FROM: Coordinator  
TO: Distribution List (attached)

Under separate cover, by air mail, I am forwarding a set or sets of sixteen IIOE work charts derived from H.O. 17,138 B and C. The work charts separate by seasons and by disciplines, the information presented on the H.O. charts. They have been designed as analytical tools, to be used in conjunction with textual or tabular material describing the sub-disciplinary research in which each vessel is engaged, to facilitate examination of the extent to which existing cruise plans provide adequate coverage of significant problems in terms of time, area and discipline. Reference should also be made to the "Summary of Cruise Plans" with appendices issued by this office as of 1 April 1962. Ultimate reference may have to be made to individual ships' cruise plans and reports issued by the various laboratories and National Committees.

With these various tools it may be possible to identify gaps in coverage of important research problems, and to adjust existing cruise plans or design the programs of new cruises to fill gaps.

It should be noted that the detailed information provided to this office by the several laboratories and nations varies widely in its detail, particularly with regard to sub-disciplines, frequency and depth of observations, and precise detail on techniques. There is also an almost total absence of identification of the specific scientists who will be carrying out the work.

Several experts in the various disciplines have suggested the following sub-disciplines or techniques which might be emphasized.

**BIOLOGICAL OCEANOGRAPHY**

- Zooplankton - Deep water samples of any kind
- Isaacs-Kidd Midwater Trawls
- Indian Ocean Standard Net
- Other (specify)
BIOLOGICAL OCEANOGRAPHY (Cont’d.)

- Pigments
- Primary production
- Phytoplankton net samples
- Benthic sampling

ICHTHIOLOGY
- Experimental Fishing
- Microbiology
- Other (specify)

GEOLOGY, GEOPHYSICS, BATHYMETRY

- Gravity
- Magnetics
- Deep reflection
- Seismic refraction
- Cores

- Heat Flow
- Bottom photography
- Dredging
- Precision Depth Recording
- Other (specify)

PHYSICAL OCEANOGRAPHY

- Temperature
- Salinity
- Bathythermograph
- GEK
- Transparency

- Currents (instrument measurements - specify)
- Sound Velocity
- Radio-activity sampling
- Other (specify)

CHEMISTRY

- Oxygen
- Nutrient salt analysis
- Trace elements
- CO₂

- C14 and other isotopes
- pH
- H2S
- Other (specify)

METEOROLOGY

- Surface Observations
- Radiosonde
- Radar-wind

- Radiation Balance
- Wave observation
- Other (specify)

Such information must be made available and exchanged at an early date. If it has not already been forwarded for each cruise in this detail to this office or that of the Secretary of the Intergovernmental Oceanographic Commission it should be forwarded at an early date to Dr. Warren S. Wooster, Secretary of IOC, UNESCO, place de Fontenoy, Paris-7, France.
A preliminary sub-disciplinary breakdown of cruise programs may be distributed in the future by this office. However, since this letter is probably the final general and formal communication from me prior to the end of the year, I wish to express my warm appreciation to each National Committee for the high degree of cooperation I have been afforded during the past three years. To my very many good friends genial hosts and associates whom I have been privileged to know around the world during this period, may I extend sincerest good wishes for personal happiness and for success in this important effort - the Expedition.

Most cordially yours,

Robert G. Snider

P.S. After 1 January 1963 my address will be:

Robert G. Snider
Vice President for Development
Graduate Research Center of the Southwest
Dallas 5, Texas,
U. S. A.
DISTRIBUTION LIST FOR IIOE WORK CHARTS #1-16

Dr. Robert L. Fisher
Scripps Institution of Oceanography
La Jolla, California

Director
Scripps Institution of Oceanography
La Jolla, California

Dr. John H. Ryther
Woods Hole Oceanographic Institution
Woods Hole, Massachusetts

Dr. John Lyman
National Science Foundation
1951 Constitution Avenue, N.W.
Washington 25, D.C.

Dr. Colin S. Ramage
Scientific Director for Meteorology
International Indian Ocean Expedition
International Meteorological Center
Colaba Observatory
Bombay-5, INDIA

Mr. Ronald I. Currie
National Institute of Oceanography
Wormley nr. Godalming
Surrey, ENGLAND

Mr. George E. Hemmen
The Royal Society
Burlington House
London W.1, ENGLAND

Mr. Richard G. Vetter
Executive Secretary
Committee on Oceanography
National Academy of Sciences
2101 Constitution Avenue, N.W.
Washington 25, D.C.

Dr. George E. R. Deacon, Director
National Institute of Oceanography
Wormley nr. Godalming
Surrey, ENGLAND

Mr. Morris N. Hill
Department of Geodesy & Geophysics
Madingley Rise
Madingley Road
Cambridge, ENGLAND

Dr. A. S. Laughton
National Institute of Oceanography
Wormley nr. Godalming
Surrey, ENGLAND

Dr. E. C. LaFond, Head
Marine Environment Division
U.S. Navy Electronics Laboratory
San Diego 52, California

Mr. Richard C. Vetter
Executive Secretary
Committee on Oceanography
National Academy of Sciences
2101 Constitution Avenue, N.W.
Washington 25, D.C.

Dr. E. C. LaFond, Head
Marine Environment Division
U.S. Navy Electronics Laboratory
San Diego 52, California

Dr. John H. Ryther
Woods Hole Oceanographic Institution
Woods Hole, Massachusetts

Dr. John Lyman
National Science Foundation
1951 Constitution Avenue, N.W.
Washington 25, D.C.

Dr. Colin S. Ramage
Scientific Director for Meteorology
International Indian Ocean Expedition
International Meteorological Center
Colaba Observatory
Bombay-5, INDIA

Mr. Ronald I. Currie
National Institute of Oceanography
Wormley nr. Godalming
Surrey, ENGLAND

Mr. George E. Hemmen
The Royal Society
Burlington House
London W.1, ENGLAND

Mr. Richard G. Vetter
Executive Secretary
Committee on Oceanography
National Academy of Sciences
2101 Constitution Avenue, N.W.
Washington 25, D.C.

Dr. George E. R. Deacon, Director
National Institute of Oceanography
Wormley nr. Godalming
Surrey, ENGLAND

Mr. Morris N. Hill
Department of Geodesy & Geophysics
Madingley Rise
Madingley Road
Cambridge, ENGLAND

Dr. A. S. Laughton
National Institute of Oceanography
Wormley nr. Godalming
Surrey, ENGLAND
Dr. Paul Tchernia
Sous-Directeur
Laboratoire d'Océanographie Physique
Muséum National d'Histoire Naturelle
43, rue Cuvier
Paris-5, FRANCE

Prof. J. M. Peres
Station Marine D'Endoume
et Centre d'Océanographie
Faculté des Sciences de Marseille
Rue de la Batterie-des-Lions
Marseille-7, FRANCE

Professor Henri Lacombe
Laboratoire d'Océanographie Physique
Muséum National d'Histoire Naturelle
43, rue Cuvier
Paris-5, FRANCE

Dr. Günther Böhmecke
Secretary
Scientific Committee on Oceanic Research
34, Neuer Wall
Hamburg 36, GERMANY

Dr. Günther Dietrich
Institut für Meerskunde
der Universität Kiel
Hohenbergstr. 2
Kiel, GERMANY

CAPT José Pereira Parreira, PN,
Director
Instituto Hidrografico
Ministerio de Marinha
Lisboa, PORTUGAL

Professor V. G. Kort,
Director
Institute of Oceanology
Academy of Sciences of the USSR
Moscow, U.S.S.R.

Commodore K. P. Ryzhkov
Hydrometeorological Service
Moscow, U.S.S.R.

(2) - Professor L. A. Zenkevitch
Soviet National Com. on Oceanography
Maronovsku Pereulok 26
Room 21
Moscow V-49, U.S.S.R.

(2) - Dr. Warren S. Wooster,
Secretary
Intergovernmental Oceanographic Commission
UNESCO
place de Fontenoy
Paris-7, FRANCE

Dr. K. Langlo,
Chief
Technical Division
World Meteorological Organization
Avenue de la Paix
Campagne Rigot
Geneva, SWITZERLAND

(3) - Dr. Kazuhiko Terada,
Chief, Marine Division
Japan Meteorological Agency
Ote-machi, Chiyoda-ku
Tokyo, JAPAN

(2) - Dr. George F. Humphrey
Convenor of ANCOR
C.S.I.R.O. Marine Laboratory
Box 21
Gronulla, Sydney, AUSTRALIA

(2) - Chairman
National Com. on Oceanic Research
Madjelis Ilmu Pengetahuan Indonesia
Medan Merdeka Selatan 11
Djakarta, INDONESIA

(2) - J. D. De Silva, Esq.,
Assistant Secretary
Ministry of External Affairs
Kuala Lumpur, MALAYA

(2) - CAPT Amporn Penyapol, RTN
Secretary, NCMS
Hydrographic Department
Royal Thai Navy
Bangkok, THAILAND
Dr. Po E  
Director  
Burmesse Meteorological Department  
New Secretariat Building  
Rangoon, BURMA

(5) - Dr. N. K. Panikkar  
c/o CSIR  
Rafi Marg  
New Delhi-1, INDIA

Mr. V. Basnayake,  
Chairman  
Ceylon Committee for IIOE  
c/o CAAS  
University of Ceylon  
Colombo-3, CEYLON

(3) - CDR S. R. Islam, FN,  
Chairman  
National Committee for SCOR in Pakistan  
Hydrographic Directorate  
Naval Headquarters  
Karachi, PAKISTAN

D. N. F. Hall, Esq.,  
Director  
EAMFRO  
P. O. Box 668  
ZANZIBAR

Mr. B. W. Thompson  
East African Meteorological Department  
Ngong Road  
P. O. Box 30259  
Nairobi, KENYA

Monsieur Michel Angot  
O.R.S.T.O.M.  
Centre d’Océanographie et des Pêches de Nosy-Bé  
Boîte Postale No. 68  
Nosy-Bé, THE MALAGASY REPUBLIC

Professor José Pinto-Lopes,  
Director  
Instituto de Investigação Científica de Moçambique  
P. O. Box 1780  
Lourenço Marquês, Mozambique

Mr. Jean de B. Baissac  
Mesnil aux Roses  
Vacoas  
MAURITIUS (Indian Ocean)

Mr. Eric Boden  
Science Cooperation Division  
South African CSIR  
P. O. Box 395  
Pretoria, SOUTH AFRICA

Dr. David H. Davies,  
Director  
Oceanographic Research Institute  
So. African Ass'n for MRR  
University of Natal  
Centenary Aquarium Buildings  
2 West Street  
Durban, Natal, SOUTH AFRICA

Professor John H. Day,  
Chairman  
Oceanography Steering Committee  
Oceanography Department  
University of Cape Town  
Rondebosch, Cape Town, SOUTH AFRICA

Captain J. K. Mallory  
c/o Fleet Mail Office  
Simonstown, C.P., SOUTH AFRICA

Mr. C. G. Du Plessis  
Fisheries Department  
Sea Point  
Cape Town, SOUTH AFRICA

Mr. O. H. Oren,  
Coordinator  
Israel National Committee for SCOR  
The Research Council  
c/o The Fisheries Research Station  
4-6 Banks Street,  
Haifa, ISRAEL

Professor E. Steemann Nielsen  
Danmarks Faraceutiske Højskole  
Botanisk Afdeling  
Universitesparken 2  
Copenhagen, d., DENMARK
Dr. Wieshau C. Juan,
President
Chinese National Committee on Oceanic Research
c/o College of Science
National Taiwan University
Taipei, TAIWAN (Formosa)

Dr. J. Brackett Hersey
Woods Hole Oceanographic Institution
Woods Hole, Massachusetts

Dr. Bostwick H. Ketchum
Woods Hole Oceanographic Institution
Woods Hole, Massachusetts

Dr. Johannes Krey
Institut für Meerskunde der Universität Kiel
Hohenbergstr. 2
Kiel, GERMANY
10 November 1962

FROM: Coordinator
TO: Recipients of sets of 16 I.I.O.E. Work Charts and my letter subscripted RGS/jas 11162.

I enclose an appropriate number of sets of the sub-disciplinary breakdowns for each seasonal chart sent earlier. These have been prepared in this office with the most valuable assistance of Dr. Y. Takenouti of the Office of Oceanography, UNESCO and my assistant Miss Janet A. Smith. There are no doubt errors and omissions however. The Expedition looks good on the surface. I think it will be good. However, the character of the information made available by various individuals, laboratories, and nations varies much in its detail and significance.

These twelve sub-disciplinary breakdowns by seasons for the basic three oceanography disciplines of BIOLOGY, PHYSICS AND CHEMISTRY, and GEOLOGY-GEOPHYSICS-BATHYMETRY are based on documents in this office, and notes brought by Dr. Takenouti from Paris in connection with the transfer of responsibility for coordination from me to the Secretary of IOC. We may have misread the available data - no doubt such instances can be discovered. However, the noteworthy discovery is that when available data provided by the primary sources are examined they are often inadequate for analysis to determine the extent, or even the opportunity, for coordination of effort to achieve the optimum results from the Expedition.

There are now available to Expedition scientists, planners, and disciplinary coordinators for SCOR a set of track charts (Completed Cruises and Projected Cruises - H.O. 17,138-B and H.O. 17,138-C); a Summary of Cruise Plans dated 1 April 1962 issued by this office; a set of 16 I.I.O.E. Work Charts distributed to you in early November 1962; a letter of 1 November 1962 urging submission to IOC of detailed information on sub-disciplinary breakdowns of cruises by all participants; and as of 10 November 1962, the list of sub-disciplinary breakdowns by vessels by seasons in each discipline past, present and projected. These are the tools, drawn from various national, laboratory and individual contributions which this office has made available to you.
Please forward to the Secretary of the Intergovernmental Oceanographic Commission, UNESCO, Paris, and to each of SCOR's disciplinary coordinators (as reported to me on 24 October 1962 by the President of SCOR) - Chemical Oceanography to Dr. Johannes Krey, Institut für Meerskunde der Universität Kiel, Hohenbergstr. 2, Kiel, Germany; Biological Oceanography to Professor L. A. Zenkevitch, Soviet National Committee on Oceanography, Maronovsku Pereulok 26, Room 21, Moscow V-49, U.S.S.R.; Physical Oceanography to Dr. Paul Tchernia, Sous-Directeur, Laboratoire d'Océanographie Physique, Museum National d'Histoiere Naturelle, 43, rue Cuvier, Paris-5, France; and Geological and Geophysical Oceanography to Dr. Robert L. Fisher, Scripps Institution of Oceanography, La Jolla, California, U.S.A., the corrections, amplifications and additions to this sub-disciplinary breakdown necessary to provide all nations and laboratories with data for future planning and coordination. Please forward abuse to me.

Meteorology information for shipboard observations is currently inadequate. It is hoped that such information can be forwarded including programs, personnel, etc. to Dr. Colin S. Ramage, Scientific Director for Meteorology, International Indian Ocean Expedition, International Meteorological Center, Colaba Observatory, Bombay-5, India. I trust that he will be able to disseminate this together with his existing fund of information about the shore and island based meteorological program.

Most cordially yours,

[Signature]

Robert G. Snider

P.S

In H.O. 17,138-C VITJAZ '62 is shown going north from 35° S just east of 91° E in black. This also appears on each of the appropriate Work Charts (#4, #8 and #12). Information received from the U.S.S.R. after the H.O Charts went to press indicated that this track should be in green rather than in black.

R.G.S.

RGS/jas
enc
I.I.O.E. WORK CHART No. 1
BIOLOGICAL OCEANOGRAPHY CRUISES
PAST and PROJECTED
December - February (Red)

LEGEND

0 - Biology (unspecified)
1 - Phytoplankton net samples
2 - Zooplankton
   a - Deep water samples of any kind
   b - Isaacs-Kidd Midwater Trawls
   c - Indian Ocean Standard Net
   d - Other (specify)

3 - Benthic sampling
4 - Primary production
5 - Ichthyology
6 - Experimental Fishing
7 - Microbiology
8 - Pigments
9 - Other (specify)

AUSTRALIA
DIAMANTINA '60 - Feb. - B-1,2,4,8
DIAMANTINA '61 - Feb. - B-1,2,4,8
DIAMANTINA '62 - Feb. - B-1,2,4,8
GASCOYNE '61 - Feb. - B-1,2,4,8

FED. REP. OF GERMANY
UNK. SHIP '63-64 - B-0

INDIA
KISTNA '62 - Dec. - B-1,2,3,4,5,6
VARUNA '62 - B-1,2,6

JAPAN
KAGOSHIMA-MARU '63-64 - B-0
KOYO-MARU '62-63 - B-1,2a,2c,4,6,9 (eggs, oblique trawling)
KOYO-MARU '63-64 - B-0
UMITAKA-MARU '60-61 - B-1,2,6
UMITAKA-MARU '62-63 - B-0
UMITAKA-MARU '63-64 - B-0

PAKISTAN
ZULFIQAR '62 - B-1,2,4
ZULFIQAR '63 - B-1,2,4
PORTUGAL
   ALMIRANTE LACERDA '63-64 - B-1,2a,6,8,9 (visual)

REP. OF SOUTH AFRICA
   NATAL '62 - B-1,2,9 (visual)
   NATAL '63 - B-1,2,4,6

THAILAND
   OC. VES. #2 '62-63 - B-1,2,5

U.S.S.R.
   VITJAZ '59-60 - B-1,2,3,4,5
   VITJAZ '60-61 - B-0
   VITJAZ '62 - B-0

UNITED KINGDOM
   DISCOVERY '63 - Dec. '63 - Jan. '64 - B-9 (visual)
   DISCOVERY '64 - Feb. - B-1,2,4,8,9 (fish eggs, larva, mid-water trawl)

U.S.A.
   ANTON BRUUN '63 - B-1,2a,2b,2c,3,4,5,6,8
   ANTON BRUUN '64 - B-1,2a,2b,2c,3,4,5,6,8
   SERRANO '61 - B-0
   SERRANO '63 - B-0
   TE VEGA '63 - B-0
   VEMA '60 - B-1,2,3,7
   ARGO '60 (Track shown only on Charts #9 & #12 - B-1,2a,2b,3,9 (insects)

NOTE:
   ARGO '62-63 - in east Bay of Bengal is in error.

RGS/Jas
10 Nov. 1962
INTERNATIONAL INDIAN OCEAN EXPEDITION
30 EAST 40TH STREET . NEW YORK 16, N. Y. . LEXINGTON 2-6533

COORDINATOR
ROBERT G. SNIDER

I.I.O.E. WORK CHART No. 2
BIOLOGICAL OCEANOGRAPHY CRUISES
PAST and PROJECTED
March - May (Blue)

LEGEND

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Biology (unspecified)</td>
<td>3</td>
<td>Benthic sampling</td>
</tr>
<tr>
<td>1</td>
<td>Phytoplankton net samples</td>
<td>4</td>
<td>Primary production</td>
</tr>
<tr>
<td>2</td>
<td>Zooplankton</td>
<td>5</td>
<td>Ichthyology</td>
</tr>
<tr>
<td>a</td>
<td>Deep water samples of any kind</td>
<td>6</td>
<td>Experimental Fishing</td>
</tr>
<tr>
<td>b</td>
<td>Isaacs-Kidd Midwater Trawls</td>
<td>7</td>
<td>Microbiology</td>
</tr>
<tr>
<td>c</td>
<td>Indian Ocean Standard Net</td>
<td>8</td>
<td>Pigments</td>
</tr>
<tr>
<td>d</td>
<td>Other (specify)</td>
<td>9</td>
<td>Other (specify)</td>
</tr>
</tbody>
</table>

AUSTRALIA
DIAMANTINA '60 - Mar. - B-1,2,4,8
DIAMANTINA '61 - Mar. - B-1,2,4,8
DIAMANTINA '62 - Mar. - B-1,2,4,8
GASCOYNE '61 - B-1,2,4,8

FRANCE
CALYPSO '63- B-1,2,3,9 (photography)
CDT. ROBERT GIRAUD '61 - B-1,2a

FED. REP. OF GERMANY
UNK. SHIP '63 - B-0

INDIA
KISTNA '63 - B-1,2,3,4,5,6
VARUNA '62 - B-1,2,6

PAKISTAN
ZULFIQUAR '63 - B-1,2,4

REP. OF SOUTH AFRICA
NATAL '62 - B-1,2,9 (visual)

U.S.S.R.
VITJAZ '60 - B-1,2,3,4,5
VITJAZ '61 - B-0
WORK CHART No. 2.

UNITED KINGDOM
DISCOVERY '63 - B-9 (visual)
DISCOVERY '64 - Mar. - B-1,2,8,9 (visual); Apr. - B-1,2,4,8,9
(fish eggs, larva, mid-water trawl)

U.S.A.
ANTON BRUUN '63 - B-1,2a,2b,2c,2d (surface),3,4,5,6,8
ANTON BRUUN '64 - B-1,2a,2b,2c,2d (surface),3,4,5,6,8
PIONEER '64 - B-0
SERRANO '61 - B-0
TE VEGA '64 - B-0
VEMA '58 - B-0
VEMA '60 - B-1,2,3,7
VEMA & CONRAD '63 - B-1,2,3,7

NOTE:
ANTON BRUUN '64 - along 80°E should be '63

RGS/jas
10 Nov. 1962
I.I.O.E. WORK CHART No. 3
BIOLOGICAL OCEANOGRAPHY CRUISES
PAST and PROJECTED
June – August (Green)

LEGEND

0 - Biology (unspecified)
1 - Phytoplankton net samples
2 - Zooplankton
   a - Deep water samples of any kind
   b - Isaacs-Kidd Midwater Trawls
   c - Indian Ocean Standard Net
   d - Other (specify)
3 - Benthic sampling
4 - Primary production
5 - Ichthyology
6 - Experimental Fishing
7 - Microbiology
8 - Pigments
9 - Other (specify)

AUSTRALIA
DIAMANTINA ’60 - B-1,2,4,8
DIAMANTINA ’61 - B-1,2,4,8
DIAMANTINA ’62 - B-1,2c,2d (Clarke-Bumpus Net),4,8
GASCOYNE ’62 - B-2c-2d (Clarke-Bumpus Net,3,9 (photography)

INDIA
KISTNA ’63 - B-1,2,3,4,5,6
VARUNA ’62 - B-1,2,6

INDONESIA
JALANIDHI ’63 (unknown season) - B-1,2,3,5

PORTUGAL
ALMIRANTE LACERDA ’63-64 - B-1,2a,6,8,9 (visual)

REP. OF SOUTH AFRICA
AFRICANA II ’61 - B-1,2,3,4,6
AFRICANA II ’62 - B-1,2a,4,6
NATAL ’62 - July - B-1,2,9; Aug. - B-1,2,6

U.S.S.R.
VITJAZ ’62 - B-0
UNITED KINGDOM

DISCOVERY '63 - Aug. - B-1, 2a, 2b, 2c, 4, 8, 9 (visual);
June-July - B-1, 2a, 2b, 2c, 3, 4, 8, 9
(eggs, larva, visual)

U.S.A.

ANTON BRUUN '63 - B-1, 2a, 2b, 2c, 3, 4, 5, 6, 8
ANTON BRUUN '64 - B-1, 2a, 2b, 2c, 3, 4, 5, 6, 8
PIONEER '64 - B-0
TE VEGA '64 - B-0
VEMA '58 - B-0
VEMA '62 - B-1, 2, 3, 7
INTERNATIONAL INDIAN OCEAN EXPEDITION
30 EAST 40TH STREET . NEW YORK 16, N. Y. . LEXINGTON 2-6533

I.I.O.E., WORK CHART NO. 4
BIOLOGICAL OCEANOGRAPHY CRUISES
PAST and PROJECTED
September – November (Black)

LEGEND

0 - Biology (unspecified)
1 - Phytoplankton net samples
2 - Zooplankton
   a - Deep water samples of any kind
   b - Isaacs-Kidd Midwater Trawls
   c - Indian Ocean Standard Net
   d - Other (specify)
3 - Benthic sampling
4 - Primary production
5 - Ichthyology
6 - Experimental Fishing
7 - Microbiology
8 - Pigments
9 - Other (specify)

AUSTRALIA
DIAMANTINA '59 - B-1,2,4,8
DIAMANTINA '60 - B-1,2,4,8
DIAMANTINA '62 - B-1,2b,2c,2d (Clarke-Bumpus Net),4,8
GASCOYNE '62 - B-2a,2d (Clarke-Bumpus Net),4,8

FED. REP OF GERMANY
UNK. SHIP '63 - B-0

INDIA
CONCH '62 - B-2c,3
KISTNA '62 - B-1,2,3,4,5,6
VARUNA '62 - B-1,2,6

PAKISTAN
ZULFIQUAR '62 - B-1,2,4

REP. OF SOUTH AFRICA
NATAL '62 - B-2,9 (visual)

U.S.S.R.
VITJAZ '59 - B-1,2,3,4,5
VITJAZ '60 - B-0
VITJAZ '62 - B-0
UNITED KINGDOM
  DISCOVERY '63 - Sept.-Oct. - B-1, 2, 4, 8, 9 (visual); Nov. - B-1, 2, 8

U.S.A.
  ANTON BRUUN '63 - B-1, 2a, 2b, 2c, 3, 4, 5, 6, 8
  ANTON BRUUN '64 - B-1, 2a, 2b, 2c, 3, 4, 5, 6, 8
  SERRANO '61 - B-0
  ARGO '60 (Track shown only on Charts #9 & #12) - B-1, 2a, 2b, 3, 9

RGS/jas
10 Nov. 1962
INTERNATIONAL INDIAN OCEAN EXPEDITION
30 EAST 40TH STREET . NEW YORK 16, N. Y. - LEXINGTON 2-6533

COORDINATOR
ROBERT G. SNIDER

I.I.O.E. WORK CHART No. 5
PHYSICAL AND CHEMICAL OCEANOGRAPHY CRUISES
PAST and PROJECTED
December - February (Red)

LEGEND

PHYSICAL OCEANOGRAPHY
0 - Physical Oceanography (unspecified)
1 - Temperature
2 - Salinity
3 - GEK
4 - Bathythermograph

CHEMICAL OCEANOGRAPHY
0 - Chemical Oceanography (unspecified)
1 - Oxygen
2 - Nutrient salt analysis
3 - pH

5 - Transparency
6 - Currents (instrument measurements - specify)
7 - Sound Velocity
8 - Radio-activity sampling
9 - Other (specify)

AUSTRALIA
DIAMANTINA '60 - P-1,2,4; C-1,2
DIAMANTINA '61 - P-1,2,4; C-1,2
DIAMANTINA '62 - P-1,2,4; C-1,2
GASCOYNE '61 - P-1,2,4; C-1,2

FRANCE
CALYPSO '62-63 - P-1,2,4,6
CDT. ROBERT GIRAUD '62-63 - P-1,2,3,4,6

FED. REP. OF GERMANY
UNK. SHIP '63-64 - P-0; C-0

INDIA
KISTNA '62 - P-1,2,4,5,6 (surface & subsurface),7; C-1,2,3,5
VARUNA '62 - P-1,2,6; C-0
WORK CHART No. 5

JAPAN
KAGOSHIMA-MARU '63-64 - P-0; C-0
KOYO-MARU '62-63 - P-1,2,3,4,6; C-1,2
KOYO-MARU '63-64 - P-0; C-0
UMITAKA-MARU '60-61 - P-1,2; C-1,2,3
UMITAKA-MARU '62-63 - P-0; C-0
UMITAKA-MARU '63-64 - P-0; C-0

PAKISTAN
ZULFIQUAR '62 - P-1,2,4,5,6; C-1,2,3,4,6,7
ZULFIQUAR '63 - P-1,2,4,5,6; C-1,2,3,4,6,7

PORTUGAL
ALMIRANTE LACERDA '63-64 - P-1,2,3,5,6; C-1,2

REP. OF SOUTH AFRICA
NATAL '63 - Jan. - P-1,2,3,4; C-1,2,7
NATAL '63 - Feb. - P-1,2,3,4,6; C-1,2

THAILAND
OC. VES #2 - P-1,2,4,6; C-1

U.S.S.R.
VITAZ '59-60 - P-1,2,3,4,5,6; C-1,2,3
VITAZ '60-61 - P-0; C-0
VITAZ '62 - P-0; C-0

UNITED KINGDOM
DISCOVERY '63 - P-1,2,6 (direct reading & Swallow Float); C-1,2
DISCOVERY '64 - P-1,2,3,4,6 (direct reading & Swallow Float); C-1,2,4

U.S.A.
ANTON BRUUN '63 - P-1,2,4,5; C-1,2,3,4,6
ANTON BRUUN '64 - P-1,2,4,5; C-1,2,3,4,6
ARGO '62-63 - (Start 15 Feb. '63) - P-1,2,6; C-1,2
ATLANTIS II '65 - P-0; C-0
CHAIN '63-64 - P-0; C-0
CHAIN '64-65 - P-0; C-0
REQUISITE '61 - P-0; C-0
SERRANO '61 - P-0; C-0
SERRANO '63 - P-0; C-0
VEMA '60 - P-1,2,4,7; C-1,2,6,7
ARGO '60 (Track shown only on Charts #9 and #12) - P-1,2,4,7; C-1,2,6,7

RGS/jas
10 Nov. 1962
### LEGEND

**PHYSICAL OCEANOGRAPHY**

- 0 - Physical Oceanography (unspecified)
- 1 - Temperature
- 2 - Salinity
- 3 - GEK
- 4 - Bathythermograph

**CHEMICAL OCEANOGRAPHY**

- 0 - Chemical Oceanography (unspecified)
- 1 - Oxygen
- 2 - Nutrient salt analysis
- 3 - pH
- 4 - H₂S
- 5 - CO₂
- 6 - Trace elements
- 7 - C₁₄ and other isotopes
- 8 - Other (specify)
- 5 - Transparency
- 6 - Currents (instrument measurements - specify)
- 7 - Sound Velocity
- 8 - Radio-activity sampling
- 9 - Other (specify)

### AUSTRALIA

- DIAMANTINA '60 - P-1,2,4; C-1,2
- DIAMANTINA '61 - P-1,2,4; C-1,2
- DIAMANTINA '62 - P-1,2,4; C-1,2
- GASCOYNE '61 - P-1,2,4; C-1,2

### FRANCE

- CALYPSO '62-63 - P-1,2,4,6
- CALYPSO '63 - P-1,2,4; C-1,2
- CDT. ROBERT GIRAUD '61 - P-1,2,3,4,6 (surface)

### REP. OF GERMANY

- UNK. SHIP '63 - P-0; C-0

### INDIA

- KISTNA '63 - P-1,2,4,5,6 (surface & subsurface), 7; C-1,2,3,5
- VARUNA '62 - P-1,2,6; C-0

### PAKISTAN

- ZULFIQUAR '63 - P-1,2,4,5,6; C-1,2,3,4,6,7
REP. OF SOUTH AFRICA
NATAL '62 - P-1,2,3,4; C-1,2,3,7

U.S.S.R.
VITJAZ '60 - P-1,2,3,4,5,6; C-1,2,3
VITJAZ '61 - P-0; C-0

UNITED KINGDOM
DISCOVERY '63 - (Start 5/26 - P-1,2,3,4,5,6 (Swallow Float);
                     C-1,2,3,4,6
DISCOVERY '64 - P-1,2,3,4,5,6 (direct reading & Swallow Float);
                     C-1,2,6

U.S.A
ANTON BRUUN '63 - P-1,2,4,5; C-1,2,3,4,6
ANTON BRUUN '64 - P-1,2,4,5; C-1,2,3,4,6
ARGO '63 - P-1,2,6; C-1,2,3,7
ATLANTIS II '65 - P-0; C-0
EASTWIND '61 - P-0; C-0
PIONEER '64 - P-0; C-0
REQUISITE '61 - P-0; C-0
SERRANO '61 - P-0; C-0
VEMA '58 - P-1,2,4; C-1
VEMA '60 - P-1,2,4,7; C-1,2,6,7
VEMA & CONRAD '63 - P-1,2,4,7; C-1,2,6,7

NOTE:
ANTON BRUUN '64 - along 80°E and from Ceylon to Laccadives
should be '63.

RGS/jas
10 nov. 1962
INTERNATIONAL INDIAN OCEAN EXPEDITION
30 EAST 40TH STREET - NEW YORK 16, N. Y. - LEINGTON 2-6533

COORDINATOR
ROBERT G. SNIDER

CABLES
SCORINDOC - NEW YORK

I.I.O.E. WORK CHART No. 7
PHYSICAL AND CHEMICAL OCEANOGRAPHY CRUISES
PAST and PROJECTED
June - August (Green)

LEGEND

PHYSICAL OCEANOGRAPHY
0 - Physical Oceanography (unspecified)
1 - Temperature
2 - Salinity
3 - GEK
4 - Bathythermograph
5 - Transparency
6 - Currents (instrument measurements - specify)
7 - Sound Velocity
8 - Radio-activity sampling
9 - Other (specify)

CHEMICAL OCEANOGRAPHY
0 - Chemical Oceanography (unspecified)
1 - Oxygen
2 - Nutrient salt analysis
3 - pH
4 - H2S
5 - CO2
6 - Trace elements
7 - C14 and other isotopes
8 - Other (specify)

AUSTRALIA
DIAMANTINA ’60 - P-1,2,4,5; C-1,2
DIAMANTINA ’61 - P-1,2,4,5; C-1,2
DIAMANTINA ’62 - P-1,2,4,5; C-1,2
GASCOWNE ’62 - P-1,2,4; C-1,2

FRANCE
CDT. ROBERT GIRAUD ’60 - P-1,2,3,4,6 (surface)
CDT. ROBERT GIRAUD ’61 - P-1,2,3,4,6 (surface)
CDT. ROBERT GIRAUD ’62 - P-1,2,3,4,6

INDIA
KISTNA ’63 - P-1,2,4,5,6 (surface & subsurface),7; C-1,2,3,5
VARUNA ’62 - P-1,2,6; C-0

INDONESIA
JALANIDHI ’63 (season unknown) - P-1,2,4,6; C-1,2

PORTUGAL
ALMIRANTE LACERDA ’63-64 - P-1,2,3,4,5,6; C-1,2
REP. OF SOUTH AFRICA
   AFRICANA II '61 - P-1,2; C-1,2,6
   AFRICANA II '62 - P-1,2; C-1,2,6
   NATAL '62 - June - P-3; July - P-1,2,3,4; C-1,2; Aug. - P-1,2,3,4,6; C-1,2
   QUEEN '62 - P-9 (air-sea energy exchange)

U.S.S.R.
   VITJAZ '62 - P-0; C-0

UNITED KINGDOM
   DISCOVERY '63 - P-1,2,3,4,5,6 (direct reading & Swallow Float); C-1,2,6

U.S.A.
   ANTON BRUUN '63 - P-1,2,4,5; C-1,2,3,4,6
   ANTON BRUUN '64 - P-1,2,4,5; C-1,2,3,4,6
   ARGO '62 - P-1,2,4,6 (direct reading & Swallow Float); C-1,2,3
   ATLANTIS '58 - P-0; C-0
   ATLANTIS II '63 - P-0; C-0
   PIONEER '64 - P-0; C-0
   VEMA '58 - P-1,2,4; C-1
   VEMA '62 - P-1,2,4,7; C-1,2,6,7

RGS/jas
10 Nov. 1962
INTERNATIONAL INDIAN OCEAN EXPEDITION
30 EAST 40TH STREET - NEW YORK 16, N. Y. - LEXINGTON 2-6533

COORDINATOR
ROBERT G. SNIDER

CABLES
SCORINDOC - NEW YORK

I.I.O.E. WORK CHART No. 8
PHYSICAL AND CHEMICAL OCEANOGRAPHY CRUISES
PAST and PROJECTED
September - November (Black)

LEGEND

PHYSICAL OCEANOGRAPHY
0 - Physical Oceanography (unspecified)
1 - Temperature
2 - Salinity
3 - GEK
4 - Bathythermograph
5 - Transparency
6 - Currents (instrument measurements - specify)
7 - Sound Velocity
8 - Radio-activity sampling
9 - Other (specify)

CHEMICAL OCEANOGRAPHY
0 - Chemical Oceanography (unspecified)
1 - Oxygen
2 - Nutrient salt analysis
3 - pH
4 - H2S
5 - CO2
6 - Trace elements
7 - C14 and other isotopes
8 - Other (specify)

AUSTRALIA
DIAMANTINA '59 - P-1,2,4; C-1,2
DIAMANTINA '60 - P-1,2,4,5; C-1,2
DIAMANTINA '62 - P-1,2,4,5; C-1,2
GASCOYNE '62 - P-1,2,4; C-1,2

FRANCE
CDT. ROBERT GIRAUD '60 - P-1,2,3,4,6 (surface)
CDT. ROBERT GIRAUD '62 - P-1,2,3,4,6 (surface)

FED. REP. OF GERMANY
UNK. SHIP '63-64 - P-0; C-0

INDIA
CONCH '62 - P-1,2,4,5; C-1
KISTNA '62 - P-1,2,4,5,6 (surface & subsurface), 7; C-1,2,3,5
VARUNA '62 - P-1,2,6; C-0

PAKISTAN
ZULFIQUAR '62 - P-1,2,4,5,6; C-1,2,3,4,6,7
REP. OF SOUTH AFRICA
   NATAL '62 - P-1,2,3,4; C-1,2

U.S.S.R.
   VITJAZ '59 - P-1,2,3,4,5,6; C-1,2,3
   VITJAZ '60 - P-0; C-0
   VITJAZ '62 - P-0; C-0

UNITED KINGDOM
   DISCOVERY '63 - P-1,2,3,4,5,6 (direct reading & Swallow Float); C-1,2,6

U.S.A.
   ANTON BRUUN '63 - P-1,2,4,5; C-1,2,3,4,6
   ANTON BRUUN '64 - P-1,2,4,5; C-1,2,3,4,6
   ATLANTIS II '63 - P-0; C-0
   CHAIN '63-65 - P-0; C-0
   SERRANO '61 - P-0; C-0
   ARGO '60 (Track shown only on Charts #9 and #12) - P-1,2,4; C-1,2,6,7

RGS/jas
10 Nov. 1962
INTERNATIONAL INDIAN OCEAN EXPEDITION
30 EAST 40th STREET . NEW YORK 16, N. Y. - LEXINGTON 2-6533

COORDINATOR
ROBERT G. SNIDER

I.I.O.E. WORK CHART No. 9
GEOLOGICAL, GEOPHYSICAL AND BATHYMETRIC CRUISES
PAST and PROJECTED
December - February (Red) - Presented by seasons only
for simplicity in production

LEGEND

0  - Geology, Geophysics & Bathymetry (unspecified)
1  - Precision Depth Recording
2  - Cores
3  - Dredging
4  - Gravity
5  - Magnetics
6  - Heat Flow
7  - Seismic refraction
8  - Deep reflection
9  - Bottom photography
10 - Bathymetry
11 - Other (specify)

AUSTRALIA
DIAMANTINA '60 - GGB-10
DIAMANTINA '61 - GGB-10
DIAMANTINA '62 - GGB-10
GASCOYNE '61 - GGB-10

FRANCE
CDT. ROBERT GIRAUD '63 - GGB-10

FED. REP. OF GERMANY
UNK. SHIP '63-64 - GGB-0,10

INDIA
KISTNA '62 - GGB-2,3,4,5,6,7,10
VARUNA '62 - GGB-3,10

JAPAN
KAGOSHIMA-MARU '63-64 - GGB-0
UMITAKA-MARU '62-63 - GGB-0
UMITAKA-MARU '63-64 - GGB-0

PAKISTAN
ZULFIQUAR '62 - GGB-2,10
ZULFIQUAR '63 - GGB-2,10

THAILAND
OC. VES. #2 '62-63 - GGB-2,3,10
U.S.S.R.

VITJAZ '59-60 - GGB-2,3,7,10
VITJAZ '60-61 - GGB-0
VITJAZ '62 - GGB-0

UNITED KINGDOM

DALRYMPE '61-62 - GGB-1,2,5,8
DISCOVERY '63 - GGB-1,4,5
DISCOVERY '64 - GGB-1,4,5
OWEN '61-62 - GGB-1,3,4,5

U.S.A.

ARGO '60 - GGB-1,2,3,4,5,6,7,9
ARGO '61 - GGB-1,2,3,4,5,6,7,9
ARGO '62 - GGB-1,2,3,4,5,6,7,9 (Dec. '62)
ARGO '62-63 - GGB-1,2,3,4,5,6,7,9 (27 Dec. '62 - 15 Feb. '63)
ARGO '63 - GGB-1,4,5 (17 Feb. on)
ATLANTIS II '65 - GGB-1,4,5,8
CHAIN '63-65 - GGB-1,2,3,4,5,6,7,8,9
HORIZON '62 - GGB-1,3,7
REQUISITE '61 - GGB-0
SERRANO '61 - GGB-0
SERRANO '63 - GGB-0
TE VEGA '63 - GGB-0
VEMA '60 - GGB-1,2,3,4,5,6,7,8,9

NOTE:

ARGO '63 - at 45° S, 145° E should be '61.

RGS/jas
10 Nov. 1962
INTERNATIONAL INDIAN OCEAN EXPEDITION

I.I.O.E. WORK CHART No. 10
GEOLOGICAL, GEOPHYSICAL AND BATHYMETRIC CRUISES
PAST and PROJECTED
March - May (Blue) - Presented by seasons only
for simplicity in production

LEGEND

0 - Geology, Geophysics & Bathymetry (unspecified)
1 - Precision Depth Recording
2 - Cores
3 - Dredging
4 - Gravity
5 - Magnetics
6 - Heat Flow
7 - Seismic refraction
8 - Deep reflection
9 - Bottom photography
10 - Bathymetry
11 - Other (specify)

AUSTRALIA
DIAMANTINA '60 - GGB-10
DIAMANTINA '61 - GGB-10
DIAMANTINA '62 - GGB-10
GASCOYNE '61 - GGB-10

FRANCE
CALYPSO '63 - GGB-10
CDT. ROBERT GIRAUD '63 - GGB-10

FED. REP. OF GERMANY
UNK. SHIP '63 - GGB-0,10

INDIA
KISTNA '63 - GGB-2,3,4,5,6,7,10
VARUNA '62 - GGB-3,10

PAKISTAN
ZULFIQUAR '63 - GGB-2,10

REP. OF SOUTH AFRICA
NATAL '62 - April - GGB-2,10; May - GGB-2,3,4,5,7,10

U.S.S.R.
VITJAZ '60 - GGB-2,3,7,10
VITJAZ '61 - GGB-0
UNITED KINGDOM
DISCOVERY '63 - GGB-1, 2, 3, 4, 5, 6, 7, 9, 11 (rock drilling)
DISCOVERY '64 - GGB-1, 4, 5
OWEN '61-62 - GGB-1, 3, 4, 5
OWEN '63 - GGB-1, 3, 4, 5, 7

U.S.A.
ARGO '63 - 15 Feb. - 15 May - GGB-1, 4, 5, 7; 15 May - 1 June GGB-1, 4, 5

ATLANTIS II '65 - GGB-1, 4, 5, 8
PIONEER '64 - GGB-1, 2, 3, 4, 5, 9
REQUISITE '60 - GGB-0
REQUISITE '61 - GGB-0
SERRANO '61 - GGB-0
TE VEGA '64 - GGB-0
VEMA '58 - GGB-0, 1
VEMA '60 - GGB-1, 2, 3, 4, 5, 6, 7, 8, 9
VEMA & CONRAD '63 - GGB-1, 2, 3, 4, 5, 6, 7, 8, 9

NOTE:

ANTON BRUUN '63 - track leaving from below Vizagapatnam to 87°E, 17°N and then to Calcutta should be deleted.

ARGO '62 - near 39°E in Mozambique Channel should be ARGO '63. This correction is also required on H.O. 17,138-C.

RGS/jas
10 Nov. 1962
INTERNATIONAL INDIAN OCEAN EXPEDITION
30 EAST 40TH STREET . NEW YORK 16, N. Y. . LEXINGTON 2.6533

COORDINATOR
ROBERT G. SNIDER

CABLES
SCORINDOC - NEW YORK

I.I.O.E. WORK CHART No. 11
GEOLOGICAL, GEOPHYSICAL AND BATHYMETRIC CRUISES
PAST and PROJECTED
June - August (Green) - Presented by seasons only
for simplicity in production

LEGEND

0  -  Geology, Geophysics & Bathymetry (unspecified)
1  -  Precision Depth Recording          6  -  Heat Flow
2  -  Cores                             7  -  Seismic refraction
3  -  Dredging                          8  -  Deep reflection
4  -  Gravity                           9  -  Bottom photography
5  -  Magnetics                         10 - Bathymetry
     11 - Other (specify)

AUSTRALIA
DIAMANTINA '60 - GGB-10
DIAMANTINA '61 - GGB-10
DIAMANTINA '62 - GGB-10
GASCOYNE '62 - GGB-10

FRANCE
CDT. ROBERT GIRAUD '60 - GGB-10
CDT. ROBERT GIRAUD '61 - GGB-10
CDT. ROBERT GIRAUD '62 - GGB-10

INDIA
KISTNA '63 - GGB-2,3,4,5,6,7,10
VARUNA '62 - GGB-3,10

INDONESIA
JALANIDHI '63 - GGB-1,2

PORTUGAL
ALMIRANTE LACERDA '63-64 - GGB-2,3,10

REP. OF SOUTH AFRICA
AFRICANA II '62 - GGB-10,11 (bottom drilling)
NATAL '62 - June - GGB-2,3,4,5,7,10; July - GGB-10; Aug - GGB-4,10
U.S.S.R.
VITJAZ '62 - GGB-0

UNITED KINGDOM
DISCOVERY '63 - GGB-1,4,5

U.S.A.
ARGO '62 - GGB-1,4,5
ARGO '63 - GGB-1,4,5
ATLANTIS '58 - GGB-0
ATLANTIS II '63 - GGB-0
PIONEER '64 - GGB-1,2,3,4,5,9
TE VEGA '64 - GGB-0
VEMA '58 - GGB-0,1
VEMA '62 - GGB-1,2,3,4,5,6,7,8,9

NOTE:
ARGO '62 - from about 39° E, 45° S to Cape Town should be ARG0 '63. This correction is also required on H.O. 17,136-C.

RGS/jas
10 Nov. 1962
I.I.O.E. WORK CHART No. 12
GEOLOGICAL, GEOPHYSICAL AND BATHYMETRIC CRUISES
PAST and PROJECTED
September - November (Black) - Presented by seasons only
for simplicity in production

LEGEND

0 - Geology, Geophysics & Bathymetry (unspecified)
1 - Precision Depth Recording
2 - Cores
3 - Dredging
4 - Gravity
5 - Magnetics
6 - Heat Flow
7 - Seismic refraction
8 - Deep reflection
9 - Bottom photography
10 - Bathymetry
11 - Other (specify)

AUSTRALIA
DIAMANTINA '59 - GGB-10
DIAMANTINA '60 - GGB-10
DIAMANTINA '62 - GGB-10
GASCOYNE '62 - GGB-10

FRANCE
CDT. ROBERT GIRAUD '60 - GGB-10
CDT. ROBERT GIRAUD '62 - GGB-10

FED. REP. OF GERMANY
UNK. SHIP '63 - GGB-0

INDIA
KISTNA '62 - GGB-2,3,4,5,6,7,10

PAKISTAN
ZULFIQUAR '62 - GGB-2,10

U.S.S.R
VITJAZ '59 - GGB-2,3,7,10
VITJAZ '60 - GGB-0
VITJAZ '62 - GGB-0
UNITED KINGDOM
DALRYMPLE '61-62 - GGB-1,2,3,5,8
DISCOVERY '63 - GGB-1,4,5
OWEN '61-62 - GGB-1,3,4,5
OWEN '62 - GGB-1,4,5

U.S.A.
ARGO '60 - GGB-1,2,3,4,5,6,7,9
ARGO '62 - GGB-1,2,3,4,5,6,7,9
ATLANTIS II '63 - GGB-0
CHAIN '63-65 - GGB-1,2,3,4,5,6,7,8,9
HORIZON '62 - GGB-1,3,6,7
SERRANO '61 - GGB-0
TE VEGA '64 - GGB-0

NOTE:
CONCH '62 - along Malabar coast should be deleted.

BGS/jas
10 Nov. 1962