CONSEIL INTERNATIONAL DES UNIONS SCIENTIFIQUES - INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS
SPECIAL COMMITTEE ON OCEANIC RESEARCH
(SCOR)

INTERNATIONAL INDIAN OCEAN EXPEDITION
30 EAST 40TH STREET - NEW YORK 16, N. Y. - LEXINGTON 2-6533

COORDINATOR
ROBERT G. SNIDER

CABLES
SCORINDOC - NEWYORK

SUMMARY OF SHIP'S PROGRAMS

Alphabetically by Country

AUSTRALIA

HMAS DIAMANTINA

1961-4 - General area of operation between 0° and 45°S, 85°E and 140°E.
Biology, Chemistry and Physics on all cruises
Meteorology, including radio-sonde and radiation
Geology and Geophysics may be included.

1961 - 26 July - 26 August - 4 weeks
1962 - * August - September - 8 weeks
1963 - February - March - 8 weeks
* June - 4 weeks
* July - August - 8 weeks
December - 4 weeks
1964 - February - March - 7 weeks
* May - 2 weeks
* July - August - 7 weeks
December - 2 weeks

* Proposes to work in Northern Summer on tracks along 86°E and 94°E between 8°N and 32°S which are to be covered by Japanese in Northern Winter. Disciplines to be represented by CSIRO - Cronulla are primary production, nutrient chemistry, pigments, hydrology, water masses, circulation, zooplankton, phytoplankton, light transmission, physical oceanography; CSIRO - Aspendale-Radiation balance; R.A.N. - Canberra - Bathymetry, Radio-sonde; Bureau of Mineral Resources - Canberra - Geophysics.

HMAS GASCOYNE

1962 - August - September - 9 weeks - Indian Ocean
1963 - February - March - 8 weeks - Indian Ocean

FRANCE

FNS COMMANDANT ROBERT GIRAUD

1962 or 1963 - July to September - Cape Guardafui to 30°S linked sections from coast to 5-600 miles out.
Physical and Chemical Oceanography - Hydrographic stations, temperature, salinity, oxygen and direct current measurements Bab el Mandeb and Ormuz Straits.
Similar to 1960 cruise completed same area same season.

1963 - January to March ? - Eastern Arabian Sea
Physical and Chemical Oceanography - Hydrographic stations and direct current measurements in Bab el Mandeb and Ormuz Straits assisting CALYPSO. Same area as April-June 1961 GIRAUD cruise.

CALYPSO

1962-1963 - December 1962 to March 1963 - Red Sea, Gulf of Aden, Arabian Sea, Persian Gulf.
Physical and Chemical Oceanography - Hydrographic stations and direct current measurement in Bab el Mandeb and Ormuz Straits. Five traverses of Red Sea, three in Gulf of Aden. Joint operation in Arabian Sea and Persian Gulf with GIRAUD, covering same area as her April-June 1961 cruise.

(BIOLOGICAL VESSEL)- (22 m.)

1962 - Throughout year ? - Mozambique Channel based at Tulear, Malagasy Republic.
Biological Oceanography - Program under Prof. Peres will conform with internationally agreed "Program for Biology".

(NEW VESSEL FOR NOUMEA) - (35 m.)

Vessel under construction proposed to make Indian Ocean cruise, date, place and program unknown, enroute Noumea.

(NEW CONSTRUCTION) - (70 m.)

New research ship may possibly operate in Expedition. No further information.

GERMAN FEDERAL REPUBLIC

NEW VESSEL

1963-4 or 1964-5 - October - April - 187 day cruise to Gulf of Aden, Arabian Sea, Persian Gulf.
Mid-October to Mid-November - Straits of Babel Mandeb and Gulf of Aden.
Biology - Intensive investigation with primary emphasis on biology - 30 days 3000 track miles.

GERMAN FEDERAL REPUBLIC

NEW VESSEL - contd
Mid-November to Mid-February in Arabian Sea.
Physical Oceanography - Primary emphasis on this discipline with 417 stations in 10,200 track miles.
Mid-February to Mid-March in Persian Gulf.
Geology and geophysics - Primary emphasis during this period.
Note - 31 scientists and technicians (space for 2 visitors from NW Indian Ocean) in following disciplines - Physical Oceanography, chemical oceanography, marine geology, marine geophysics, marine meteorology, planktology, marine zoology, marine botany.
Date of departure depends on availability of vessel.

INDIA

INS KISTNA - (Indian Navy Frigate converted for oceanography)
1962 and 1963 - At least 6 months sea time each year in N.W. Indian Oean and in Bay of Bengal. Primarily deep-sea cruising in both S.W. and N.E. monsoons in both areas.
Arabian Sea - Bombay to Karachi to mouth of Persian Gulf to Bombay, E-W sections on 19°N and 17°N and on 12°N and 9°N to 52°E. Westerly section from Cochin to 5°N, 62°E - South to 10°S to 66°E, North to 0° to 1°N, 70°E, South to 10°S, to 74°E, North to 0° thence to Cochin.
Bay of Bengal - 7 coastal sections Madras to Burma, up to 200 miles from coast. Section on 92°E - 20°N to 12°N and west to India. Three transverse sections to Andamans, Nicobars and Sumatra between 10°N and 5°N linked with meridional sections on 89°, 87°, 84°, 82°, 79°E between 8°N and 5°N. 5 Sections NNE-SSW and NNW-SSE between 9°N and 0° starting at 77°E and going to 95°E.
Biology - Qualitative, quantitative and systematic studies of phyto and zooplankton and benthos. Primary productivity (C_{14}method) and abundance of plants and animals in relation to chemical and physical features. Related features such as dissolved oxygen, water movements and oceanic circulation, and distribution of organisms. Experimental fishing.
Physical Oceanography - Hydrographic stations to 2000 m. Surface and subsurface current measurement. Transparency and sound propagation studies.
Chemistry - Standard Analysis for PO_4, NO_3, SiO_4, pH, O_2 and CO_2; plus large-volume sampling for radioactive isotope analysis.

INDIA

INS KISTNA - contd
Geology and Geophysics - Continuous bathymetry, sediment coring, gravity and magnetic studies, heat flow and seismic refraction in significant areas.
Meteorology - Surface observations plus upper atmosphere if equipment available.

R/V VARUNA (75' new fisheries research vessel)
1962 and 1963 - At least 6 months each year - both monsoons. Approximately to 1000 fathom curve on west coast of India.
Biological Oceanography - Phytoplankton, Zooplankton and benthic studies; primary productivity; experimental fishing and applied fisheries research on continental shelf and adjoining areas.
Physical Oceanography - Hydrographic stations and current measurements to vessel's capacity.
Chemistry - Standard analysis of water samples.
Geology and Geophysics - Bottom samples.
Meteorlogy - Surface observations.

R/V CONCH (50' vessel) - Kerala University
1962 and 1963 - At least 6 months each year - both monsoons. Continental shelf to 45-50 miles from coast on west coast of India from Cochin.
Biological Oceanography - Phytoplankton, zooplankton and benthic studies; primary productivity; experimental fishing and applied fisheries research on continental shelf and adjoining areas.

M.F.V. BANGADA - (Ministry of Food and Agriculture fishing vessel)
1962 and 1963 - At least six months each year - both monsoons. Continental shelf and adjoining areas in Bay of Bengal.
Biological Oceanography - Phytoplankton, zooplankton and benthic studies; primary productivity; experimental fishing and applied fisheries research on continental shelf and adjoining areas.

(NOT YET DESIGNATED) - (Naval coastal minesweeper?)
1962 and 1963 - Available for short periods for coastal work in Bay of Bengal.
Biological Oceanography - Phytoplankton, zooplankton and benthic studies; primary productivity; experimental fishing and applied fisheries research on continental shelf and adjoining areas.

INDONESIA

JALANIDHI - (650 ton research vessel under construction)
This vessel is being constructed for use in the Indian Ocean Expedition. Completion reported August 1962. No schedule or program plans available for Indonesian shipboard operations.

JAPAN

UMITAKA MARU (Tokyo University of Fisheries)
1962-63 -December - March - 8°N to 32°S along 78°E - 30°days
1963-64 -Biology - Investigation of animals and plants, collection of bottom specimens, plankton hauls and trawls down to 1,000m at stated periods, water samples for productivity analysis.
Chemistry - Dissolved oxygen and nutrient salt analysis, trace elements, etc.
Physics - General oceanographic observations to bottom at least every 150 miles, B/T's, shallow stations at intermediate points, Ekmann current meter observations in equatorial region.
Meteorology - Synoptic observation and airsea interface studies.
1963-64 only -Geology & Geophysics - PDR Bathymetry, gravity and magnetism; bottom specimens.

RYOFU MARU - (Japanese Meteorological Agency)
1963-64 -December - March - 8°N to 32°S along 86°E - 30 days.
Physics and Chemistry - General oceanographic observarion; Current measurement; Special chemical elements.
Geology and Geophysics - Subterranean heat; Collection of bottom of specimens; Precision Sounding.
Meteorological observation.

KOYO MARU - (Meteorological Agency)
1962-63 -December - March - 8°N to 32°S along 94°E - 30 days.
1963-64 Biology - Investigation of animals and plants and special chemical elements.
Geophysics - Echo Sounding
Geology - Collection of bottom specimens.
Meteorological observation.

TAKUYO MARU (Hydrographic Office - Maritime Safety Agency)
1963-64 -December - March 8°S to 32°S along 102°E.
8°S to 32°S along 110°E. 20 days.
Physics and chemistry - General oceanographic observation; current measurement; special chemical elements.
Geology and geophysics - Precision echo sounding, collection of bottom specimens; Terrestrial magnetism.
Meteorological observations.

JAPAN - contd

KAGOSHIMA MARU (Kagoshima University
1963-64 - December - March - 8°S to 32°S along 106°E, 8°S to 22°S along 118°E (?) - 30 days.
Biology - Investigation of animals and plants;
Physics and chemistry - General oceanographic observation.
Geology and geophysics - Sounding; Collection of bottom specimens.
Meteorological observations.

PAKISTAN

PNS ZULFIQUAR - (2,000 tons)
1962 - (months not determined - Bay of Bengal - North of 19°N, and Arabian Sea - East of 64°E and North of 18°N. Eleven stations in Bay of Bengal, fourteen in Arabian Sea.
Physical and Chemical Oceanography - Hydrographic casts analysed for temperatures, salinities, oxygen, nitrate, silicate, inorganic and total phosphate. Current and transparency measurements.
Biology - Primary production, plankton sampling, chlorophyl observation, sea weed samples.
Geology and Geophysics - Bathymetry, coring, dredging.
Meteorology - Surface observations and radiation.

1963 - (months not determined) - Bay of Bengal - 16°N to 21°N and 91°E to Burmese coast - 9 stations. Arabian Sea - Gulf of Oman to 66°E and 22°N to 25°N - 14 stations.
Physical and Chemical Oceanography
Biology
Geology

1964 - (Months not determined) - Bay of Bengal - 16°N to 18°N and 84°E to 91°E - 11 stations. Arabian Sea - 18°N to 22°N and 58°E to 64°E - 14 stations.
Physical and Chemical Oceanography
Biology
Geology

PNS MADADGAR - (1,000 tons)
Reported to participate in 1962 and 1963

FISHERIES RESEARCH VESSEL - (90 tons)
Two reported under procurement - one for West Pakistan, one for East Pakistan - coastal observations.

PORTUGAL

PNS ALMIRANTE LACERDA

1962 - Southwest monsoon period. Mozambique Channel. 8 sections between Mozambique and 43°E.
Physical and Chemical Oceanography
Biology
Geology and Geophysics
Meteorology
(NOTE: No detailed program or schedule available)

1963 - Same as 1962

SOUTH AFRICA

NATAL

1962 - April - Cruise 1 - (University of Capetown, Department of Oceanography) Agulhas Current to 500 miles off South African coast. 37 Stations on four sections in 3 weeks - Durban to Simonstown.
Physics - Hydrology of Agulhas Current - Hydrographic casts to bottom, B/T, G.E.K. (C.S.I.R.)
Biology - Plankton and productivity of Agulhas current; Botany-Taxonomy of Diatoms and Peridinians. Plankton hauls to 100 m. on all stations; intensive hauls to 400 m. on 12 stations.

1962 - May - Cruise 2 - across South East African continental shelf. Two sections to South Easterly direction of Cape Agulhas to 500 miles. 3 weeks.
Geology - (University of Capetown - Department of Oceanography) Geological and chemical analysis of bottom sediments on continental shelf and deep sea sediments. Precision echo sounder profiles.
Geophysics - (Bernard Price Geophysical Institute) - Seismic, gravity and magnetic observations.
Physics - G.E.K. observations (C.S.I.R.)
June - Cruise 3 - S.E. from Mazeppa Bay to 35°S, 37°E, thence westward to Cape Agulhas - 2½ weeks.
Geology, Geophysics, Physics as in Cruise 2.
July - Cruise 4 - Agulhas current - same as Cruise 1
Physics and Biology as in Cruise 1.

1962 - August - Cruise 5 - 2½ weeks. E. of Natal and S. of Madagascar to 600 miles from African coast.
Biology - (S. African Museum) Distribution of subsurface pelagic fishes - Tunny experimental fishing; Plankton and productivity investigation of Agulhas current - regular net hauls to 100 m. periodic to 400 m. 2 sections to 600 miles.
Physics - (CSIR and Weather Bureau) 48 hour station at 32°S, 44°E to study energy exchange between ocean and atmosphere; temperature and current measurement vs. depth and internal waves to 300 m., G.E.K.

SOUTH AFRICA

NATAL - contd

Geophysics - (Bernard Price Institute) Gravimetric measurement underway.

1962 - October - Cruise 6 - Agulhas Current - Same as Cruise 3
Physics and Biology - as in Cruise 1.

1963 - January - Cruise 7 - Agulhas Current - same as Cruise 1.
Physics and Biology - as in Cruise 1.
February - Cruise 8. E of Natal and S. of Madagascar to 600 miles. Same as Cruise 5.
Biology, Physics, Geophysics - as in Cruise 5.

AFRICANA II - (Division of Fisheries)

1961 - June, July, Agulhas Current to 1,500 miles off African Coast. 2 sections from Lourenco Marques and to Durban extending to 38°S, 58°E. 42 stations.
Physics - Temperatures and salinities at all stations.
Chemistry - Analysis of oxygen, inoganic phosphate and broad trace element composition -- all stations.
Biology - Primary Productivity by C^{14} technique - Plankton hauls for qualitative and quantitative analysis at all stations. Surface trolling, hand and long-lining, midwater trawling and blanket netting in passage.

1962 - June, July - Port Elizabeth to Prince Edward Is. to Crozet Is. to East London. Similar cruise to 1961.

THAILAND

OCEANOGRAPHIC VESSEL NO. 2 - (90 tons)

1962 and 1963 - December 1962 and January 1963 - Continental Shelf off west Thailand coast. Twelve E-W sections 20 miles apart with 49 stations at 20 mile intervals. 8 anchored coastal current stations.
Physical and Chemical Oceanography - Hydrographic casts at all stations. Current measurement.
Biological Oceanography - One meter net plankton tows, dip net biological collections at some stations and on coast.
Geology - Bottom sediment samples.
Meteorology - Special surface observations at stations and at synoptic hours.

NEW VESSEL - (350 tons)
This vessel may be available - if adequately equipped by early 1963 for cooperative work with adjoining countries along entire coast of Bay of Bengal.

USSR

VITJAZ

1962 - April - October - Eastern, Equatorial and Central Indian Ocean (See chart) Enter at Djakarta, depart at Suez.
Physics - Investigation of surface and subsurface circulation and make up of Indian Ocean water mass during northern summer months.
Geology and Geophysics - Investigation of geological bottom formations and the earth under the Indian Ocean.
Biology - Investigation of biological structure of Indian Ocean from point of view of exploitation for commercial fishing. Collection of material for investigation of zonal difference in appearances of various creatures in Indian Ocean.
Note - To follow "program of International Investigation of Indian Ocean". 185 day cruise - at approximately 12 knots - passage time for 25,000 mile route is 88 days, station time 52 days, port time 40 days, reserve 5 days.

See also cruises by VITJAZ in September 1959 to March 1960 and October 1960 to March 1961, for which only tracks have been provided. No further future plans available. OB and ALEXANDER KOVALEVSKY have been reported scheduled for 1960 - 61 work. No information.

UNITED KINGDOM

HMS DALRYMPLE (Imperial College)

1961 - October - Red Sea & Arabian Coast to Persian Gulf. Magnetic Surveys
1961-2 - Nov. - Feb. - Persian Gulf (lower) Sediment Studies
1962-3 - Probably similar - Geology & Geophysics

HMS OWEN - (Cambridge)

1961-2 - October-May - Red Sea, Arabian Sea and West Central Indian Ocean - Africa to India to Gan to Mauritius. Geophysics - Bathymetry, Magnetism, Gravity. Meteorology (Synoptic observation)
1962-3 - October-April - probably N.W. Indian Ocean. New plans being developed for virtually full time deep water oceanographic cruise.
1963-4 -
1964-5 - in Western Indian Ocean - No plans formulated.

UNITED KINGDOM (contd)

RRS DISCOVERY III

1963 - March-May - Seychelles Ridge, Somali Basin, Carlsberg Ridge, Arabian Basin (Cambridge & NIO)
Geophysics - Bathymetry, magnetic, gravity and seismic surveys, bottom photography and sampling
Meteorology - Synoptic observation and radio sonde
Biology - observation of surface phenomena

1963 - June, July - South Arabian Coast
Water movements, nutrient cycle, organic production, succession of plant and animal populations.
Biology - (NIO) Intensive water sampling and sampling with vertical nets on continental shelf at 20-30 miles intervals, 40-50 miles in deep water plus bottom samples and periodic net tows. Detailed investigation of one upwelling center. Qualitative and quantitative plankton studies.
Chemistry - (NIO) General survey plus detailed upwelling region investigation. Estimation of nutrient composition of sea water and organisms, and exchanges with bottom sediments. Measurement of ultraviolet adsorption in sea water and distillates, particularly in plankton blooms.
Physics - (NIO) Direct current measurement with current waters, B/T and towed electrodes; possibly with neutrally buoyant floats.
Geophysics - PDR bathymetry, magnetic and gravity measurements continuously.
Meteorology - Synoptic observations and radio sonde.

1963 - August - October - 4 transverse sections across Arabian Sea.
Hydrography and Biology - (NIO) 2 stations daily-current to 200 meters; chemical, physical and biological (algal production) sampling to 500 meters at noon, chemical, physical sampling to bottom, biological sampling (Zooplankton esp.) to 1,500 m. at 2200. Various trawls and net hauls to bottom periodically.
Geophysics - PDR bathymetry, magnetic and gravity measurements continuously.
Meteorology - Synoptic observations and radio sonde.

1963 - November - Equatorial region - African coast to 78°E. Current measurements.
Physics - (NIO) Special current measurements using direct reading meters and neutrally buoyant floats at points along equator and on at least 3 meridional sections.
Chemistry - (NIO) Physical and chemical sampling to 600 m. at 30 mile intervals on meridional sections.

UNITED KINGDOM

RRS DISCOVERY III (contd)

1963 - Biology - (NIO) Water sampling for chlorophyl measurement and chemical analysis; vertical net hauls to 500 m. at 30 mile intervals. Towed horizontal and oblique nets.
Geophysics - PDR bathymetry, magnetic and gravity measurements continuously.
Meteorology - synoptic observations and radio sonde.

1964 - January, February - 4 transverse sections across Arabian Sea (Same as Aug. to Oct. 1963).
March - Equatorial region (Same as Nov. 1963)
April - Colombo to Suez - Geophysics on passage.

UNITED STATES

R/V VEMA - (Lamont Geophysical Observatory)

1962 - June, July - SW Indian Ocean, Madagascar Basin, Mozambique Channel, Madagascar Seychelles, Mauritius area; northern Indian Ocean ridge; Gulf of Aden
Geophysics & Geology - PDR bathymetry, magnetic and gravity measurements continuously. Seismic reflection profiles, bottom thermal and acoustic probes, bottom sampling, coring and photography, island rock collections.
Physics & Chemistry - Water sampling at various depths for physical and chemical characteristics, C_{14} and tritium sampling, B/T and sound velocity measurements.
Biology - Plankton sampling at various depths, microbiological sampling, ocean bottom trawls.

1963 - 17 March to 15 June - Aden to Capetown - Southern Indian Ocean; South Africa, Kerguelen.
Disciplines not specified - probably similar to 1962.

R/V CONRAD (LGO)

1963 - 17 March to 15 June - Aden to Capetown - South Indian Ocean - South Africa, Kerguelen, W. Australia. Cruise plans not detailed.

WILLIAMSBURG - (Woods Hole Oceanographic Institute) Based at Bombay.
Biology - Basic program for all cruises. Complete hydrographic stations to bottom for measurement of physical and chemical oceanographic parameters, measurement of light penetration, primary production (C-14 technique), phyto-plankton pigments, zooplankton sampling from selected depth intervals and midwater trawl hauls. Stations every 120 miles on meridional sections, more frequently on coastal cruises.

UNITED STATES

WILLIAMSBURG - contd

Meteorology - Synoptic observations and radio sonde.

1963 - Feb. - April - Cruise I - Bay of Bengal, Andaman Sea, and Nicobar Islands. 15 sections around the Bay of Bengal from Ceylon to Nicobars out to 250 miles from coast and section from Rangoon to Ceylon. Dredging and bottom trawling on continental shelf additional.

1963 - May - July - Cruise 2 - Cochin to 20°N, 70°E to 40°S to 80°E to Colombo and Cochin. Midwater and/or surface collecting additional.

1963 - Aug. - Sept. - Cruise 3 - Cochin to Karachi to 20°N, 60°E to 40°S to 50°E to Tamatave. Midwater and/or surface collecting additional.

1963 - Oct. - Nov. - Cruise 4 - Tamatave to Reunion to 40°S, 55°E to 75°E to Cochin. Diversions to Chagos, Maldives and Laccadives. Midwater and/or surface collecting additional.

1964 - Jan. - March - Cruise 5 - Arabian Sea and Gulf of Aden. 19 sections around the coast of the Arabian Sea from Cochin to Cape Guardafui out to 250 miles from the coast and a transverse section from Africa to India on 10°N. Dredging and bottom trawling on continental shelf additional.

1964 - April - May - Cruise 6 - Cochin to 20°N, 65°E to 40°S to 30°E to Durban. Midwater and/or surface collecting additional.

1964 - June - July - Cruise 7 - (Agulhas current) Durban to Port Elizabeth to 40°S, 25°E; 5 sections within 500 miles of coast to Lourenco Marques to S. end of Madagascar to 40°S, 45°E to 30°E to Durban. Dredging and bottom trawling on continental shelf additional.

1964 - Aug.-Sept; - Cruise 8 - (Mozambique and Somali currents) 10 sections from Durban to 5°N, 50°E across Mozambique Channel and to 500 miles from African Coast to Zanzibar and along Kenya and Somalia coasts, thence S. on 50°E to Diego Suarez and Nosy Bé. Dredging and bottom trawling on continental shelf additional.

1964 - Oct.-Nov. - Cruise 9 Nosy Bé to Reunion, N. on 55°E to 10°N via Seychelles diversion to Laccadives Maldives and Chagos for investigations, to Cochin. Dredging and bottom trawling on continental shelf and island groups additional.

UNITED STATES

AUXILIARY VESSEL - (charter by WHOI) Based at Bombay

Biology and Geology - Collection and observation in and around island groups and shallow water areas. Shore parties landed on atolls for intensive 2-3 month studies. Extensive investigations of each region by Auxiliary Vessel. Small boats, dark rooms, some laboratory space, diving equipment and dredging and experimental trawling to 100 fathoms.

1963 - March - May - Cruise A. Singapore, Nicobar Islands - Andaman Islands - Cochin.

1963 - June - Sept. - Cruise B. Cochin - Laccadive Islands - Maldive Islands - Cochin

1963 - October - December - Cruise C - Cochin - Chagos Archipelago - Mauritius.

1964 - January - February - Cruise D - Mauritius - Seychelles - Madagascar.

1964 - March-June - Cruise E - Madagascar - Comoros Islands - Zanzibar

WEATHER SHIPS

1963-64 - Meteorology
Biology - Chemistry - Physics - Time series at single location on 1 weather ship below Bay of Bengal on Equator of basic biological, chemical and physical oceanographic observations.

ARGO (Scripps Institution of Oceanography)

1962 - 27 June to 24 July - Equatorial section from 96°E to 46°E. (Knauss)
Physical Oceanography - Hydrographic stations every 110 miles, alternately to bottom and 100° m. Two day current measuring stations at approximately 90°E, 80°E, 72°E and 55°E. Measurements relative to anchored buoys with propellor type current meters for shallower, faster currents; with Swallow floats for currents less than 15 cm/sec.
Chemistry - At least minimum recommended program at all stations.
Biology - At least minimum recommended program at all stations.
Geology and Geophysics - Continuous precise bathymetry, gravity and magnetometry underway.
Meteorology - Extent of observations determined by availability of equipment.

1962 - 27 July to 25 August - Meridional sections probably on 55°E and 72°E, at least one of which will extend from 5°N to 5°S.
Physical Oceanography - 5 to 10 stations on each section, at one-half degree intervals within 3° of the equator, at 1° intervals beyond for current measurements relative to anchored buoys. Several hydrographic casts to bottom, remainder to 1000 m.

UNITED STATES

ARGO - contd

Chemistry - At least minimum recommended program at all stations.
Biology - At least minimum recommended program at all stations.
Geology and Geophysics - Continuous precise bathymetry, gravity and magnetometry underway.
Meteorology - Extent of observations determined by availability of equipment.

1962 - 28 August to 27 September - Meridional sections at approximately 80°E and 90°E, at least one of which will extend from 5°N to 5°S.
NOTE: Location of Meridional cross sections can be adjusted somewhat to coordinate operations with other nations' vessels which may be working extended longitudinal runs.
Physical Oceanography - 5 to 10 stations on each section, at one-half degree intervals within 3° of the equator, at 1° intervals beyond for current measurements relative to anchored buoys. Several hydrographic casts to bottom, remainder to 1000 m.
Chemistry - At least minimum recommended program at all stations.
Biology - At least minimum recommended program at all stations.
Geology and Geophysics - Continuous precise bathymetry gravity and magnetometry underway.
Meteorology - Extent of observations determined by availability of equipment.

1962 - 1 October to 26 October - Cochin to Mauritius via Laccadives-Maldives-Chagos.
28 October to 29 November - Mauritius to Fremantle via Kerguelen, Amsterdam.
2 December to 23 December - Fremantle to Darwin via Wharton Basin. (Shor and Raitt)
Geology and Geophysics - 50 long seismic refraction profiles with measurements to the mantle, in the basins, along the midocean rise and on the ridges enroute. Magnetometry and gravitmetry underway. Paleomagnetic studies. Special heat flow studies on and near mid ocean rise, also in basins. Reconnaissance coring, especially in mid latitudes in Wharton and northeast Reunion Basins.
Physics and Chemistry - Hydrographic casts, atmospheric water vapor collection and dissolved gas extraction from large volume water samples. Detailed studies of deuterium and oxygen 18 in deep and surface water, marine water vapor and rain; of dissolved bicarbonate concentration and carbon 13 content; of concentrations and isotopic ratios in dissolved gases of rare gases such as xenon and helium occurrence.

UNITED STATES

ARGO - contd

Biology - Occasional special micro and macroplankton hauls and mid water trawls.
Meteorology - Extent of observations determined by availability of equipment.

1962-63 - 27 December to 12 February - Darwin to Vizagapatnam via Djakarta. (Fisher)
Geology and Geophysics - Underway geophysical investigation of the Indonesian Trench and environs. Detailed magnetic and gravity studies to investigate trench-island area and ridge relationship. Precision bathymetry.

1963 - 15 February to 15 May - Equatorial region from 96°E to 46°E, between 5°N and 5°S, generally going from east to west. (Knauss)
Physical Oceanography - Hydrographic stations and current measurement as in July-September 1962 program, but in opposite monsoon. Detailed plans not completed.
Chemistry - As in July-September 1962 program.
Biology - As in July-September 1962 program.
Geology and Geophysics - As in July-September 1962 program.
Meteorology - As in July-September 1962 program.

1963 - 15 May to 1 June - Zanzibar to Antarctic Convergence to Cape Town. (Kneeling)
Chemical Oceanography - Investigation in high latitude of air-sea carbon dioxide exchange. Hydrographic stations.
Geology and Geophysics - Precision bathymetry, gravity and magnetic observations underway.

HORIZON - (Scripps)

1962 - 9 September to 27 September - Red Sea and Arabian Sea.
Geology and Geophysics - Bathymetry and bottom sampling.

1962 - 10 October to 22 December - Mid ocean and Amsterdam ridges, Wharton Basin.
Geology and Geophysics - Acts as shooting ship for ARGO's seismic refraction studies. Bottom sampling.
Physical and Chemical Oceanography - Water sampling.

SPENCER F. BAIRD - (Scripps)

1964 - 15 January to 15 July (March, April, May in Indian Ocean) 15°S to 40°S between Australia and Mauritius. (Riedel)

UNITED STATES

SPENCER F. BAIRD

1964 — Geology and Geophysics - Detailed Stratigraphic and geochemical sampling in critical areas found in earlier reconnaissance cruises. Continuous precise bathymetric and magnetic studies underway. Oriented coring for paleomagnetic studies. Heat flow measurements, bottom sampling, bottom photography and sediment coring for paleoceanographic studies. Chemistry - Atmospheric and sea surface carbon dioxide measurements.

ATLANTIS II - (DS Hole Oceanographic Institution)

1963 - June through December - Latitudinal sections across Arabian Sea and N.W. Indian Ocean to 80°E, coordinated with scheduled observations of other nations. Also Agulhas current system from Mozambique Channel to Republic of South Africa or investigations in Reunion Basin.
Physics and Chemistry - Approximately 400 deep hydrographic stations at 40 mile average interval along approximately 17,500 miles of track. Special emphasis wind and thermal driven oceanic circulation, upwelling and chemical changes particularly related to productivity; direct current and electrical potential measurements.
Geology and Geophysics - Precision echo sounding continuously, continuous seismic profiling, magnetics and gravity when feasible. Also special studies.
Meteorology - Full shipboard meteorological observations including radiosonde and radar wind coordinated with WHOI airborne meteorological investigations.

1965 - February through July - Similar program to 1963 in opposite monsoon (N.W. quadrant Indian Ocean), latitudinal tracks plus either Agulhas current or Reunion Basin.
Physics and Chemistry - Approximately 400 deep hydrographic stations at 40 mile intervals along 17,500 miles of track. Special emphasis wind and thermal driven oceanic circulation, upwelling and chemical changes, currents, etc.
Geology and Geophysics - Precision echo sounding continuously, continuous seismic profiling, magnetics and gravity when feasible. Also special studies.
Meteorology - Full shipboard meteorological observations including radiosonde and radar wind coordinated with WHOI airborne meteorological investigations.

UNITED STATES contd

CHAIN (WHOI)

1963-64 - September to March - N.W. Indian Ocean to 25°S, 80°E including Arabian Sea.
Geology and Geophysics - Investigation of structural relationship of Madagascar to Africa, substructure of Seychelles and relationship if any with Madagascar, structure of neighboring basins and ridge systems.
Techniques of investigation will include seismic refraction and reflection, bottom sampling by dredging and coring, bottom photography, heat flow measurements, magnetic and gravity measurements and precise bathymetry.
Physics and Chemistry - Standard physical and chemical observations on a supplementary basis. Surface water temperature to 600 feet measured by towed thermistor chain and digital computer to measure and analyse horizontal and vertical temperature variations to study stability of surface water, internal waves and near surface sound transmission paths. Evaluation of acoustic properties of Indian Ocean.

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Airplanes and Shore Parties

1963-65 - Coastlines of Indian Ocean - Selected areas.
Geology - Coastal geology studies of phenomena associated with extremely rapid energy changes at and near the beach.

UNITED STATES

Airplanes and Shore Parties, contd
Overall reconnaissance by airplane photo time lapse technique, in conjunction with WHOI airborne meteorological program. Field examination at selected sites of the effects of sea on selected coastal features and effect of sea state during seasonal monsoons on beach profiles and materials.

U.S. COAST & GEODETIC SURVEY - (One Class I ship - 2-3,000 tons)
1963 or 64 In part of Indian Ocean which has been given inadequate attention. The USC&GS plans to participate in latter phases of Expedition and its program is flexible.

USS REQUISITE (Hydrographic Office)
This vessel has done some work in the Arabian Sea and Persian Gulf. It is reported to be participating further but no plans or schedules are available.

USS SERRANO - (Hydrographic Office)
This vessel has done some work in the Straits of Mallacca and the Andaman Sea. It is reported to be participating further but no plans or schedules are available.

CONSEIL INTERNATIONAL DES UNIONS SCIENTIFIQUES - INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS
SPECIAL COMMITTEE ON OCEANIC RESEARCH
(SCOR)

INTERNATIONAL INDIAN OCEAN EXPEDITION
30 EAST 40TH STREET - NEW YORK 16, N. Y. - LEXINGTON 2-8533

COORDINATOR
ROBERT G. SNIDER

CABLES
SCORINDOC - NEWYORK

SUMMARY OF SHIP'S PROGRAMS

Non-Shipoperating Participants

In addition to the shipboard programs of participants listed in the body of this summary, other formal participants in the Expedition are planning contributions to the overall study.

ISRAEL has developed a "Program for Oceanographic Study of the Red Sea". This will deal with such general problems as Physical Oceanography, Geological Problems, Biology, and Recent Microfauna and Ecological Problems. The first Expedition under this program, to the South Red Sea, was scheduled for 1 March to 15 April 1962.

CEYLON will contribute to the meteorological observation and tide measuring programs and may have some scientists on other nation's vessels.

NATIONALIST CHINA plans to have its scientists carry out studies on the vessels of other nations.

EAST AFRICA, through some of its component parts, will participate in meteorological and tidal observations.

MALAGASY REPUBLIC will contribute to the meteorological and tide gauge programs, and in cooperation with France, to biological studies.

MALAYA will participate in the meteorological and tide gauge networks, and is forming a committee to develop further plans.

MAURITIUS will take part in meteorological and tidal observations.

Other nations, without formal participation, are sending scientists for training or research on Expedition vessels.

1Apr62