a reconnaissance survey of contractor task area THIRTEEN in the Philippine Sea. The reconnaissance phase of the survey was completed on 23 March. The ships again departed Manila for the acoustic work, which was accomplished in four details. They completed the area survey and returned to Manila on 30 June. Mr. J. R. Hedges was NAVOCEANO project coordinator.

Texas Instruments, Inc., under contract number N62306-1687, employed ATLANTIC SEAL and ARCTIC SEAL on four surveys. Reference numbers 22 through 25 apply to those cruises performed by Texas Instruments, Inc. A track chart of the cruises is shown in Figure 11.

22. Operation No. 938012, Figure 11.

From 1 July to 4 October 1967, the MGS contract ships ATLANTIC SEAL and ARCTIC SEAL surveyed out of Cork, Ireland, in contractor task area TWO. Following a reconnaissance survey of area TWO, completed in FY 1967, four acoustic details were run. The acoustic work began 26 June, and the ships operated out of Cork, Ireland, on each acoustic detail. Messrs. W. A. Babis, J. R. Hedges, and S. Chanesman were NAVOCEANO project coordinators.

23. Operation No. 938015, Figure 11.

After completing survey operations in contractor task area TWO, ATLANTIC SEAL and ARCTIC SEAL proceeded to contractor task area THREE and began acoustic work there. The first of four acoustic details in area THREE began on 5 October 1967. Between details, the ships made port at La Coruna, Spain, and Lisbon, Portugal. Upon completion of the acoustic work in area THREE, the ships proceeded to Ponta Delgada, Azores, arriving there 31 December 1967. Messrs. R. L. Scrivener, R. G. Engler, S. Chanesman, and W. T. McComas, alternately, were NAVOCEANO project coordinators.

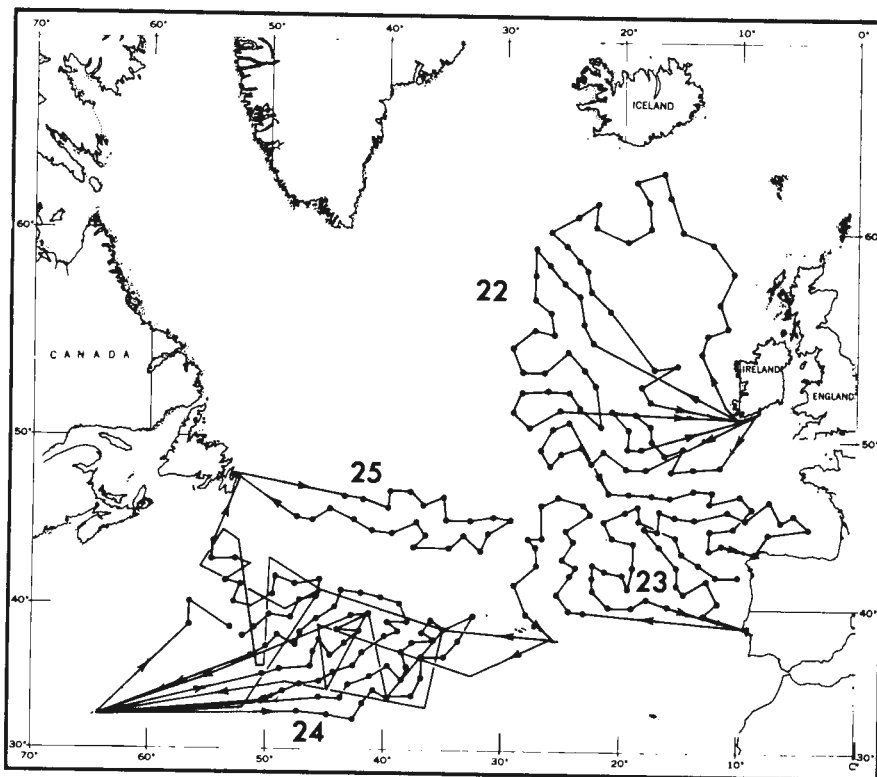


FIGURE 11. ATLANTIC SEAL and ARCTIC SEAL Cruises, North Atlantic

24. Operation No. 938017, Figure 11.

ATLANTIC SEAL and ARCTIC SEAL departed Ponta Delgada, Azores, on 5 January 1968 for a reconnaissance cruise between the Azores and Bermuda, contractor task area SEVEN. At the completion of the reconnaissance survey, the ships departed for Bermuda, arriving there on 8 February. Acoustic work in area SEVEN began on 16 March, and the survey ended at Newfoundland on 5 June. Mr. K. R. Wilzer was NAVOCEANO project coordinator.

25. Operation No. 938032, Figure 11.

ATLANTIC SEAL and ARCTIC SEAL departed St. John's, Newfoundland, and began the first acoustic detail in contractor task area THIRTEEN on 13 June 1968. The survey was completed on 4 July, and the ships returned to Newfoundland. The reconnaissance survey of this area was cancelled. Mr. J. R. Walker was NAVOCEANO project coordinator.

III. INSHORE SURVEY: Project 104

The purpose of the Inshore Survey Project is to acquire ocean environmental data in domestic and foreign coastal waters. Three programs were conducted under the Inshore Survey Project during FY 1968: The Fouling program; the Fleet Observations of Oceanographic Data (FLOOD) program; and a Riverine/Estuary survey program.

Biofouling studies are conducted in coastal waters of the world to: 1) Determine composition, areal distribution, and seasonal accumulation of fouling organisms; 2) determine the effects of fouling and biological deterioration on sensors and equipment; and 3) develop a capability for describing the life history of objects recovered from the sea by examining the attached organisms. Test sites are established in areas representative of the biological provinces of the world.

The fouling studies are made by exposing test panels in clusters near the surface, at middenth, and near the bottom on tautline arrays or near the bottom in panel racks. These arrays or racks are planted at comparable distances from shore at all sites. Panels are recovered monthly throughout the year, and physical and chemical data are collected monthly in support of the panel data. Local support usually is required for panel recoveries. The data are forwarded to NAVOCEANO for analysis and retention.

Fouling studies were made in six areas during FY 1968, reference numbers 26 through 31. Area locations are shown in Figures 12 and 13.

26. Operation No. 923001, Figure 12.

Biofouling test panels were exposed at five sites in the area of Strait of Juan de Fuca, Admiralty Inlet, Washington, in June 1963. The area is representative of the southern portion of the Aleutian province. From July 1967 through June 1968, yearly panels were collected bimonthly at two of the sites from two-panel arrays. At the other three sites, yearly panels were collected only once from the bottom racks. Surface temperature and salinity data were obtained at the time the panels were recovered. Four panels were emplaced to be retrieved in July 1969. Mr. J. R. DePalma is chief scientist. The data are on file at NAVOCEANO. An informal report will be prepared in FY 1970.

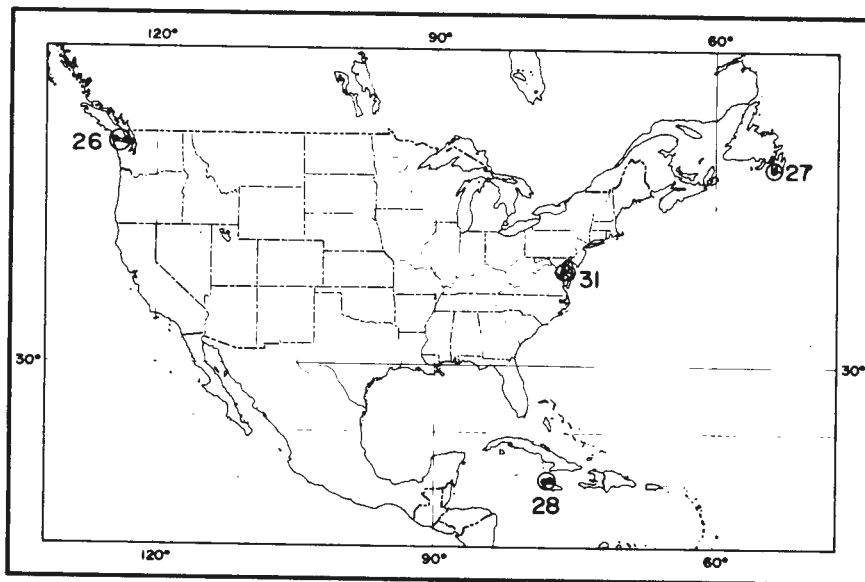


FIGURE 12. Biofouling Sites, U.S. Coasts

27. Operation No. 924002, Figure 12.

A biofouling study at Argentia, Newfoundland, began in June 1964 and was phased out in January 1968. This area is representative of the northern portion of the Nova Scotian province. A test panel array was emplaced in 100 feet of water, and panels were exposed at 50 and 95 feet. Monthly and cumulative panels and supplementary temperature and salinity data were collected each month by Navy divers. Mr. J. R. DePalma was chief scientist. The data are on file at NAVOCEANO. An informal report will be published in FY 1969.

28. Operation No. 927017, Figure 12.

A cooperative McCullum-Pratt Institute of Johns Hopkins University and NAVOCEANO biofouling study continued in Montego Bay and Oyster Bay, Jamaica. Fouling panels were implaced

on bottom racks in January 1967. The racks were exposed in water depths of 30 feet at Montego Bay and 6 feet at Oyster Bay. Panels were retrieved and new panels replaced each month for monthly and cumulative attachments through January 1968. Temperature and salinity measurements were obtained at the times of panel recovery. The survey expired after one year of observations. Mr. J. A. Bruce was chief scientist. The data are on file at NAVOCEANO. An oceanographic cruise summary, IR No. 68-116, will be published in FY 1969.

29. Operation No. 927035, Figure 13.

Cooperative United States-Japan biofouling studies continued at Maizuru, Japan, from July 1967 through June 1968. Maizuru represents the temperate Japonian provinces. A rack of panels was placed on the bottom in both 10 and 39 meters of water. Monthly and cumulative panels were retrieved by Japanese Navy divers. Supplementary oceanographic data were collected at the time the panels were retrieved. Mr. J. R. DePalma was chief scientist. All data are on file at NAVOCEANO. An informal report will be prepared in FY 1969.

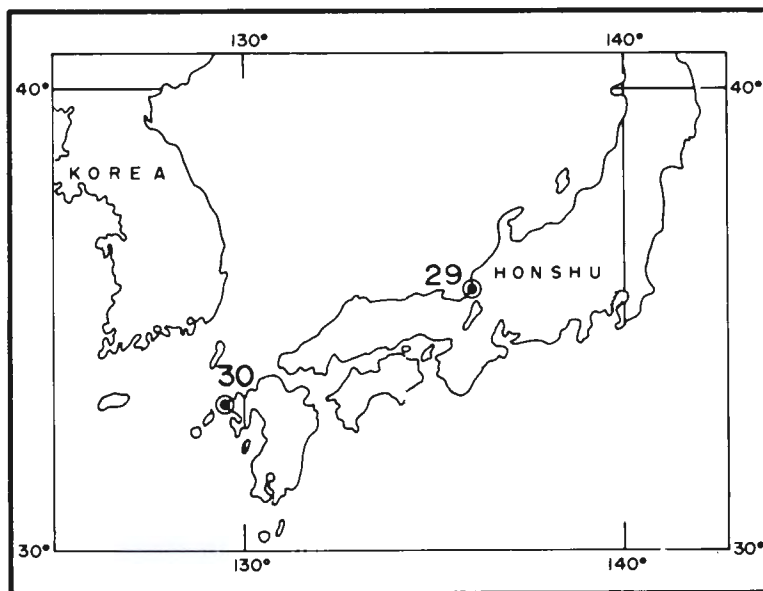


FIGURE 13. Biofouling Sites, Japan

30. Operation No. 928001, Figure 13.

Cooperative United States-Japan biofouling studies continued at Sasebo, Japan, from 12 July 1967 through 30 June 1968. Sasebo represents the subtropical Osakan-Kyushan province. Mr. J. R. DePalma was project coordinator. A rack of panels was placed on the bottom in both 10 and 20 meters of water.

During the year, 25 panels were collected from each rack by Japanese Navy divers. Temperature, salinity, and Secchi disc visibility data were collected once each month. All data are on file at NAVOCEANO. An informal report will be prepared in FY 1969.

31. Operation No. 928007, Figure 12.

A biofouling study was conducted at Benedict, Md., on the Patuxent River. In September 1967, a test panel array with two panels at surface, middepth, and 17 feet was planted in 20 feet of water. Additionally, three Ekman current meters were exposed in an array to collect foulers. The test panels and current meters were retrieved in November 1967. No further testing is planned at this location. Mr. E. R. Long was chief scientist. The data are on file at NAVOCEANO. An informal report will be prepared in FY 1969.

The FLOOD program is a continuing program whereby naval combatant ships, equipped with an instrument kit, collect oceanographic and hydrographic data. The objective of the program is to obtain broader geographic coverage of information than can be obtained with the Navy's regular fleet of survey ships. The program also provides for the collection of data on an opportunity basis in localities where the immediate needs of the Navy do not warrant a full-scale survey but where data can contribute significantly to future requirements.

NAVOCEANO provides the equipment needed for the surveys, and NAVOCEANO representatives instruct the ship's survey team in the use of oceanographic instruments, in data collection methods, and in the use of the various data log sheets. Mr. Atwood S. Barwick is NAVOCEANO chief scientist for the FLOOD program.

Data were collected for Project FLOOD from surveys by USS AFFRAY (MSO 511), USS ALACRITY (MSO 520), and USS OBSERVER (MSO 461), reference numbers 32 through 34. The survey area locations are shown in Figure 14.

32. Operation No. 928018, Figure 14.

AFFRAY departed Charleston, S.C., on 7 August 1967 for operations in the Caribbean Sea as a part of Mine Division 45. Between 11 and 15 October, bottom sediment grab samples and nine water transparency and color observations were taken on Mouchoir and Silver Banks, north of Hispaniola, and in the waters between Puerto Rico and the Virgin Islands. The oceanographic data were collected for project FLOOD. No one from NAVOCEANO was aboard AFFRAY during the cruise. The water transparency and color data will be on file at NAVOCEANO. The bottom sediment data will be transmitted to NODC. An informal report will be prepared in FY 1969.

33. Operation No. 928018, Figure 14.

ALACRITY departed Charleston, S.C., on 7 August 1967 for operations in the Caribbean Sea as a part of Mine Division 45. On 8 September, bottom sediment samples and BT's were collected on Navidad Bank, north of Hispaniola, for project FLOOD. The cruise ended in November. No one from NAVOCEANO was aboard ALACRITY during the cruise. The data will be forwarded to NODC. An informal report will be prepared in FY 1969.

34. Operation No. 928018, Figure 14.

OBSERVER departed Charleston, S.C., on 7 August 1967 for operations in the Caribbean Sea as a part of Mine Division 45. Bottom sediment grab samples and BT's were collected for project FLOOD. The cruise ended in November. No one from NAVOCEANO was aboard OBSERVER during the cruise. The data will be forwarded to NODC. An informal report will be prepared in FY 1969.

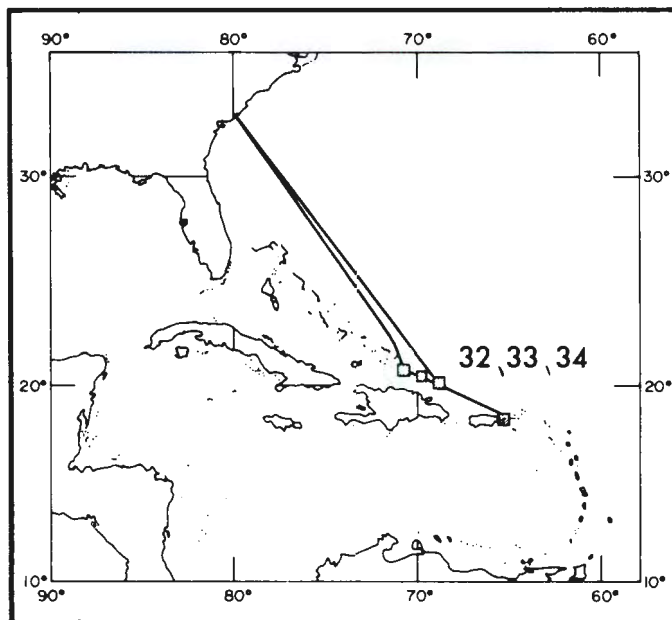


FIGURE 14. FLOOD Cruises, Caribbean Sea

The Riverine/Estuary surveys were initiated at the request of the military forces in Vietnam. The military needs were for pertinent environmental information to support the military forces operating on inland waterways, estuaries, and offshore locations. The information acquired by NAVOCEANO pertained to mine countermeasures, circulation patterns both in rivers and estuaries, and studies on the dispersion rate for contaminants. Usually, the military supports the surveys with men, small boats, and often light aircraft, and NAVOCEANO supplies the required equipment and technical advisors.

Two Riverine/Estuary surveys were conducted during FY 1968, reference numbers 35 and 36. The survey locations are shown in Figure 15.

35. Operation No. 928005, Figure 15.

Between 15 July and 21 September 1967, a riverine survey was conducted in the main shipping channel from Sai Gon to Can Gio, Republic of Vietnam. This survey was unequivocally a first in the collection of a large amount of hydrological data in a hostile area under wartime conditions. Mr. R. F. Kopenski was NAVOCEANO chief scientist. In addition to the data listed in Table I, two tide gages were permanently installed, 319 water samples of suspended sediments were collected, 83 current meter observations were made, and 62 DATADIVE records were completed. The data are on file at NAVOCEANO. An oceanographic cruise summary report, IR No. 68-60, has been published.

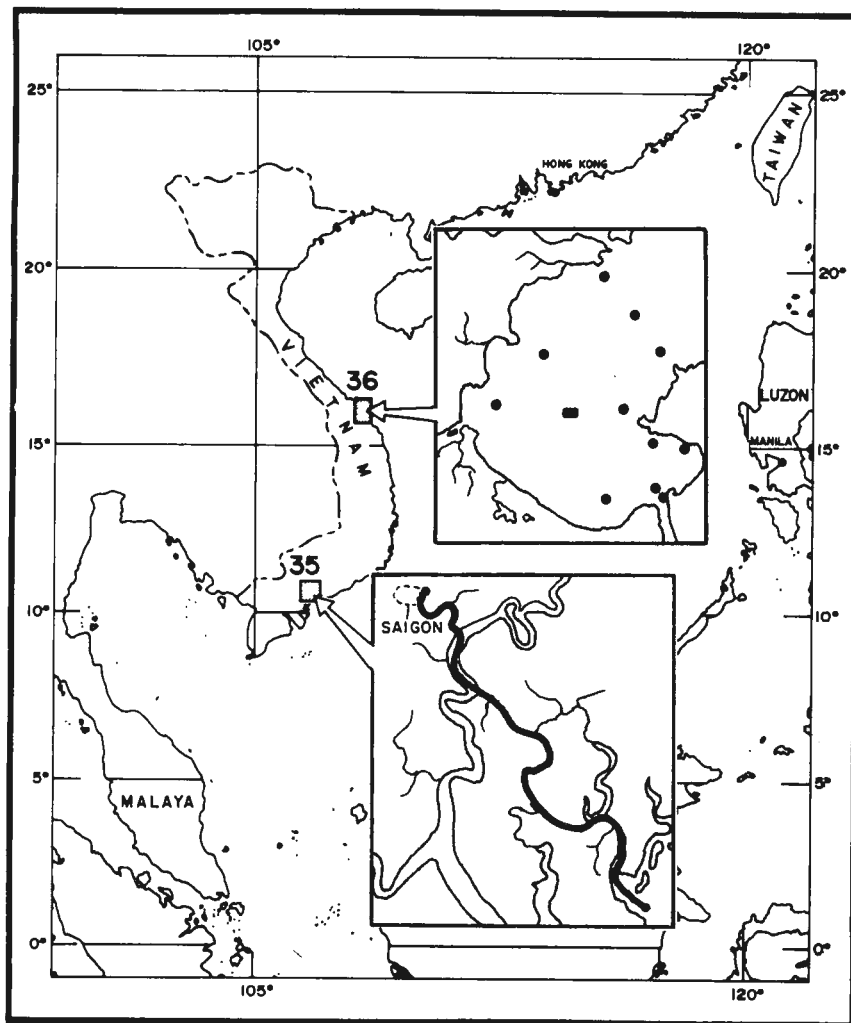


FIGURE 15. Riverine and Dye Dispersal Surveys, Vietnam

36. Operation No. 928012, Figure 15.

NAVOCEANO conducted a dye dispersal study in Da Nang Bay, Republic of Vietnam, from 14 to 22 August 1967. Mr. D. E. Kenney was chief scientist. The natural background fluorescence of the bay was measured at 10 locations. Rhodamine-B dye was released at slack before flood tide and at slack before ebb tide. Aerial observations, including color photographs, were made to obtain the overall spatial distribution of the dye. The data are on file at NAVOCEANO. An oceanographic cruise summary, IR. No. 68-24, has been published.

IV. SHIPS OF OPPORTUNITY: Project 202

The Ships-of-Opportunity Program effectively and economically enlists and utilizes available military and non-military ships, submarines, and small craft to augment survey ships in carrying out conventional and special oceanographic surveys. These ships are enrolled in offshore, coastal, and estuarine areas throughout the world in direct support of military and national oceanographic requirements.

Five oceanographic surveys were conducted during FY 1968, reference numbers 37 through 41. Track charts are shown in Figures 16 through 19.

37. Operation No. 928011, Figure 16.

Scientists from NAVOCEANO and the University of Wisconsin participated in a geophysical survey of the northern Labrador Sea from 1 August to 1 October 1967. The survey was conducted from aboard USCGC MARIPOSA. Mr. G. L. Johnson of NAVOCEANO was chief scientist. Bathymetry, subbottom profiling, magnetometer, and 10 profiles of seismic refraction data were collected. The seismic refraction data were retained by University of Wisconsin. All other data are on file at NAVOCEANO. An oceanographic cruise summary, IR No. 68-27, has been published.

38. Operation No. 928015, Figure 17.

UNITAS VIII cruise around South America was from 18 August to 8 December 1967. Four ships participated in the cruise. Oceanographic data were collected to assist in the conduct of ASW exercises by providing information relevant to sonar detection of submarines. Messrs. L. E. Jarvela and D. R. Tuck, alternately, were NAVOCEANO chief scientists aboard GLENNON. The data are on file at NAVOCEANO. An oceanographic cruise summary, IR No. 68-14, has been published.

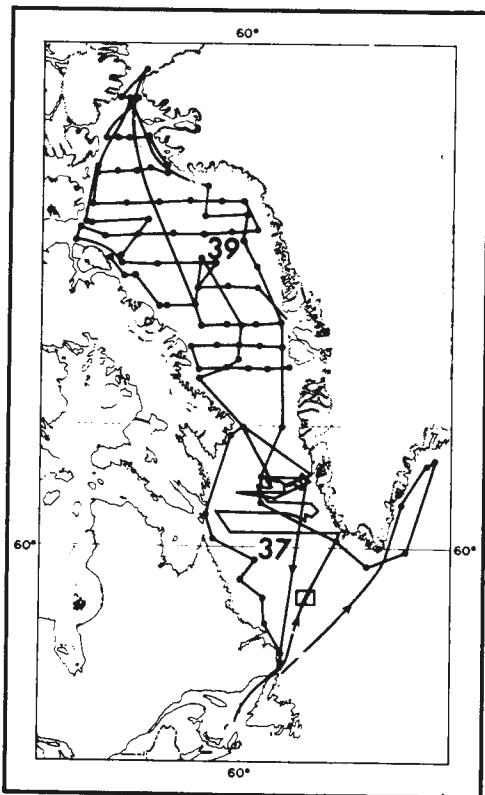


FIGURE 16. Eastern Arctic Surveys

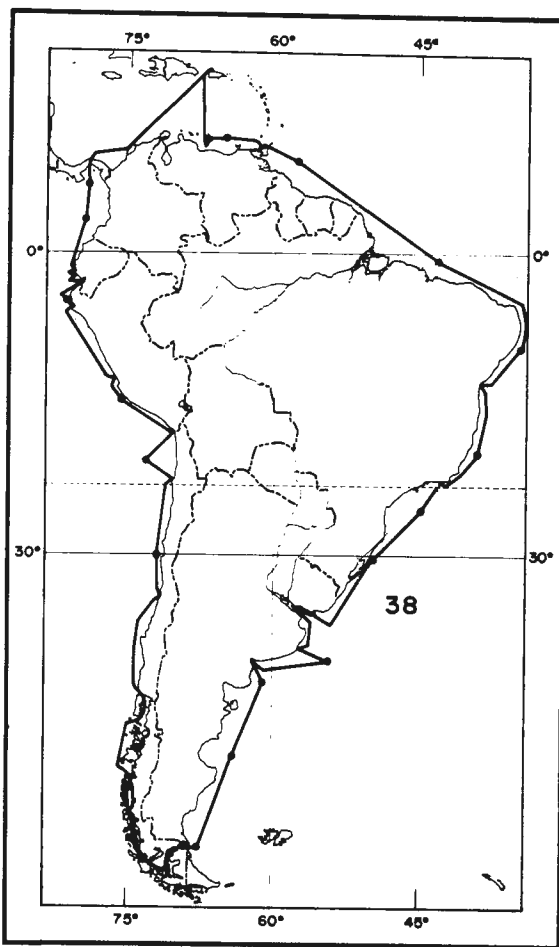


FIGURE 17. UNITAS VIII Survey,
South America

39. Operation No. 928016, Figure 16.

A two-phase survey was conducted in the Baffin Bay, Davis Strait, and Labrador Sea from 1 September to 18 October 1967. The first phase was a cooperative effort by NAVOCEANO, ONR, and Rensselaer Polytechnic Institute to obtain an extensive suite of bottom sediment samples and bottom sediment sound velocities from Baffin Bay. USCGC SOUTHWIND was the survey ship for this phase. The second phase was to occupy oceanographic stations in support of the East Arctic Ice Forecast Program. USCGC EDISTO was survey ship on the second phase. Mr. L. A. Codispoti was NAVOCEANO chief scientist. The bottom sediment and plankton data are on file at NAVOCEANO. Nansen station data are on file at NODC under cruise reference number 311161. The BT data will be forwarded to NODC. An oceanographic cruise summary, IR No. 68-23, has been published.

40. Operation No. 928033, Figure 18.

NAVOCEANO conducted a survey in the northern Bering Sea from 2 to 25 February 1968. The survey, conducted aboard USCGC NORTHWIND, was an oceanographic study of Anadyr Gulf to determine the winter sea water properties and explain water mass formation in this area. Mr. C. I. Coffey was chief scientist. The Nansen station data are on file at NODC under cruise reference number 311206. The BT data will be forwarded to NODC. The radioisotope, current, and ice data are on file at NAVOCEANO. An oceanographic cruise summary, IR No. 68-30, has been published.



FIGURE 18. NORTHWIND Cruise, Bering Sea

41. Operation No. 928034, Figure 19.

From 4 February to 5 March 1968, an oceanographic survey was conducted in the Ross Sea, Antarctica, from aboard USCGC BURTON ISLAND and USCGC WESTWIND. Current measurements were made with meters and drogues, and the annual ice forecast stations were occupied. Mr. W. L. Gsell was NAVOCEANO chief scientist. The Nansen station data are on file at NODC under cruise reference number 311250. The current data are on file at NAVOCEANO. The BT data will be forwarded to NODC. An oceanographic cruise summary, IR No. 68-64, has been published.

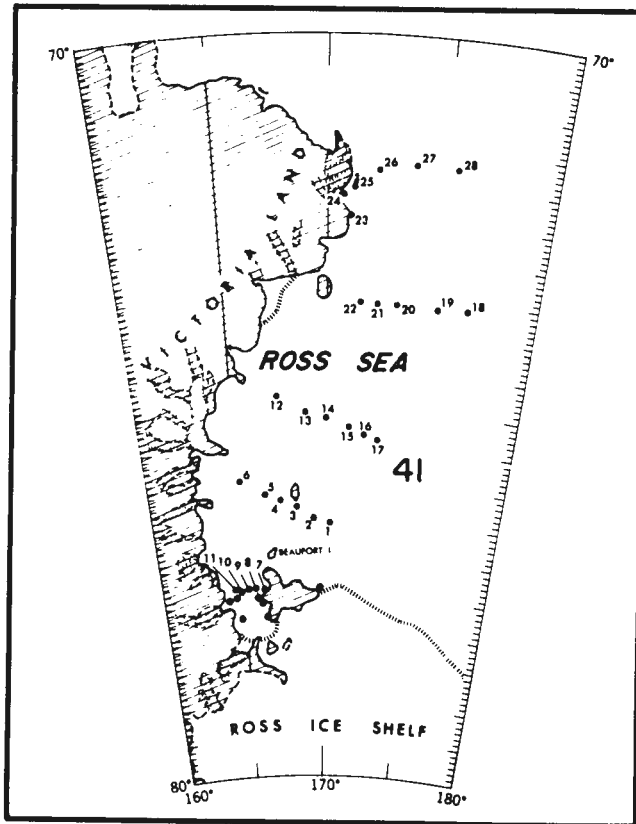


FIGURE 19. BURTON ISLAND and WESTWIND Cruises, Antarctica

V. AGOR: Project 203

The AGOR Task Force (now the Research Ships Branch) was established in FY 1963 for the purpose of monitoring construction of the first AGOR ships that were to be under the technical control of the Oceanographer of the Navy. Four AGOR ships were outfitted with permanent scientific equipment and are in operation in support of the various organizations conducting research projects in the ocean environment.

NAVOCEANO provides technical management of the ships and facilities, coordination of scientific liaison between ship users and operators, and equipment and data support for scheduled operations. Each ship is at sea for approximately 240 days a year on scientific operations for the following organizations: Applied Physics Laboratory, University of Washington; Marine Physical Laboratory, University of California, Scripps Institution of Oceanography; Naval Air Development Center; Naval Oceanographic Office; Naval Civil Engineering Laboratory; Naval Electronics Laboratory Center;

Naval Ordnance Laboratory; Naval Ordnance Test Station, China Lake and Pasadena; Naval Radiological Defense Laboratory; Naval Research Laboratory; Naval Postgraduate School, Monterey; Naval Underwater Weapons Research and Engineering Station; and Navy Underwater Sound Laboratory.

The USNS GILLISS (T-AGOR 4), USNS SANDS (T-AGOR 6), and USNS LYNCH (T-AGOR 7) are assigned to MSTSLANT for the use of Atlantic Coast Laboratories. The USNS DAVIS (T-AGOR 5) is assigned to MSTSPAC for the use of the Pacific Coast Laboratories.

Twelve cruises were conducted aboard GILLISS, reference numbers 42 through 53. Track charts are shown in Figure 20.

42. Operation No. 918001, Figure 20.

After participating in an "Open House" at St. John's, Newfoundland, in June 1967, GILLISS departed for the Azores and arrived at Ponta Delgada on 1 July. Between 1 and 17 July, NAVOCEANO personnel collected oceanographic data along a 2,000-mile grid (Operation MILOC-67). Temperature data were collected with a near surface recording thermometer along 1,900 miles of track, and pyrhelimeter data were recorded for 154 hours. The cruise terminated at Belfast, Ireland, on 24 July. Mr. J. E. Walczak was chief scientist. The BT and Nansen station data are on file at NODC under BT reference number 021079 and NODC cruise reference number 311122, respectively. The other data are on file at NAVOCEANO. No NAVOCEANO report is planned.

43. Operation No. 928010, Figure 20.

GILLISS departed Belfast, Ireland, on 3 August 1967 for oceanographic operations in the Norwegian Sea and returned to Belfast on 22 August. Mr. L. W. Shearer of NAVOCLANO was chief scientist, and Mr. W. F. Cook was project coordinator. Water samples were collected and analyzed for salinity, oxygen, phosphate, and nitrate content; on-station Isaac-Kidd midwater trawl samples were collected; and Volume Reverberation measurements were made. The BT data are on file at NODC under BT reference number 021539. All other data are on file at NAVOCEANO. No NAVOCEANO report is planned.

44. Operation No. 918017, Figure 20.

GILLISS departed Belfast, Ireland, on 25 August 1967 for bio-acoustic and oceanographic operations on a trans-Atlantic track terminating at New York on 18 September. At four stations, Isaac-Kidd midwater trawl samples were taken along with Nansen casts, dissolved oxygen samples, and volume reverberation measurements. Mr. L. W. Shearer of NAVOCEANO was chief scientist. The BT data are on file at NODC under BT reference number 021539. All other data are on file at NAVOCEANO. No NAVOCEANO report is planned.

45. Operation No. 918024, Figure 20.

From 17 October to 11 November 1967, GILLISS surveyed a 2,200-mile grid between 36° and 40°N latitude and 65° and 69°W longitude. NAVOCEANO personnel collected salinity and temperature data using a STD system, BT data using mechanical and expendable BT's, and essential meteorological information. The trip started from Bayonne, New Jersey, on 16 October and ended at New London, Connecticut, on 12 November. Mr. E. Khedouri of NAVOCEANO was chief scientist, and Mr. W. F. Cook was project coordinator. The data are on file at NAVOCEANO. No NAVOCEANO report is planned.

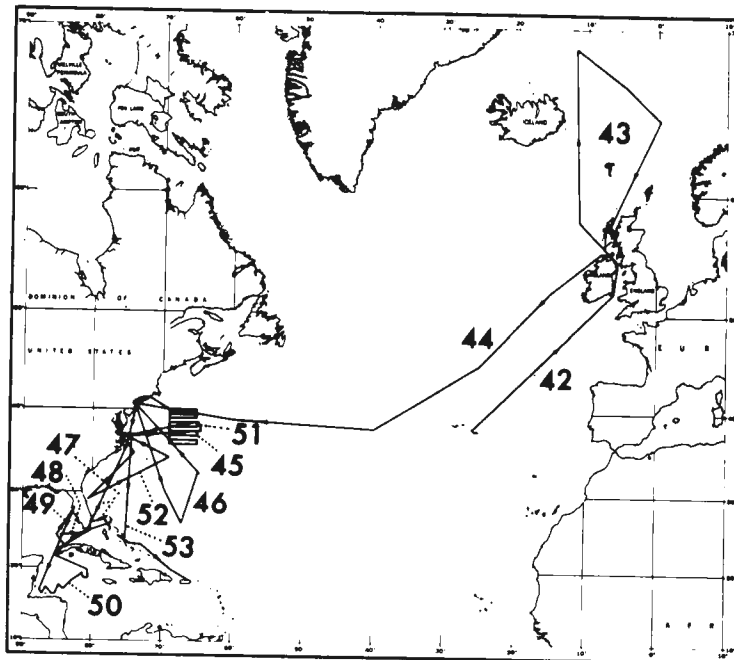


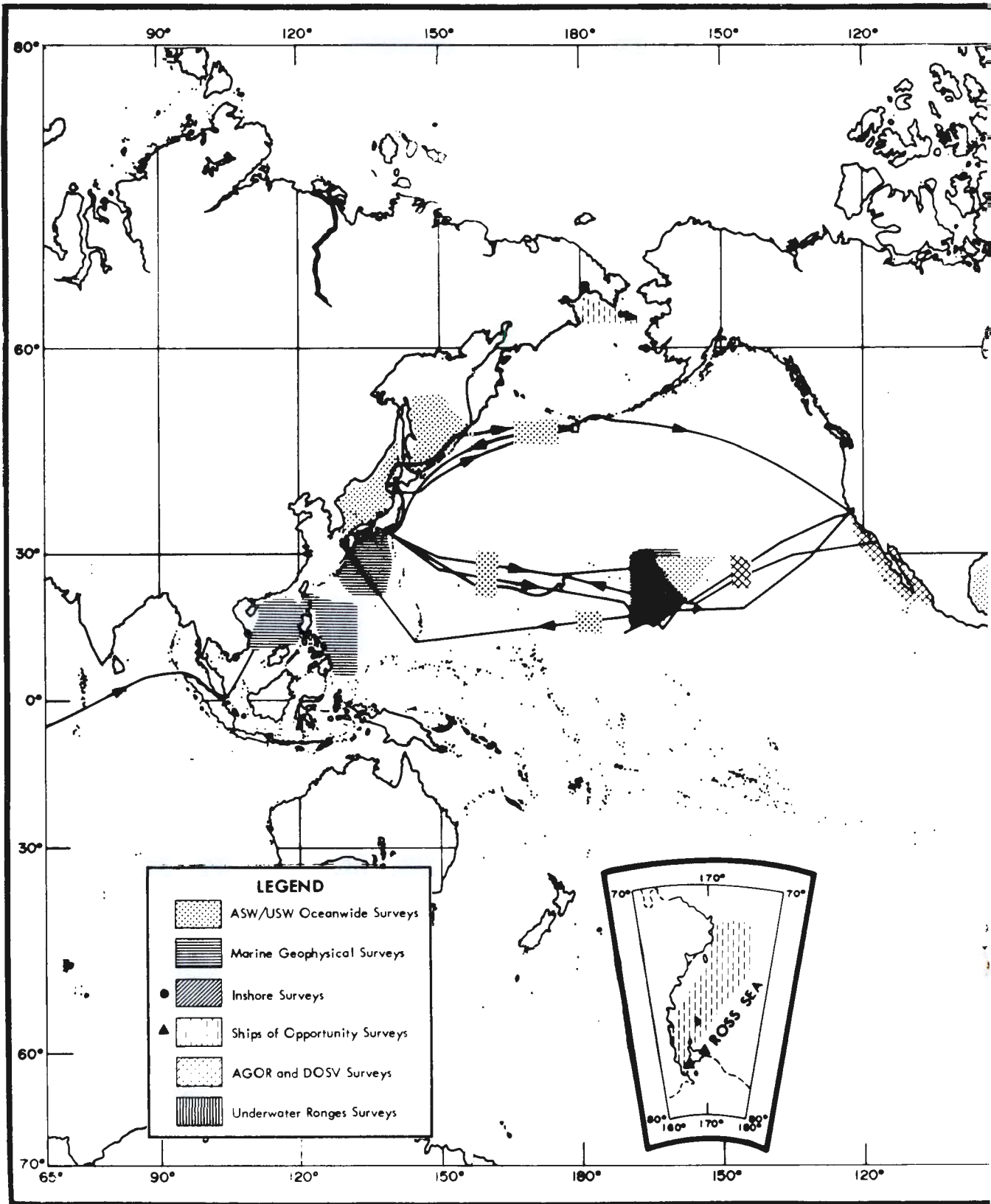
FIGURE 20. GILLISS Cruises, North Atlantic

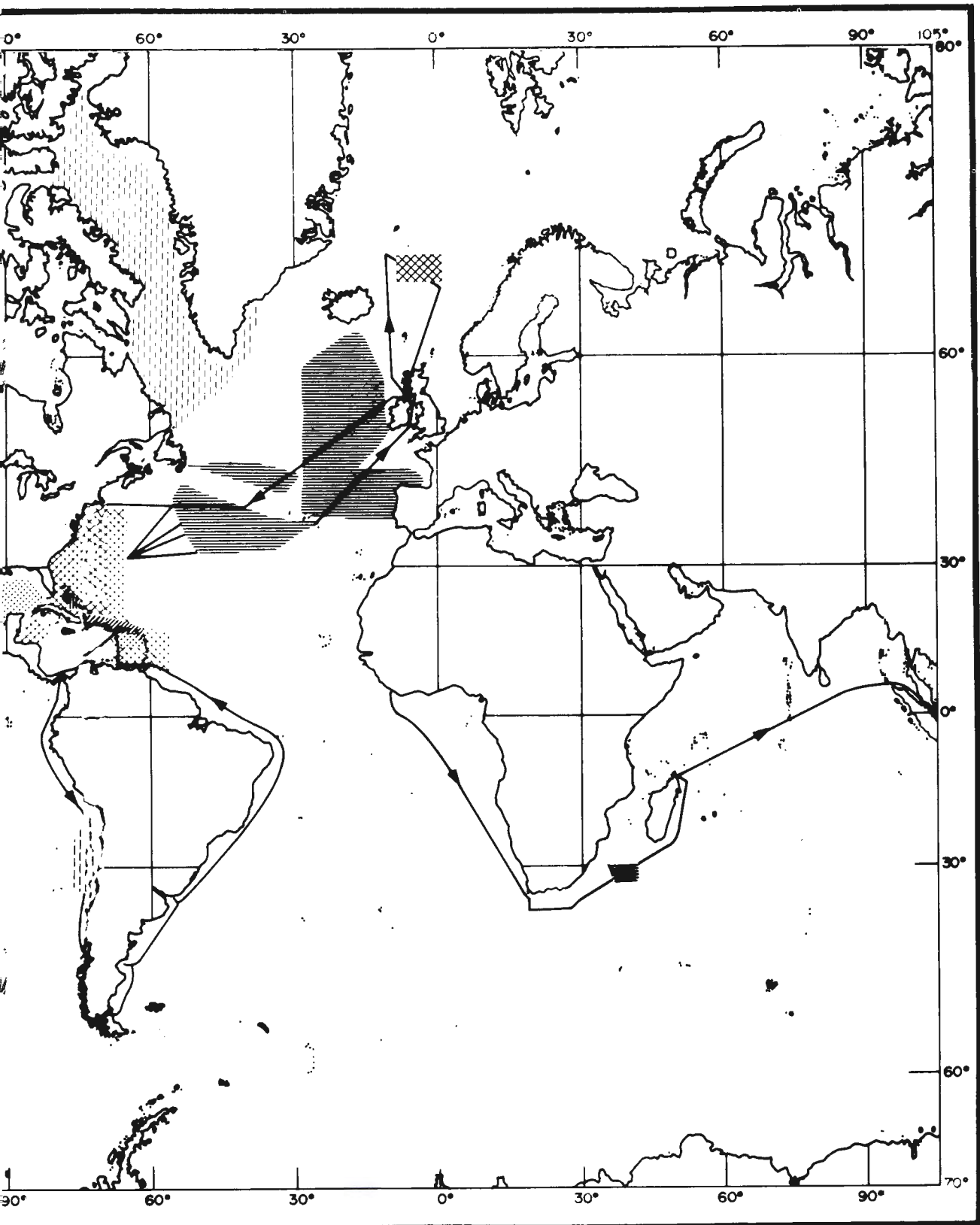
46. Operation No. 918032, Figure 20.

NOL employed GILLISS for a survey from 6 to 21 December 1967. The purpose of the survey was to measure "in situ" optical characteristics of the ocean with a Deep Ocean Optical Measurement (DOOM) instrument. The DOOM was lowered five times, to depths of 3,000 fathoms, in an area southwest of Bermuda. Mr. Matlack of NOL was chief scientist, and Mr. E. L. Barkson was NAVOCEANO project coordinator. The BT data are on file at NODC under BT reference number 021645. The optical data were retained by NOL personnel. No NAVOCEANO report is planned.

47. Operation No. 918035, Figure 20.

USL conducted an oceanographic survey from aboard GILLISS between 3 and 26 January 1968. Measurements, in the sea, of electromagnetic noise and light transmission (36 hours





of observations) were taken from 8 to 17 January in the Northwest Providence Channel. Measurements, at the surface, of electromagnetic noise (54 hours of observations) were recorded off New Providence Island from 19 to 25 January. The cruise began from Bayonne, New Jersey, and terminated at Key West, Florida. Mr. Finkle of USL was chief scientist, and Mr. W. F. Cook was NAVOCEANO project coordinator. The BT and Nansen cast data are on file at NODC under BT reference number 022301 and cruise reference number 311188, respectively. USL retained the electromagnetic noise and light transmission data. No NAVOCEANO report is planned.

48. Operation No. 918039, Figure 20.

NOL utilized GILLISS from 12 to 22 February 1968 to conduct Underwater Sonic Boom operations in the Straits of Florida. GILLISS was target ship for SPAR. The survey was to determine bearing accuracies as a junction of range and bottom profile. Mr. A. T. Jacques of NOL was chief scientist, and Mr. E. L. Barkson was NAVOCEANO project coordinator. The acoustic and bathymetric data were retained by NOL. The BT data are on file at NODC under BT reference number 021841. The S/V-D-T data are on file at NAVOCEANO. No NAVOCEANO report is planned.

49. Operation No. 918042, Figure 20.

An NOL survey was performed from aboard GILLISS, 26 February to 6 March 1968, in the vicinity of the Gulf of Mexico. The survey was to determine the critical explosion standoff distance for glass spheres. Glass spheres were lowered to a depth of 10,000 feet in company with explosives which were fired hydrostatically. Hydrophones were lowered to record the explosion noise and model collapse. Mr. R. S. Price of NOL was chief scientist, and W. F. Cook was NAVOCEANO project coordinator. All data were retained by NOL. No NAVOCEANO report is planned.

50. Operation No. 918045, Figure 20.

GILLISS departed Tampa, Florida, on 13 March 1968 to conduct an ONR sponsored survey and a NAVOCEANO training program from 14 to 30 March in the Caribbean Sea. Mr. W. F. Cook was NAVOCEANO chief scientist. Continuous seismic profiles were obtained using the Southwest Center for Advanced Studies (SCAS) Airgun and Eel. Continuous magnetic measurements and bathymetry were recorded. Thirteen core heat flow stations were occupied using a modified Ewing corer. Training was in the techniques of the above operations as well as in Nansen cast operations, Micro-Winkler oxygen titrations, and use of the expendable BT. The survey ended on 30 March at Port Everglades, Florida. The core and heat flow were retained by Mr. A. Erickson of Massachusetts Institute of Technology. Dr. C. Helsley of SCAS retained the seismic data. Other data are on file at NAVOCEANO. A NAVOCEANO report of the survey is planned.

51. Operation No. 918048, Figure 20.

From 2 to 19 May 1968, GILLISS was used to obtain information about the geological and geophysical properties of selected seamounts in the New England Seamount chain. Detailed magnetic, seismic, and bathymetric data were obtained for two seamounts and one area at 37° 30'N, 65° 30'W. The cruise began and ended at Norfolk, Virginia. Dr. P. T. Taylor of NAVOCEANO was chief scientist. The data are on file at NAVOCEANO. No NAVOCEANO report is planned.

52. Operation No. 918049, Figure 20.

A geophysical survey was conducted by NAVOCEANO personnel aboard GILLISS from 22 May to 4 June 1968. The survey was in the North Atlantic along the Blake Escarpment and Abyssal Plain. Lt. Eric Schneider was chief scientist. The data are on file at NAVOCEANO. No NAVOCEANO report is planned.

53. Operation No. 918050, Figure 20.

NRL conducted a survey aboard GILLISS from 11 to 21 June 1968. Dr. C. Cheek of NRL was chief scientist, and Messrs. W. F. Cook and T. A. Bender, Jr., were NAVOCEANO project coordinators. The objective of the cruise was to collect sea water samples and cores for analyses of hydrocarbons and trace metals. Studies also were conducted to examine the exchange of carbon monoxide at the sea-air interface. In addition, newly developed gas chromatographic and atomic absorption equipment were evaluated for sea-worthiness. Two days were spent on the Potomac River and in the Chesapeake Bay collecting surface water and air samples. GILLISS then proceeded to the Puerto Rican Trench, stopping for a Nansen cast at 33° 40'N, 74° 41'W and a Nansen cast and core in Exuma Sound, Bahamas. One core and a Niskin bottle sample were collected from the Puerto Rican Trench. The cruise terminated at San Juan, Puerto Rico. The Nansen cast data will be forwarded to NODC. All other data were retained by NRL. No NAVOCEANO report is planned.

Twenty cruises were conducted aboard DAVIS, reference numbers 54 through 73. Track charts are shown in Figures 21 and 22.

54. Operation No. 918003, Figure 21.

DAVIS participated in a survey (BESP Project) near San Clemente Island from 5 through 9 July 1967. Mr. A. R. Mooney was chief scientist. Three current meter arrays were implanted, and oceanographic data were collected. The Nansen cast data are on file at NODC under cruise reference number 311088. The other data are on file at NAVOCEANO. An oceanographic data report, IR No. 68-20, has been published.

55. Operation No. 918005, Figure 21.

From 12 to 16 July 1967, DAVIS was used by NAVOCEANO and

NAVPGSCOL, Monterey. A bathymetric-magnetic survey was conducted by NAVOCEANO personnel in an area off Punta Santo Tomas, Baja California. Current dispersal investigations were made by NAVPGSCOL personnel. In addition, training of personnel from both activities was accomplished. Mr. D. Middleburg was NAVPGSCOL chief scientist, and Mr. R. Thomas was NAVOCEANO chief scientist and project coordinator. The Nansen station data are on file at NODC under cruise reference number 311088. The expendable BT, plankton, and current drogoue data were retained by NAVPGSCOL. The remaining data are on file at NAVOCEANO. No NAVOCEANO report is planned.

56. Operation No. 918007, Figure 21.

NUWC, San Diego, employing DAVIS, conducted seismic profiling operations over the California Continental Borderland during the period 20 through 26 July 1957. Mr. D. Moore of NUWC was chief scientist, and Mr. J. B. Coleman was NAVOCEANO project coordinator. All data were retained by NUWC. No NAVOCEANO report is planned.

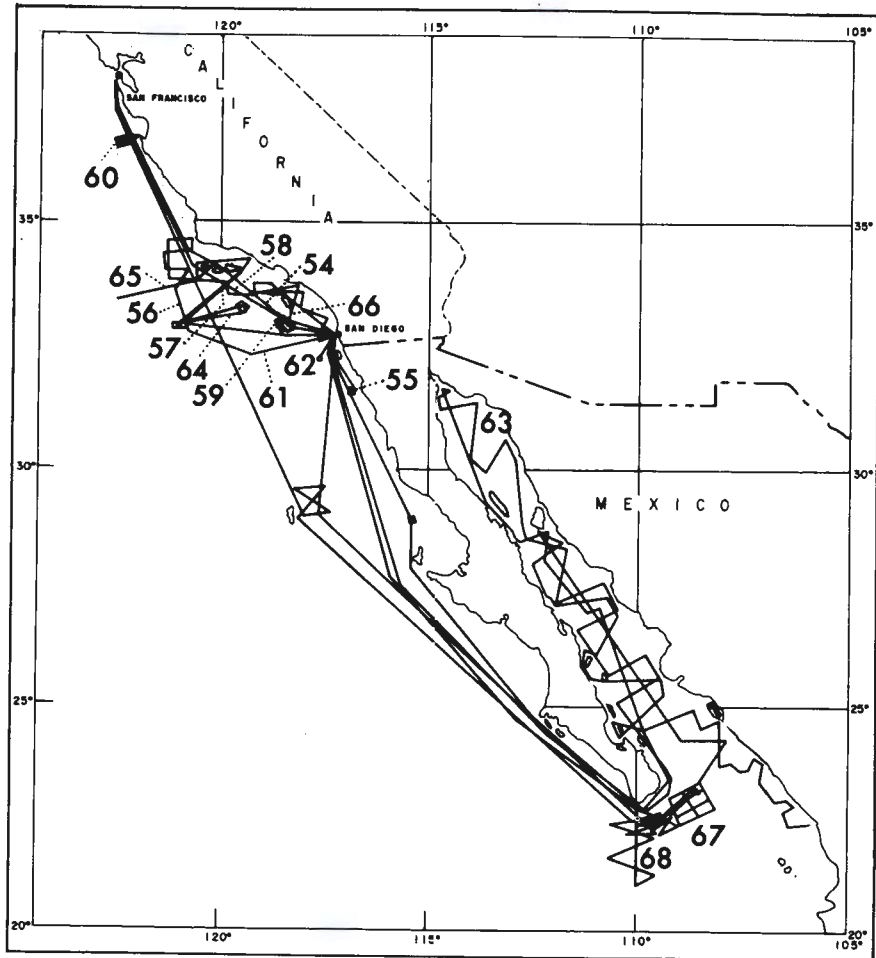


FIGURE 21. DAVIS Cruises, California Coast

57. Operation No. 918008, Figure 21.

Naval Civil Engineering Laboratory (NCEL), Port Hueneme, conducted a fine grain precision bathymetric survey over the San Juan Seamount. DAVIS was employed for the survey from 26 through 30 July 1967. Bathymetric, bottom sediment, and plankton data were obtained. Mr. J. Ciani was NCEL chief scientist, and Mr. J. B. Coleman was NAVOCEANO project coordinator. All data were retained by NCEL. No NAVOCEANO report is planned.

58. Operation No. 918011, Figure 21.

NAVOCEANO personnel conducted Bottom Environmental Survey Project (BESP) operations aboard DAVIS near San Clemente Island during the period 18 through 24 August 1967. Mr. A. R. Mooney was chief scientist. In addition to the data listed in Table I, bottom photographs were obtained along 5 miles of track, deep-towed transducer records were obtained over approximately 26 miles of track, and the Bottom Environmental Sensing System (BESS) was launched once and retrieved. The data are on file at NAVOCEANO. An oceanographic data report, IR No. 68-20, has been published. An informal report, IR No. 67-74, on the design and use of BESS will be published in FY 1969.

59. Operation No. 918016, Figure 21.

An oceanographic survey was conducted for NAVOCEANO from DAVIS between 25 and 30 August 1967. Bottom sediment samples were collected along the west side of San Clemente Island. Mr. G. V. Shaefer was chief scientist. Copies of the geological data have been forwarded to NODC, NODC acquisition No. 121357-1. All original data are on file at NAVOCEANO. No NAVOCEANO report is planned.

60. Operation No. 918018, Figure 21.

DAVIS was utilized by NAVPGSCOL personnel to conduct current dispersal studies off the California coast. The survey was from 1 to 4 September 1967. Mr. W. Denner was NAVPGSCOL chief scientist, and Mr. W. W. Van Atta was NAVOCEANO project coordinator. The data were retained by NAVPGSCOL personnel. No NAVOCEANO report is planned.

61. Operation No. 918019, Figure 21.

Personnel from NUWC, San Diego, sailed on DAVIS from 14 to 20 September 1967. The cruise mission was to install and recover equipment for acoustic transmission and reverberation tests. Data were collected from San Juan Seamount. Mr. G. E. Pickens of NUWC was chief scientist, and Mr. W. W. Van Atta was NAVOCEANO project coordinator. All data were retained by NUWC. No NAVOCEANO report is planned.

62. Operation No. 918022, Figure 21.

DAVIS departed San Diego on 2 October 1967 for an NUWC,

San Diego, cruise to implant an echo repeater array and to provide ranging information for the USS BAYA. Acoustic data were obtained for NUWC. The cruise terminated at San Diego on 5 October. Mr. W. W. Van Atta was NAVOCEANO project coordinator. NUWC retained all data. No NAVOCEANO report is planned.

63. Operation No. 918023, Figure 21.

NUWC, San Diego, utilized DAVIS for seismic profiling in the Gulf of California from 15 October to 11 November 1967. Dr. Moore of NUWC was chief scientist, and Mr. R. Thomas was NAVOCEANO project coordinator. Shipboard analysis of the data indicated the existence of several unexpected features; e.g., shallow sediments near the northern end of the Gulf. NUWC retained the data. Supplementary bathymetric and geomagnetic records are being forwarded to NAVOCEANO for retention. Dr. Moore will analyze the data and issue reports.

64. Operation No. 918028, Figure 21.

NCEL conducted a bathymetric (LORAC controlled), underwater camera, and bottom environmental investigation over the southern portion of San Juan Seamount from 12 to 17 November 1967. DAVIS was utilized for the survey. Mr. Ciani of NCEL was chief scientist, and Mr. R. Thomas was NAVOCEANO project coordinator. In addition to the data shown in Table I, 10 bottom temperature measurements were made and 600 feet of still camera film were exposed. All data were retained by NCEL. The results of the survey will be published by NCEL in a technical paper.

65. Operation No. 918031, Figure 21.

On 4 December 1967, DAVIS unloaded NAVPGSCOL personnel and equipment at Port Hueneme, California. At a site off the California coast, a reference buoy and six near-surface parachute current drogues were launched. The next 24 hours were spent tracking the drogues and taking 10 Nansen casts. The DAVIS then moved 100 miles west of the site, and the same sequence of events was repeated. The drogues and buoys were destroyed, and DAVIS returned to Port Hueneme on 7 December. Mr. Denner of NAVPGSCOL was chief scientist, and Mr. Thomas was NAVOCEANO project coordinator. The data were retained by NAVPGSCOL personnel. No NAVOCEANO report is planned.

66. Operation No. 918033, Figure 21.

Bottom sampling investigations were made along the east side of San Clemente Island from aboard DAVIS, 11 to 12 December 1967. Mr. G. V. Shaefer of NAVOCEANO was chief scientist. After a change of crew, Mr. W. R. Heiner conducted a geological survey of Osborn Bank from 13 to 16 December. In addition to the data shown in Table I, bathymetric records for 17 hours of survey and magnetometer data for 15 hours of survey were obtained. The BT data are on file at NODC under BT reference

number 021650. The other data are on file at NAVOCEANO. Data from both areas of survey will be presented in NAVOCEANO reports after the data are analyzed.

67. Operation No. 918036, Figure 21.

NUWC, San Diego, employed DAVIS for a bathymetric, magnetic, and subbottom profiling survey from 9 January to 5 February 1968. Data were collected off the coast of Baja California, in the Gulf of California, and off Punta Santo Tomas. Mr. Smith of NUWC was chief scientist, and Mr. J. B. Coleman was NAVOCEANO project coordinator. The BT data are on file at NODC under BT reference number 021913. The subbottom profiling data and portions of the bathymetric and magnetic data were retained by NUWC. Portions of the bathymetric and magnetic data are on file at NAVOCEANO. No NAVOCEANO report is planned.

68. Operation No. 918041, Figure 21.

DAVIS was employed for an APL and NAVOCEANO survey from 14 February to 14 March 1968. Salinity/temperature/depth (STD) observations were taken every 6 hours from San Diego to Guadalupe Island and thence to the southern tip of Baja California, where additional STD, self-propelled underwater research vehicle (SPURV), thermistor, and acoustic transmission array data were obtained. All measurements were recorded and directed by a van-mounted computer to correlate the relation of thermal gradients and acoustic properties. DAVIS proceeded to 29°N, 117°W where five STD, two thermistor, one SPURV, two acoustic, and two reverberation tests were run. After completion of all tests, DAVIS proceeded to San Francisco. Mr. S. R. Murphy of APL was chief scientist, and Messrs. G. V. Shaefer and J. B. Coleman were NAVOCEANO project coordinators. The BT data are on file at NODC under BT reference numbers 021916 and 022030. Bathymetric and magnetic data are on file at NAVOCEANO, and all other data were retained by APL. No NAVOCEANO report is planned.

69. Operation No. 918051, Figure 22.

A geophysical/acoustic survey was conducted from San Francisco, California, to Honolulu, Hawaii, aboard DAVIS from 27 March to 9 April 1968. Dr. A. Blackman of NAVOCEANO was chief scientist. The data are on file at NAVOCEANO. No NAVOCEANO report is planned.

70. Operation No. 918052A, Figure 22.

Naval Radiological Defense Laboratory (NRDL) conducted an oceanographic survey near Hawaii from 11 to 25 April 1968. The survey was performed aboard DAVIS. A dye dispersal study was made to the west of Oahu in an area of known current structure. The study was in cooperation with the R/V TERITU of the University of Hawaii. Navigational control was maintained

by the Hawaiian National Guard from the beach. A total of 120 hours of dye dispersal data was obtained, and two water samples for Ce 137 analysis were collected. Mr. Schuert of NRDL was chief scientist, and Mr. W. W. Van Atta was NAVOCEANO project coordinator. The BT data will be forwarded to NODC. All other data were retained by NRDL, San Francisco. No NAVOCEANO report is planned.

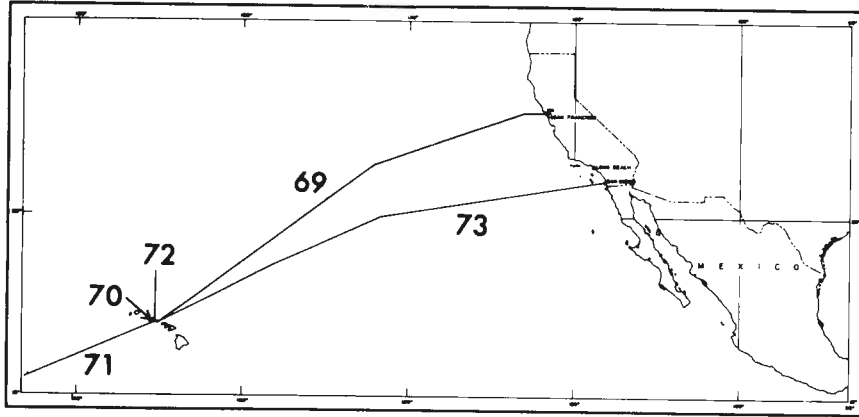


FIGURE 22. DAVIS Cruises, California - Hawaii

71. Operation No. 918052B, Figure 22.

ONR utilized DAVIS for a cruise near Johnston Island from 29 April to 16 May 1968. The distribution of turbid water in the "island wake" was studied using optical properties of the water mass as an indicator. Dr. Wenekens of ONR was chief scientist, and Mr. W. W. Van Atta was NAVOCEANO project coordinator. The bathymetric and magnetic data are held at NAVPGSCOL for analysis. The BT data will be forwarded to NODC. All other data were retained by ONR. No NAVOCEANO report is planned.

72. Operation No. 918053A, Figure 22.

A NAVOCEANO survey was conducted north of Oahu from aboard DAVIS from 21 to 27 May 1968. The survey was to collect biological samples and make bio-acoustic measurements. Mr. L. W. Shearer was chief scientist. The data are on file at NAVOCEANO. No NAVOCEANO report is planned.

73. Operation No. 918053B, Figure 22.

DAVIS participated in a survey from Honolulu to San Diego during the period 31 May to 16 June 1968. The survey was to collect geophysical and acoustic data from three ocean stations. Only two of the stations were occupied. Dr. A. Blackman of NAVOCEANO was chief scientist. The BT data will be forwarded to NODC. All other data are on file at NAVOCEANO. No NAVOCEANO report is planned.

Nine cruises were conducted aboard LYNCH, reference numbers 74 through 82. Track charts are shown in Figure 23.

74. Operation No. 918002, Figure 23.

LYNCH departed Solomons, Maryland, on 1 July 1967 en route to the operating area adjacent to Hudson Canyon. Mr. R. K. Oser was chief scientist. Three buoyed current meter arrays, planted on 22 May 1967, were retrieved during the period 2 through 6 July, and subbottom profiles were obtained. A total of 2,996 hours of temperature observations was recorded at the current meter arrays. The ship arrived at Washington, D.C., on 8 July. The data are on file at NAVOCEANO. An informal data report will be published in FY 1969.

75. Operation No. 918009, Figure 23.

LYNCH was employed for survey operations between Norfolk, Virginia, and Jacksonville, Florida, from 30 July to 12 August 1967. The objective of the survey was to investigate microtopography of the upper and lower Continental Rise and to determine its orientation and effect on normal incidence bottom reflectivity. Lt. J. G. Schneider of NAVOCEANO was chief scientist. The cruise terminated at Solomons, Maryland. The data were retained by Lamont Geological Laboratory. No NAVOCEANO report is planned.

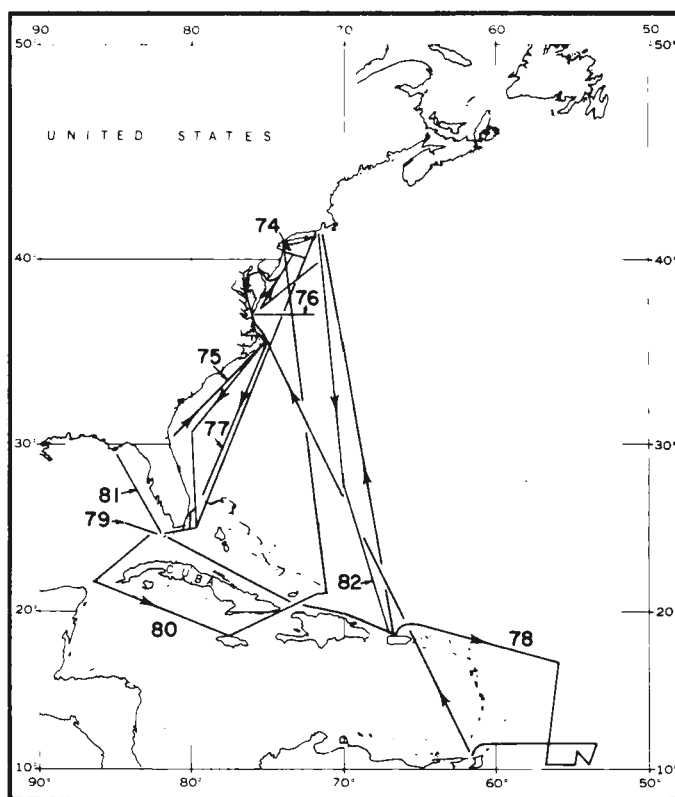


FIGURE 23. LYNCH Cruises, North Atlantic

76. Operation No. 918013, Figure 23.

LYNCH was cruising off the Virginia Capes, from 14 to 23 August 1967, in support of SPAR operations. Mr. Snavely of NOL was chief scientist, and Mr. R. F. Block was NAVOCEANO project coordinator. The SPAR cruise was performed primarily for indoctrinating new NOL personnel in the habits of SPAR. A new method of erecting the SPAR was attempted with good results. No oceanographic data were collected. No NAVOCEANO report is planned.

77. Operation No. 918015, Figure 23.

NRL conducted oceanographic operations from aboard LYNCH between 24 August and 7 September 1967. The survey began at Solomons, Maryland, and ended at Key West, Florida. Mr. R. Nekritz of NRL was chief scientist, and Mr. R. F. Block was NAVOCEANO project coordinator. The BT data are on file at NODC under BT reference number 021209. Nansen cast station data are on file at NODC under cruise reference number 311136. No NAVOCEANO report is planned.

78. Operation No. 918020, Figure 23.

LYNCH departed San Juan, Puerto Rico, on 18 September 1967 to investigate dynamic conditions, distribution of physical properties, and interaction of various oceanographic processes in the general area of the Barbados Experiment and in closely interrelated adjacent regions. Collecting STD and Nansen station data was the primary effort. In addition, two buoyed current meter arrays were implanted and carbon-14 samples were collected at two locations. The cruise terminated in Port-of-Spain, Trinidad, on 7 October. Dr. P. A. Mazeika was NAVOCEANO chief scientist, and Mr. T. D. Edsall, III, was project coordinator. The BT data are on file at NODC under BT reference number 021501. The STD data are on file at NODC under cruise reference number 318026. All other data are on file at NAVOCEANO. No NAVOCEANO report is planned at this time.

79. Operation No. 918027, Figure 23.

From 13 to 22 November 1967, LYNCH took part in a 2-ship, NOL operation to determine bearing accuracies of the SPAR hydrophone system as a function of range and bottom relief. Operations, which were carried out in the Gulf of Mexico, were terminated early due to an electrical failure on SPAR involving ballasting. Mr. Jacques of NOL was chief scientist, and Mr. G. H. Madden was NAVOCEANO project coordinator. The S/V-D-T data are on file at NAVOCEANO. No NAVOCEANO report is planned.

80. Operation No. 918030, Figure 23.

LYNCH departed Miami, Florida, on 2 December 1967 for a NAVOCEANO hydrophone evaluation cruise. Three hydrophone

arrays were compared for future use with the seismic profiling systems aboard the AGOR ships. Tracks were run at various depths and speeds in the Caribbean Sea northwest of Jamaica. The cruise terminated at Montego Bay, Jamaica, on 11 December. Mr. R. G. Evans of NAVOCEANO was chief scientist. The data are on file at NAVOCEANO. No NAVOCEANO report is planned.

81. Operation No. 918037, Figure 23.

LYNCH departed Key West, Florida, on 10 January 1968 for an NRL acoustic survey in the Gulf of Mexico. NAVOCEANO personnel collected oceanographic data in support of the survey. Mr. Lawson of NRL was chief scientist, and Mr. R. F. Block was NAVOCEANO project coordinator. The cruise terminated at Panama City, Florida, on 25 January. The BT and Nansen cast data are on file at NODC under BT reference number 021738 and cruise reference number 311190, respectively. All other data are on file at NAVOCEANO. No NAVOCEANO report is planned.

82. Operation No. 918044, Figure 23.

LYNCH departed New London on 14 March 1968 en route to an area south of Puerto Rico for operations with SANDS. The survey was conducted for USL. While en route, LYNCH was diverted by a message from COMASWFORLANT to take three Nansen cast stations in support of Fleet operations. LYNCH was the transmitting ship and SANDS was the receiving ship for investigating the reflective properties of ocean boundaries. The cruise terminated at San Juan on 5 April. Mr. S. Santaniello of USL was chief scientist, and Mr. G. H. Madden was NAVOCEANO project coordinator. The BT data are on file at NODC under BT reference number 022082. The other data are on file at NAVOCEANO. No NAVOCEANO report is planned.

Nine cruises were conducted aboard SANDS, reference numbers 83 through 91. Track charts are shown in Figure 24.

83. Operation No. 918004, Figure 24.

SANDS departed Solomons, Maryland, on 5 July 1967 to support an NOL underwater detonation test project near Bermuda. BT and S/V-D-T sensor data were collected. The cruise terminated at Norfolk on 17 July. Mr. Price of NOL was chief scientist, and Mr. L. K. Hawkins was NAVOCEANO project coordinator. The BT data are on file at NODC under BT reference number 021469. The S/V-D-T data are on file at NAVOCEANO. No NAVOCEANO report is planned.

84. Operation No. 918006, Figure 24.

SANDS departed New London on 19 July 1967 for a classical oceanographic survey of the BIFI (Block Island/Fischers Island) Sound Range. The cruise was in support of USL sound range project. The cruise terminated at New London on 14 August. Mr. Williams of USL was chief scientist, and Mr. L. K. Hawkins

was NAVOCEANO project coordinator. The bottom sediment, plankton, and bathymetric data were retained by USL. The S/V-D-T data are on file at NODC under cruise reference number 31V027. The other data are on file at NAVOCEANO. Publication TM-2213-184-67 was prepared by USL. An oceanographic cruise summary informal report will be published in FY 1969.

85. Operation No. 918014, Figure 24.

SANDS operated in and out of Roosevelt Roads, Puerto Rico, from 20 August to 7 September 1967. NOL and contract personnel (Lamont and Isotopes, Inc.) obtained oceanographic data and monitored the properties of dye patches at and below the surface after several subsurface explosions. A fluorometer was towed through the dye patches. One explosive charge contained a radioisotope which was monitored by Isotopes, Inc. Mr. Young was NOL chief scientist, and Mr. J. H. Nash, Jr., was NAVOCEANO project coordinator. The data were retained by NOL. No NAVOCEANO report is planned.

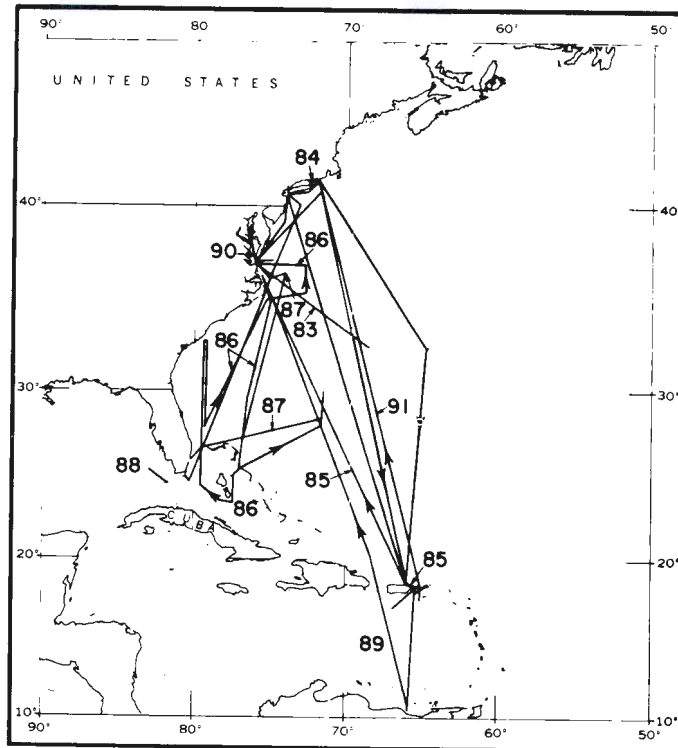


FIGURE 24. SANDS Cruises, North Atlantic

86. Operation No. 918021, Figure 24.

SANDS departed Norfolk, Virginia, on 18 September 1967 for a NAVOCEANO ASWEPs survey. AGOR support consisted of collecting Nansen cast, expendable BT, and bathymetric data. The cruise terminated at Washington, D.C., on 13 October.

Mr. A. Fisher, Jr., of NAVOCEANO was chief scientist, and Mr. T. A. Bender, Jr., was project coordinator. The Nansen station data are on file at NODC under cruise reference number 311137. The other data are on file at NAVOCEANO. No NAVOCEANO report is planned.

87. Operation No. 918025, Figure 24.

SANDS departed Washington, D.C., on 19 October 1967 for a NAVOCEANO training cruise in the area of 27°N, 76.5°W. SANDS returned to Washington 8 November. The purpose of the cruise was to provide at-sea training in the care, use, and operation of the Ramsay Probe and ACODDS. Additional data were obtained on a time-available basis in support of the "Opportunity Measurement Program." Messrs. Q. H. Carlson and R. H. Michel of NAVOCEANO were chief scientists. The BT data are on file at NODC under BT reference number 021737. All other data are on file at NAVOCEANO. No NAVOCEANO report is planned.

88. Operation No. 918029, Figure 24.

SANDS departed Key West, Florida, on 15 November 1967 for an NOL SPAR survey. Due to mechanical difficulties on SPAR in the Gulf of Mexico, the survey was cancelled. No data were collected. The cruise terminated at Key West on 22 November. Mr. Jacques of NOL was chief scientist, and Mr. T. A. Bender, Jr., was NAVOCEANO project coordinator. No NAVOCEANO report is planned.

89. Operation No. 918034, Figure 24.

SANDS departed San Juan, Puerto Rico, on 4 January 1968 and occupied five deep oceanographic stations between Puerto Rico and Venezuela, including a station in the Cariaco Trench. In addition to the data shown in Table I, 70 trace element samples were obtained. Dr. N. R. Andersen of NAVOCEANO was chief scientist. At Venezuela, the NAVOCEANO chief scientist departed SANDS, and personnel from Applied Science Laboratory (ASL) embarked. On the trip from Venezuela to Washington, D.C., two short transmissiometer stations were occupied. Mr. J. H. Nash, Jr., was NAVOCEANO project coordinator. SANDS arrived at Washington 29 January. The BT data are on file at NODC under BT reference number 021781. The transmissiometer data were retained by ASL. All other data are on file at NAVOCEANO. No NAVOCEANO report is planned.

90. Operation No. 918040, Figure 24.

SANDS departed Washington, D.C., On 5 February 1968 to participate in a 1-week training cruise in the Norfolk Canyon region. The training was for NAVOCEANO personnel in operating the Ramsay corer and an underwater camera. Mr. J. H. Nash, Jr., of NAVOCEANO was chief scientist. The cruise terminated at Norfolk, Virginia, on 11 February. Three core samples

were given to Dr. Fischer of Applied Physics Laboratory (APL). The other data are on file at NAVOCEANO. No NAVOCEANO report is planned.

91. Operation No. 918043, Figure 24.

SANDS departed San Juan, Puerto Rico, on 13 March 1968 to carry out the Bottom Reflection and Distortion Cruise 608-68 over the Muertos Trench in the Caribbean Sea. The survey, conducted by USL, terminated on 30 March. Operations consisted of vertical hydrophone lowerings, bottom coring, and bottom photography. Mr. S. Santaniello of USL was chief scientist, and Mr. T. A. Bender, Jr., was NAVOCEANO project coordinator. All data were retained by USL. No NAVOCEANO report is planned.

VI. DEEP OCEANOGRAPHIC SURVEY VEHICLE: Project 671

The mission of the Deep Oceanographic Survey Vehicle Project is to conduct research and development in the form of system feasibility and cost effective studies, including operational evaluation, to develop optimum performance characteristics of Deep Ocean Survey Vehicles (DOSV's) suitable for the conduct of oceanographic research and environmental surveys to 1,500 and 20,000 feet.

The development concept is to:

- * Determine the DOSV cost effectiveness as a survey platform.
- * Determine the specific oceanographic survey requirements which may be best met by employment of a DOSV.
- * Determine preliminary characteristics required for:
 - Vehicle - Hull, Appurtenances, Navigation System, Life Support System, and Communications.
 - DOSV Support System - Ship and Shore Facilities.
 - DOSV Oceanographic Sensors and Instruments - Bottom Sediment Measuring, Water Column Measuring, General Capabilities, etc.
- * Develop techniques for use of the DOSV.
- * Develop basic oceanographic sensors and instruments for use with a DOSV.

The project includes at-sea tests and evaluation of existing vehicles, development of experimental oceanographic sensors and

equipment for vehicle use, determination of logistic support for operation of vehicles, and comparison studies which determine where the submersible improves or does not improve our present ability to survey the sea floor and water column.

The projected milestones include the determination of whether to utilize existing vehicles, i.e., lease commercial vehicles, Deep Submergence System Project deep-sea vehicles (DSRV and/or DSSV), or NR-1; to modify existing vehicles; and/or to construct a DOSV to meet the desired performance characteristics.

Four surveys were conducted for the DOSV Project, reference numbers 92 through 95. Area locations are shown in Figure 25.

92. Operation No. 918012, Figure 25.

A survey was conducted in The Tongue of the Ocean (TOTO) from 14 to 21 August 1967 employing the wet diver delivery vehicle PEGASUS. Mr. J. Pollio was chief scientist. Operations were designed primarily to accomplish the following objectives: (1) Determine the feasibility of employing PEGASUS diver propulsion units or similar underwater vehicles to test and evaluate oceanographic sensors and sensor systems; (2) Develop underwater stereophotography techniques; (3) Test camera/strobe synchronization, lens distortion, and resolution; and (4) Map a 160-foot square area. The data thus gained was an aid in developing the necessary parameters for standardizing an underwater photographic mission. A detailed examination of the data was conducted for the random and systematic errors caused by the camera system, water-air interface, water density, water clarity, the camera focal length to height ratio, and navigation. The data are on file at NAVOCEANO. An informal report will be published in FY 1969.

93. Operation No. 918026, Figure 25.

DEEPSTAR-4000 made 10 dives between New London, Connecticut, and the Panama Canal from 27 October to 26 November 1967. The primary objective of the operation was to familiarize NAVOCEANO personnel with DEEPSTAR-4000 and to evaluate that vehicle's performance as an oceanographic surveying platform. Of equal importance with this vehicle evaluation, a number of scientific objectives were specified. Most dives included a bottom transit normal to the contours for geology reconnaissance and bottom sampling, studies of near-bottom physical properties including sound velocity, temperature, water clarity, current speed and direction, and biology investigations in the water column and along the bottom. In addition to the data shown in Table I, the following was collected: nine films of underwater motion pictures, three analog strip charts of side-scan data, and ten each visual and turbidity observations. Mr. R. Merrifield of NAVOCEANO was chief scientist. The data are on file at NAVOCEANO. An informal report will be prepared in FY 1969.

94. Operation No. 918046, Figure 25.

From 18 to 23 March 1968, an underwater, diver observed and photographed evaluation of the BESS was conducted in the waters adjacent to the Bahama Islands. The system was launched from the chartered vessel PIKES ARM in 30 feet of water near Rose Island. NAVOCEANO divers obtained 35-mm still and 16-mm movie photographs of the system's free-fall, sensor deployment, operation and return to surface. A total of 750 feet of underwater movie film was exposed. Mr. R. F. Busby of NAVOCEANO was chief scientist. The data are on file at NAVOCEANO. No NAVOCEANO report is planned.

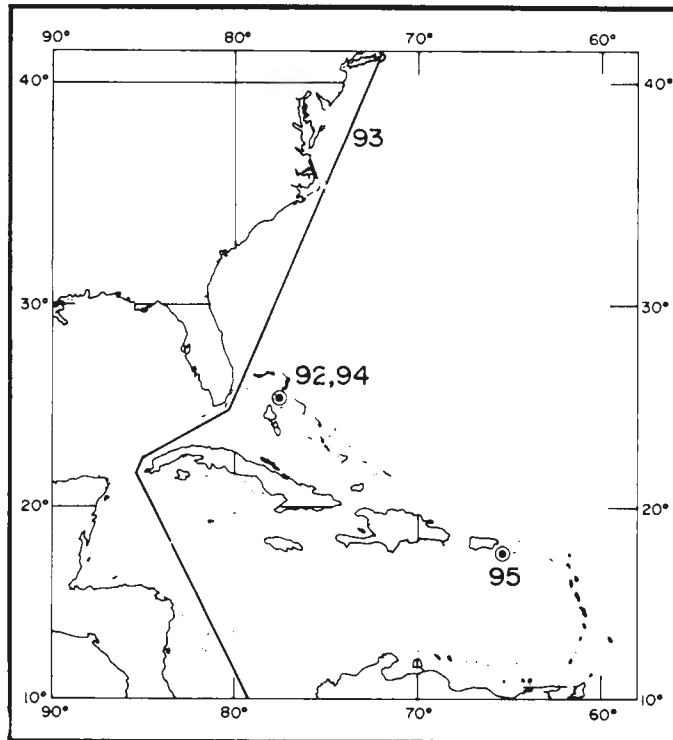


FIGURE 25. Deep Ocean Survey Vehicle Dives

95. Operation No. 918047, Figure 25.

From 11 to 24 February 1968, ALUMINAUT was employed in survey operations off Vieques, Puerto Rico. Mr. J. Pollio of NAVOCEANO was chief scientist. The operation was a continuation of the mission of Project 671 to derive the optimum design characteristics for a Deep Oceanographic Survey Vehicle (DOSV) through at-sea operations. The operation was primarily designed to visually and photographically document a projected cable route in support of the Atlantic Fleet Tactical Underwater Range (AFTUR). The survey commenced at a 6,000-foot depth and extended along the bottom of the 60-foot depth where the shoreward continuation of the route was surveyed by NAVOCEANO scuba divers. Visual observation included 40 each of suspended sediment, current, plankton, and water transparency, and 36 miles

of bottom information. The data are on file at NAVOCEANO. An informal report will be prepared in FY 1969.

VII. UNDERWATER RANGES. Project 715

NAVOCEANO provides oceanographic support for the development of underwater test ranges. The primary and continuing support is for NAVSHIPS Research and Development Range AUTEC (Atlantic Undersea Test and Evaluation Center) located in the Bahamas. Additional support is given NAVAIR Underwater Tactical Ranges by gathering oceanographic information required to design and to instrument test ranges near St. Croix and Puerto Rico.

The AUTEC provides a large, deep water test and evaluation center for acoustic measurements, tests of sonars, weapons, weapon systems, and operational evaluations requiring acoustic three-dimensional tracking underwater, and radar and optical tracking in air. The major NAVOCEANO task in AUTEC has been to define the oceanographic environment to allow meaningful interpretation of test data from the range operations. To accomplish this task, the NAVOCEANO AUTEC program has progressed from the classical techniques of oceanography such as Nansen casts, through buoyed arrays with data storage for non-real time applications, to permanent arrays with cable and RF telemetry for real-time data display at AUTEC shore stations.

Oceanographic operations continued to support the AUTEC with emphasis on the development of instrumentation and techniques for oceanographic monitoring during range tests. Oceanographic and geological surveys were conducted to provide additional environmental data for AUTEC operations.

Four surveys were conducted during FY 1968 in support of the Underwater Ranges Project, reference numbers 96 through 99. Area locations are shown in Figure 26.

96. Operation No. 938027, Figure 26.

The fourth of seven replicate surveys was conducted at the AUTEC sites in the Bahamas from 17 August to 13 September 1967. The surveys are designed to monitor sediment movement and channel filling at the AUTEC main base and down-range sites. A total of 82 beach profiles was measured at AUTEC sites 1, 2, 6, 16, and 17, and 44 channel filling measurements were made at sites 1, 2, 3, 4, 6, 7, and 16. Current meters were installed in shallow water at sites 1, 2, and 6. Mr. H. D. Huddell was chief scientist. The data are on file at NAVOCEANO. A letter report to AUTEC will be published in FY 1969.

97. Operation No. 938030, Figure 26.

Between 13 and 21 November 1967, three current meters were retrieved from AUTEK sites 1, 2, and 6, and new meters were installed at the same locations. The retrieved meters had been planted during the August 1967 sediment survey. Mr. H. D. Huddell was chief scientist of operations. The data are on file at NAVOCEANO. An informal report will be published in FY 1969.

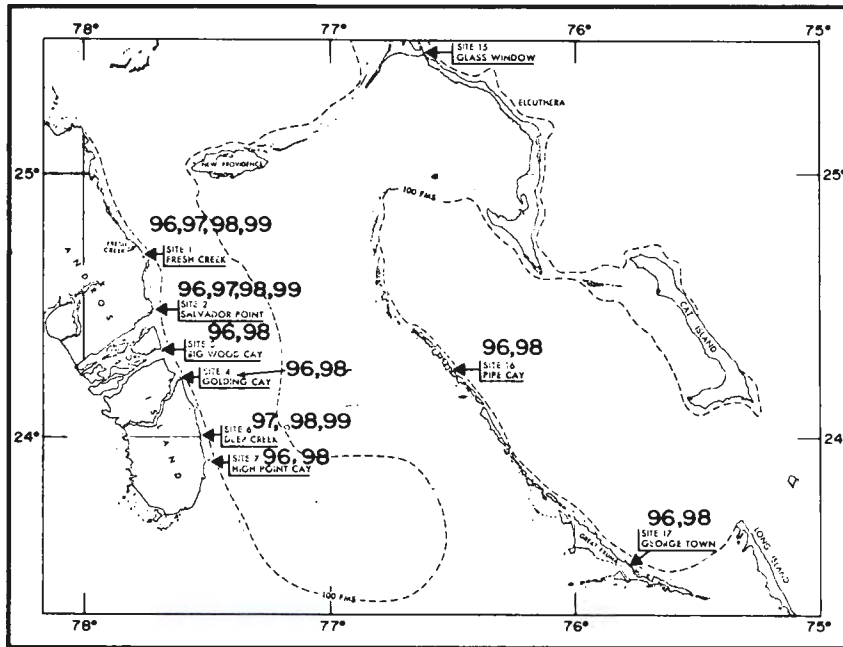


FIGURE 26. AUTEK Surveys

98. Operation No. 938009, Figure 26.

The fifth of seven replicate surveys was conducted at the AUTEK sites in the Bahamas from 18 February to 18 March 1968. Mr. H. D. Huddell of NAVOCEANO was chief scientist aboard M/V PIKES ARM. The surveys are designed to monitor sediment movement and channel filling at the AUTEK main base and down-range sites. Eighty-two beach profiles were obtained at AUTEK sites 1, 2, 6, 16, and 17. Channel filling was measured by obtaining 42 channel profiles at sites 1, 2, 3, 4, 6, 7, and 16. Current meters, installed in shallow water in November 1967, were retrieved from sites 1, 2, and 6; meters were replaced at the same locations. The data are on file at NAVOCEANO. An informal report of the survey will be prepared in FY 1969.

99. Operation No. 938031, Figure 26.

Between 19 and 26 June 1968, three buoyed current meters were retrieved from shallow waters at AUTEK sites 1, 2, and 6.

New meters were installed at the same locations. The retrieved meters originally had been planted during the February 1968 sediment survey as a part of the continuing program to monitor sediment movement along the beaches and into the channels at the AUTECH sites. Mr. H. Huddell was chief scientist. The data are on file at NAVOCEANO. An informal report will be published in FY 1969.

TABLE II. PUBLICATIONS REPORTED IN FY 1968

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TR 200	Some Summer Oceanographic Features of the Laptev and East Siberian Seas. Robert C. Lockerman. January 1968.
TR 201	Oceanographic Survey Results off Point Arguello, Calif., January and November - December 1964. Robert W. Thomas. February 1968.
TR 202	Some Results of an Oceanographic Survey in the Northern Greenland Sea, Summer 1964. Louis A. Codispoti. March 1968.
TR 203	Oceanography in the Channel Islands Area off Southern California, September and October 1965. Samuel G. Tooma, Jr., and Harry Iredale, III. June 1968.
NOO 607	Instruction Manual for Obtaining Oceanographic Data. Third Edition. NAVOCEANO. 1968.
SP 122	Oceanographic Surveys, Fiscal Year 1967. Oceanographic Surveys Department. June 1968.
IM 67-12	Deep-towed Bathymetric System. Martin G. Fagot and Robert K. Oser. February 1967.
IR 67-39	Bathymetric-Magnetic Field Investigations: Southern Portion, San Juan Seamount. Robert W. Thomas. June 1967.
IR 67-41	Oceanographic Cruise Summary, East Siberian Sea. Richard M. Wargelin. July 1967.
IR 67-43	Oceanographic Cruise Summary, DeLong Strait. Martial Car and William L. Gsell. July 1967.
IR 67-44	Oceanographic Cruise Summary, Reconnaissance Survey of Northern Mid-Oceanic Ridge. G. Leonard Johnson. July 1967.
IR 67-47	Oceanographic Cruise Summary, Barents Sea. Keith R. Newsom. July 1967.
IR 67-51	Undersea Studies with the DSRV ALVIN, Tongue of the Ocean, Bahamas, September 1966. Roswell F. Busby and Roger Merrifield. July 1967.
IR 67-65	Measurements of Underwater Reflectance and Attenuation of Diffuse Light Near Kamchatka, USSR, During Aug - Sept 1966. Richard M. Heavers. November 1967.

- IR 67-66 A Partial Bibliography, Inshore Survey Program Along Atlantic and Gulf Coasts. W. R. Heiner. September 1967.
- IR 67-67 Oceanographic Cruise Summary, Baffin Bay - Davis Strait - Labrador Sea. Kenneth B. Peery. September 1967.
- IR 67-74 Design and Use of a Bottom Environmental Sensing System. Robert K. Oser and Martin G. Fagot. October 1967.
- IR 67-76 Oceanographic Cruise Summary, Atlantic Fleet Tactical Underwater Range; Southeast Puerto Rico - 1967. Charles Ostericher, Jr. December 1967.
- IR 67-77 Oceanographic Data Report, San Clemente Island Area, October to December 1966. Robert K. Oser, James L. Berger, and Louis J. Franc. September 1967.
- IR 67-79 Oceanographic Cruise Summary, Ross Sea, Antarctica. Martial Car. December 1967.
- IR 67-85 Project FLOOD, Report on Data Collected by Mine Division 84, Eastern Ligurian Sea, December 1965. Atwood S. Barwick. December 1967.
- IR 67-100 AUTEK Sediment Deposition/Erosion Study, Interim Report. H. D. Huddell. September 1967.
- IR 68-7 Oceanographic Cruise Summary, Marine Biofouling Studies off Maizuru, Yokosuka, and Sasebo, Japan. John R. DePalma. February 1968.
- IR 68-10 Oceanographic Cruise Summary, Western Greenland Sea, August - September 1965. Martin T. Bourkland. March 1968.
- IR 68-12 An Analysis of Japanese Current Meter Arrays. J. D. Hawes. April 1968.
- IR 68-14 Oceanographic Cruise Summary, UNITAS VIII Cruise Around South America, August to December 1967. Laurie E. Jarvela. March 1968.
- IR 68-17 Oceanographic Cruise Summary, Eastern Gulf of Maine and Continental Margin. Vance G. Sprague, Jr. February 1968.
- IR 68-20 Oceanographic Data Report, San Clemente Island Area, July and August 1967. A. R. Mooney and Robert K. Oser. March 1968.
- IR 68-22 A Comparison of Synoptic Temperature - Depth Observations in the Tongue of the Ocean, Bahamas. Gilbert S. Ruggles. March 1968.

- IR 68-23 Oceanographic Cruise Summary, Baffin Bay - Davis Strait - Labrador Sea, Summer 1967. Louis A. Codispoti and Joseph H. Kravitz. May 1968.
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- IR 68-35 A Taut Wire Buoy Array for Environmental Monitoring in AUTEK. Richard F. Rooney. October 1967.
- IR 68-52 Applications of Underwater Photogrammetry. J. Pollio. June 1968.
- IR 68-62 Design and Operational Performance of Manned Submersibles. R. F. Busby. June 1968.
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- SP-96-I-7B Summary Profiles of Underway Geophysical and 3.5 kHz Normal Incidence Reflection Loss Results - Detail Survey Cruises. R. J. Iulivcci, E. T. Miller, and T. M. Pike.
- SP-96-I-8B Core, Sound Velocimeter, Hydrographic, and Bottom Photographic Stations - Cores. B. Charlotte Schreiber.
- SP-96-I-8C Core, Sound Velocimeter, Hydrographic, and Bottom Photographic Stations - Sound Velocity Profiles. Mark Erie Odegard and Eleanor M. Rocuzzo.
- SP-96-II-1 Summary Report and Bottom Reflection Loss. C. Lobel, Eleanor Weininger, and E. T. Miller.
- SP-96-II-2 Summary Tables of Acoustic Station Results. C. B. Officer, E. T. Miller, and William McGuinness.

SP-96-II-4 Reverberation.

SP-96-II-8A Core, Sound Velocimeter, Hydrographic, and Bottom Photographic Stations - Sound Velocity Profiles. Mark Erie Odegard and Eleanor M. Rocuzzo.

SP-96-V-2 Summary Tables of Acoustic Station Results. Eleanor Weininger and J. L. Simon.

SP-96-V-3 Underway 3.5 kHz Normal Incidence Reflection Loss. T. M. Pike.

SP-96-V-5 Bathymetry and Subbottom Profiling. A. M. Harian.

SP-96-V-6 Magnetics. D. L. Halpin and R. Vajk.

SP-96-V-7B Summary Profiles of Underway Geophysical and 3.5 kHz Normal Incidence Reflection Loss Results Detail Survey BERTHA ANN.

SP-96-V-8 Core, Sound Velocimeter, Hydrographic, and Bottom Photographic Stations - Cores. B. Charlotte Schreiber.

SP-96-V-8A Core, Sound Velocimeter, Hydrographic, and Bottom Photographic Stations - Sound Velocity Profiles. Eleanor Weininger and E. T. Miller.

SP-96-V-8B Core, Sound Velocimeter, Hydrographic, and Bottom Photographic Stations. B. Katz.

SP-96-V-9 Catalog of Data. Marie Krause.

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