

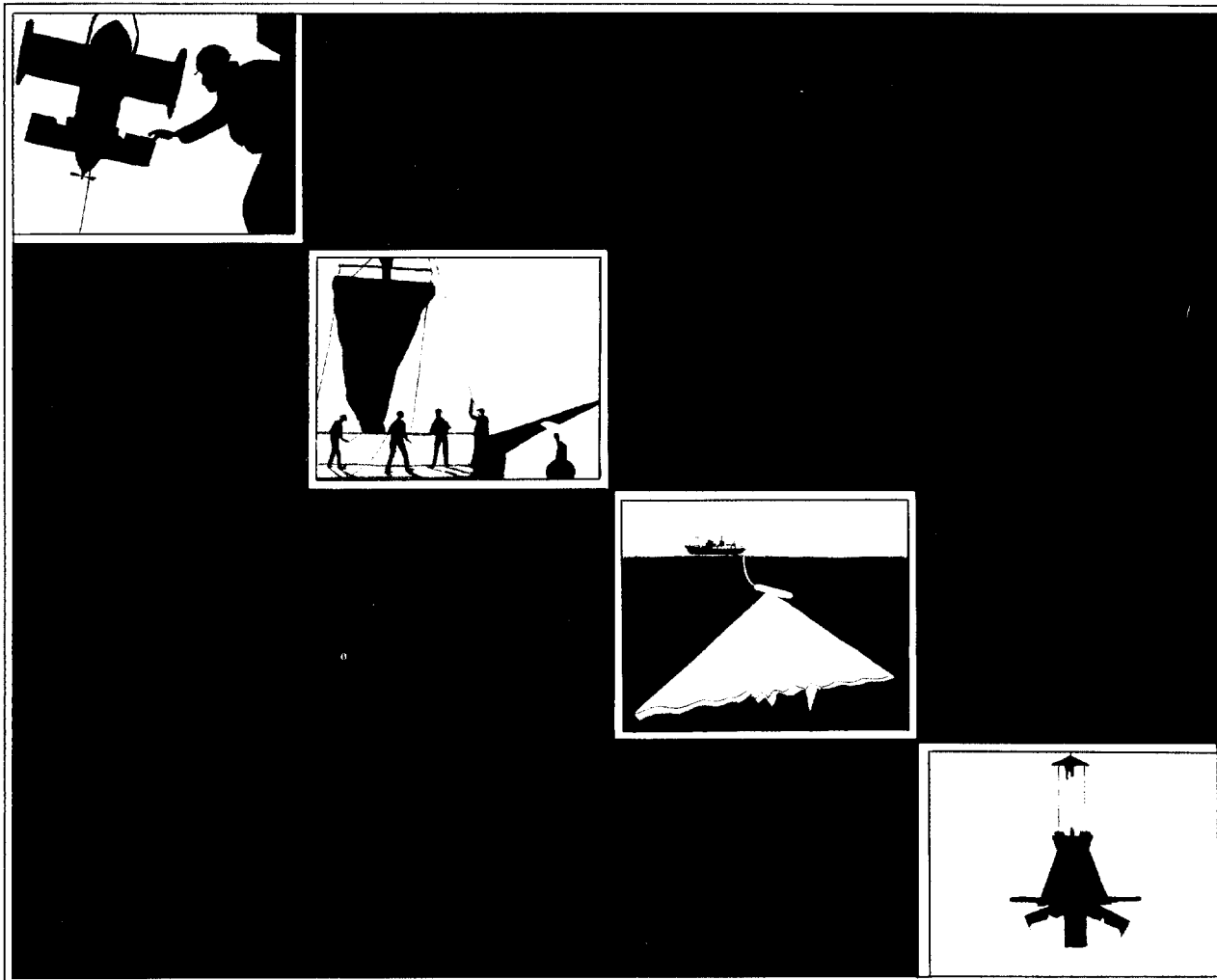


FILE
Institute of
Oceanographic Sciences
Deacon Laboratory

Index of RRS Discovery cruises until August 1988, with track charts

P Draper P M Hunter & I P Parr

Report No 278 1990



**INSTITUTE OF OCEANOGRAPHIC SCIENCES
DEACON LABORATORY**

**Wormley, Godalming,
Surrey, GU8 5UB, U.K.**

**Telephone: 0428 79 4141
Telex: 858833 OCEANS G
Telefax: 0428 79 3066**

Director: Dr. C.P. Summerhayes

INSTITUTE OF OCEANOGRAPHIC SCIENCES

DEACON LABORATORY

REPORT NO. 278

**Index of
RRS Discovery cruises until August 1988,
with track charts**

P. Draper, P.M. Hunter & I.P. Parr

1990

DOCUMENT DATA SHEET

<p><i>AUTHOR</i></p> <p>DRAPER, P., HUNTER, P.M. & PARR, I.P.</p>	<p><i>PUBLICATION DATE</i></p> <p>1990</p>
<p><i>TITLE</i></p> <p>Index of RRS <i>Discovery</i> cruises until August 1988, with track charts.</p>	
<p><i>REFERENCE</i></p> <p>Institute of Oceanographic Sciences Deacon Laboratory, Report, No. 278, 72pp.</p>	
<p><i>ABSTRACT</i></p> <p>This report summarises the cruises undertaken by RRS Discovery between February 1963 and August 1988. During this period RRS Discovery was administered directly by the Institute of Oceanographic Sciences from the Wormley Laboratory.</p>	
<p><i>ISSUING ORGANISATION</i></p> <p>Institute of Oceanographic Sciences Deacon Laboratory Wormley, Godalming Surrey GU8 5UB. UK.</p>	<p><i>TELEPHONE</i> 0428 79 4141</p> <p><i>TELEX</i> 858833 OCEANS G</p> <p><i>TELEFAX</i> 0428 79 3066</p>
<p><i>KEYWORDS</i></p> <p><i>CRUISE REPORTS</i> <i>"DISCOVERY"/RRS</i></p>	<p><i>CONTRACT</i></p> <p><i>PROJECT</i></p> <p><i>PRICE</i> £20.00</p>

<u>CONTENTS</u>	Page
PHOTOGRAPH OF RRS DISCOVERY	6
INTRODUCTION	7
NOTES AND ABBREVIATIONS, CRUISE NOTES	8-9
CRUISE DETAILS	10-24
TRACK CHARTS	27-72



RRS DISCOVERY in Grand Harbour, MALTA; February 1967

Photograph: Pamela Draper

INTRODUCTION

RRS Discovery was built in 1962 for, and operated by the National Institute of Oceanography (NIO). On the formation of the Natural Environment Research Council (NERC) in 1965 of which NIO became a component Institute, ownership of the vessel passed to the Council. Management responsibility however, remained with NIO (known since 1973 as Institute of Oceanographic Sciences, Wormley, and since 1987 as IOS Deacon Laboratory) until the NERC Research Vessel Services (RVS) became sufficiently established to assume the task. As a first step Marine and Engineering aspects of management were transferred, programming and scientific responsibilities remained with the Institute. Eventually programming devolved to council and finally scientific aspects of the vessels management passed from Institute hands to RVS in August 1988.

NOTES

- Discipline - only general topics are used 'Physics' means Physical Oceanography
- Principal Scientist - NIO, IOS or IOSDL unless otherwise stated
- Working Area - generalised region names are used unless the cruise report title indicates specific localities; a more exact location can be derived from the track chart
- Cruise Report - Discovery Cruise numbers 4-53, NIO Cruise Report numbers 4-59
- Discovery Cruise numbers 54-176, IOS Cruise Report numbers 2-204

ABBREVIATIONS

- GLORIA - Geological Long Range Inclined Asdic
- OWS 'INDIA' - Ocean Weather Station 'India'
- OWS 'J' - Ocean Weather Station 'Juliet'
- JASIN - Joint Air Sea Interaction
- MEDOC - Mediterranean Occidental Survey
- MODE-1 - Mid Ocean Dynamics Experiment 1
- GATE - GARP Atlantic Tropical Experiment
- GARP - Global Atmospheric Research Program
- FGGE - First GARP Global Experiment
- FAMOUS - French-American Mid Oceanic Underwater Survey
- NEADS - North East Atlantic Dynamic Studies
- LADLE - Lesser Antilles Deep Lithosphere Experiment
- GME - Great Meteor East

CRUISE NOTES

Note A: Cruise No. 126. This cruise was transferred to, and completed aboard, RRS Shackleton.

Cruises numbered 4 to 53 have cruise reports in the NIO Cruise Report series; cruises 54 onwards have cruise reports in the IOS Cruise Report series.

Entries marked * have cruise reports published elsewhere, as listed below:

Cruise No.	1	The Royal Society, London
	2	The Royal Society, London
	3	The Royal Society, London
	73	University of Cambridge (additional to IOS report)
	127	University of Liverpool
	136	University of Keele
	143	University of Cambridge
	150	University of Cambridge
	154	University of Birmingham
	155	University of Cambridge
	169	University of Southampton
	171	University of Cambridge
	172	British Antarctic Survey
	173	University of Southampton
	176	University of Cambridge

CRUISE NO	STATION NUMBERS	OCEANOGRAPHIC DISCIPLINE	CHIEF SCIENTIST	WORKING AREA	DATES	CRUISE REPORT
Shakedown	4979-4993	Trials	Dr. H.P.F. Herdman	N.E. At lantic (SW Approaches)	Feb-Mar 1963	-
1	5006-5101	Physics, Biology, Chemistry	Mr. R.I. Currie	South East Arabian Upwelling Region	01 Jun-20 Aug 1963	*
2	5102-5238	Geology, Geophysics, Chemistry, Physics	Dr. M.N. Hill, Univ. of Cambridge	N.W. Indian Ocean, passage to UK	23 Aug-04 Dec 1963	*
3	5239-5583	Physics, Biology, Chemistry	Dr. J.C. Swallow & Mr. R.I. Currie	W. Indian Ocean, passages from/to UK	15 Feb-28 Sep 1964	*
4	5584-5648	Geology, Geophysics	Dr. M.N. Hill, Univ. of Cambridge	N.E. At lantic (Azores)	02 Feb-01 Apr 1965	NI04
5	5649-5683	Trials, Physics, Geophysics	Mr. M.J. Tucker	N.E. At lantic (Sheif Edge)	28 Apr-23 May 1965	5
6	5684-5763	Physics	Mr. J. Crease	N.E. At lantic (Faeroe Bank)	01 Jun-01 Jul 1965	-
7	-	Geology	Mr. A.H.B. Stride	N.E. At lantic (Faeroes-Spain)	07 Jul-06 Aug 1965	-
8	5765-5828	Biology	Mr. R.I. Currie	N.E. At lantic (Madeira/Canary Islands)	01 Sep-01 Dec 1965	8
9	-	Trials	Dr. H.P.F. Herdman	N.E. At lantic (S.W. Approaches)	01 Feb-06 Feb 1966	-
10	5829-5935	Trials, Physics	Dr. J.C. Swallow	N.E. At lantic (Madeira)	15 Feb-06 Apr 1966	10
11	5936-5989	Geophysics, Geology	Dr. A.S. Laughton	N.E. At lantic (Biscay, Azores)	15 Apr-21 May 1966	11
12	5990-5993	Geology	Mr. A.H.B. Stride	N.E. At lantic (S.W. Approaches)	31 May-21 Jun 1966	-

CRUISE NO	STATION NUMBERS	OCEANOGRAPHIC DISCIPLINE	CHIEF SCIENTIST	WORKING AREA	DATES	CRUISE REPORT
13	5995-6053	Physics		N.E. Atlantic (UK/Madeira/UK)	04 Jul-11 Aug 1966	-
14	6054-6099	Geology, Geophysics	Liverpool, Bristol & Durham Univ.	N.E. Atlantic	01 Sep-30 Sep 1966	-
15	6100-6204	Biology	Dr. M.R. Clarke	N.E. Atlantic (Azores/Canary Islands)	07 Oct-28 Nov 1966	15
16	6205-6278	Geology, Geophysics, GLORIA trials	Dr. A.S. Laughton	Red Sea, Gulf of Aden, N.W. Indian Ocean, passages from/to UK	20 Jan-06 May 1967	16
17	6279-6346	Physics, Instrument trials	Mr. J. Crease	N.E. Atlantic (Faeroes, OMS India, Shelf Edge, Biscay)	03 Jun-08 Jul 1967	17
18	6350-6450	Physiology, Biological gear trials	Dr. M.R. Clarke	N.E. Atlantic (Canary Islands)	14 Jul-23 Aug 1967	18
19	6451-6470	Geology, Geophysics	Mr. A.H.B. Stride	English Channel, N.E. Atlantic, Alboran Sea	12 Sep-12 Oct 1967	19
20	6471-6540	Physics	Dr. J.C. Swallow	N.E. Atlantic (Biscay, off Iberia)	20 Oct-18 Dec 1967	20
21	6541-6722	Biology, Physics	Mr. P.M. David	N.E. Atlantic (off N.W. Africa)	14 Jan-01 Apr 1968	21
22	6723-6729	Physics (tides)	Mr. D.E. Cartwright	N.E. Atlantic (St. Kilda)	18 Jun-25 Jul 1968	22
23	6731-6741	Geophysics	Dr. A.S. Laughton	N.E. Atlantic (Biscay)	31 Jul-19 Aug 1968	23
24		Geology, Geophysics	Mr. M.J. Tucker	N.E. Atlantic (Rockall Trough), Moray Firth	19 Sep-30 Sep 1968	24
25	6741-6892	Physics ('MEDOC 1969'), Computer trials	Dr. J.C. Swallow	N.W. Mediterranean, passages from/to UK	25 Jan-28 Mar 1969	25

CRUISE NO	STATION NUMBERS	OCEANOGRAPHIC DISCIPLINE	CHIEF SCIENTIST	WORKING AREA	DATES	CRUISE REPORT
26	6893-6998	Physics, Chemistry	Prof. K.F. Bowden, Univ. of Liverpool	N.E. Atlantic (off N.W. Africa)	03 Apr-09 May 1969	LUDO IX
27 & 28	7000-7014	Geology, Geophysics, Biology	Mr. A.H.B. Stride	N.E. Atlantic, W. Mediterranean	09 Jun-24 Jul 1969	27 & 28
29	7016-7033	Geophysics	Dr. A.S. Laughton	N.E. Atlantic (Azores, Rockall Plateau)	02 Aug-06 Oct 1969	29
30	7034-7140	Biology, Physics	Mr. P.M. David	N.E. Atlantic (off N.W. Africa, Canary Islands)	15 Oct-15 Dec 1969	30
31	7141-7277	Physics ('MEDOC 1970')	Dr. J.C. Swallow	N.W. Mediterranean, Gulf of Cadiz	21 Jan-12 Mar 1970	31
32	7278-7281	Equipment trials	Mr. J. Crease	N.E. Atlantic (Biscay)	24 Mar-07 Apr 1970	-
33	7282-7299	Geophysics, Geology	Dr. A.S. Laughton	N.E. Atlantic (Rockall, Kings Trough)	14 Apr-21 May 1970	33
34	7300-7357	Physics, Meteorology ('JASTIN')	Dr. J.C. Swallow	N.E. Atlantic (OMS 'J', Biscay)	02 Jun-29 Jun 1970	34
35	7358-7403	Geology, Geophysics, Biology	Dr. A.H.B. Stride	W. Mediterranean (Tyrrhenian Sea), Gulf of Cadiz	11 Jul-19 Aug 1970	35
36	7404-7482	Biology, Physics	Mr. P.M. David	N.E. Atlantic (Azores)	26 Sep-13 Nov 1970	36
37	7484-7495	Physics, Meteorology	Mr. A.G.D. Watson	N.E. Atlantic (Biscay)	25 Nov-10 Dec 1970	37
38	7496-7707	Physics	Dr. J.C. Swallow	N.E. Atlantic (Biscay, Gulf of Cadiz)	22 Jan-07 Apr 1971	41
39	7708-7719	Biology	Mr. P. Foxton	N.E. Atlantic (Ice Land Basin, Rockall)	21 Apr-07 Jun 1971	40

CRUISE NO	STATION NUMBERS	OCEANOGRAPHIC DISCIPLINE	CHIEF SCIENTIST	WORKING AREA	DATES	CRUISE REPORT
40	7720-7721	Geology, Physics	Dr. A.H.B. Stride	E. Mediterranean, N.E. Atlantic	19 Jun-26 Jul 1971	48
41	7723-7742	Physics (tides), Meteorology	Dr. D.E. Cartwright, Mr. A.G.D. Watson	N.E. Atlantic (Hebrides, St. Kilda, Shetland)	09 Aug-19 Sep 1971	45
42	7743-7748	GLORIA fishing	Dr. J.S.M. Rusby	Sea of the Hebrides	21 Sep-30 Sep 1971	49
43	7749-7757	Geophysics, Geochemistry	Dr. A.S. Laughton	N.E. Atlantic (Kings Trough, Azores - Gibraltar Ridge)	07 Oct-25 Nov 1971	47
44	7758-7781	Physics	Dr. J.C. Swallow	N.E. Atlantic (Biscay)	04 Dec-13 Dec 1971	46
45	7782-7857	Biology, Physics	Mr. P.M. David	N.E. Atlantic (off N.W. Africa, Canary & C. Verde Isles)	04 Feb-16 Apr 1972	50
46	7858-7913	Physics, Meteorology, (Equipment development)	Mr. M.J. Tucker, Dr. J.C. Swallow	N.E. Atlantic (Rockall Trough, Biscay, off S.W. England)	27 Apr-30 May 1972	55
47	7914-7964	Geology, Geophysics	Mr. D.G. Roberts	N.E. Atlantic (Rockall Plateau)	09 Jun-03 Jul 1972	52
48	7965-8076	Physics, Biology, Chemistry	Prof. K.F. Bowden, Univ. of Liverpool	N.E. Atlantic (off N.W. Africa)	12 Jul-22 Aug 1972	53
49	8075a-8192	Physics, Meteorology ('JASIN 1972')	Dr. J.C. Swallow	N.E. Atlantic (OMS 'J')	312 Aug-02 Oct 1972	57
50	8193-8195	Equipment trials, Geology	Dr. A.H.B. Stride	English Channel, North Sea	11 Oct-26 Oct 1972	56
51	8196-8246	Physics, Geology	Mr. J. Crease, Dr. J.C. Swallow	N.E. Atlantic (Biscay, Josephine Bank, Gulf of Cadiz), N.W. Mediterranean (Gulf of Lyons, Tyrrhenian Sea)	04 Nov-18 Dec 1972	54

CRUISE NO	STATION NUMBERS	OCEANOGRAPHIC DISCIPLINE	CHIEF SCIENTIST	WORKING AREA	DATES	CRUISE REPORT
52	8282-8281	Physics, Biology	Dr. J.C. Swallow, Mr. P.M. David	N. Atlantic (32°N section, Bermuda)	17 Feb-28 Mar 1973	59
53	8282-8431	Physics ('MODE-1')	Dr. J.C. Swallow	N. Atlantic (Bermuda, passage to UK)	01 Apr-14 Jun 1973	NI0 58
54	8432-8443	Geophysics	Dr. A.S. Laughton	N.E. Atlantic (Mid-Atlantic Ridge Famous area, Azores - Gibraltar plate boundary)	29 Jun-15 Aug 1973	IOS 2
55	8444-8459	Geology, Geophysics	Dr. A.H.B. Stride	E. Mediterranean, Gulf of Cadiz	08 Sep-19 Oct 1973	5
56	8462-8469	Physics (tides)	Dr. D.E. Cartwright	N.E. Atlantic (North Bay of Biscay)	30 Oct-07 Nov 1973	4
57	8469a-8498	Physics, GLORIA fishing etc	Dr. J.S.M. Rusby	The Minches, N.E. Atlantic (off Hebrides)	10 Nov- 01 Dec 1973	6
58	-	Physics (tides)	Dr. D.E. Cartwright	N.E. Atlantic (North Bay of Biscay)	05 Dec-15 Dec 1973	4
59	8473-8483	Instrument & Hardware trials	Dr. B.S. McCartney	N.E. Atlantic (Bay of Biscay)	01 Feb-19 Feb 1974	14
60	8483a-8498	Geophysics	Mr. D.G. Roberts	N.E. Atlantic (Rockall Plateau, S.W. Approaches)	26 Feb-22 Mar 1974	8
61	8499-8516	Biology	Dr. M.V. Angel	N.E. Atlantic (44°N, 13°W)	30 Mar-16 May 1974	10
62	-	Equipment trials etc	Mr. W.E. Elford	N.E. Atlantic (Biscay)	24 May-03 Jun 1974	11
63	8517-8542	Geochemistry, Biology	Dr. S.E. Calvert	N.E. Atlantic (passage from UK, off N.W. African continental margin)	12 June-14 Jul 1974	12
64	8543-8591	Physics, Biology ('GATE')	Dr. S.A. Thorpe	Equatorial E. Atlantic	17 Jul-13 Aug 1974	13

CRUISE NO	STATION NUMBERS	OCEANOGRAPHIC DISCIPLINE	CHIEF SCIENTIST	WORKING AREA	DATES	CRUISE REPORT
65	8592-8623	Physics, Biology ('GATE')	Mr. A. de C. Baker	Equatorial E. Atlantic (8°N, 23°W)	15 Aug-29 Aug 1974	17
66	8625-8633	Physics, Meteorology ('GATE')	Dr. R.I. Tait, Univ. of Liverpool	Equatorial E. Atlantic (off W. Africa)	31 Aug-29 Sep 1974	20
67	8634-8635	Equipment trials, Geology	Dr. A.H. Stride	N.E. Atlantic (Biscay), North Sea	14 Oct-23 Oct 1974	-
68 (3 legs)	8636-8648	Physics (tides), Geophysics, Biology	Dr. D.E. Cartwright, Dr. A.S. Loughton, Dr. B.S. McCartney	N.E. Atlantic (N. Biscay Shelf, Azores, N.E. of Azores, 44°N, 13°W)	01 Nov-14 Dec 1974	16
69	8649-8819	Physics, Biology, Chemistry	Mr. A. de C. Baker	N.E. Atlantic (off N.W. Africa)	21 Jan-18 Mar 1975	51
70	8820-8853	Physics (Topography)	Dr. J.C. Swallow	N.E. Atlantic	27 Mar-25 Apr 1975	-
71	-	Geology, Geophysics (GLORIA)	Dr. A.H.B. Stride	N.E. Atlantic (Biscay & S.W. Approaches)	08 May-27 May 1975	-
72	8854-8886	Physics (Topography)	Dr. W.J. Gould	N.E. Atlantic	31 May-26 Jun 1975	-
73	8887-8895	Geophysics	Dr. A.S. Loughton	N.E. Atlantic (Mid-Atlantic Ridge, North of Azores)	03 Jul-26 Aug 1975	34*
74 leg 1	8896-8905	Physics (tides)	Mr. J.B. Rae	N.E. Atlantic (Shelf Edge and a long 53°N)	03 Sep-15 Sep 1975	35
74 leg 2	8907-8925	Geophysics	Mr. D.G. Roberts	N.E. Atlantic (S.W. Approaches, North Biscay)	15 Sep-26 Sep 1975	33
74 leg 3	-	Physics (tides), Geophysics	Dr. D.E. Cartwright	N.E. Atlantic (Shelf Edge and a long 53°N)	28 Sep-13 Oct 1975	35
75	8926-8933	Geochemistry, Biology	Dr. S.E. Calvert	N.E. Atlantic (off N.W. Africa)	22 Oct-08 Nov 1975	43

CRUISE NO	STATION NUMBERS	OCEANOGRAPHIC DISCIPLINE	CHIEF SCIENTIST	WORKING AREA	DATES	CRUISE CASE REPORT
76	8934-8935	Instrument Trials	Dr. B.S. McCartney	N.E. Atlantic	26 Jun-08 Jul 1976	-
77	8936-9046	Biology	Dr. P.J. Herring	N.E. Atlantic (Canary Islands)	15 Jul-31 Aug 1976	46
78 (3 legs)	9050-9056	Physics (tides), Equipment Trials, Geophysics	Mr. J.B. Rae, Mr. W.E. Elford, Dr. D.E. Cartwright	N.E. Atlantic (south of Iceland, west of Hebrides)	08 Sep-18 Oct 1976	52
79	9058-9134	Biology, Geochemistry, Chemistry, Physics	Dr. A.L. Rice	N.E. Atlantic (off N.W. Africa)	28 Oct-28 Nov 1976	54
80	9135-9227	Physics	Mr. J. Crease	N.E. Atlantic (Gulf of Cadiz)	30 Nov-20 Dec 1976	-
81 leg 1	9228-9382	Physics	Dr. J.C. Swallow	N.E. Atlantic (41°-49°N, 10°-30°W)	28 Jan-17 Mar 1977	-
81 leg 2	9383-9406	Physics	Dr. W.J. Gould			
82 leg 1	9498-9536	Biology, Chemistry, Physics	Dr. M.V. Angel	N.E. Atlantic (off N.W. Africa)	21 Mar-10 Apr 1977	59
82 leg 2	9537-9554	Biology, Chemistry, Physics	Mr. A. de C. Baker	N.E. Atlantic (off N.W. Africa, 20°N, 21°W, passage to UK)	12 Apr-03 May 1977	59
83	-	GLORIA II Trials, Equipment Trials	Mr. W.E. Elford	N.E. Atlantic (Celtic Sea, Porcupine Seabight)	26 May-09 Jun 1977	61
84	9555-9574	Geophysics, Geology	Dr. A.S. Laughton	N.E. Atlantic (Charlie Gibbs Fracture Zone, Reykjanes Ridge, King's Trough)	15 Jun-28 Jul 1977	60
85	-	Geology	Dr. A.H.B. Stride	E. Mediterranean (passage from/to Lisbon/UK)	01 Aug-30 Aug 1977	85
86	9575-9623	Physics, Meteorology ('JASIN 1977')	Dr. J.C. Swallow	N.E. Atlantic (Rockall Trough)	07 Sep-30 Sep 1977	57

CRUISE NO	STATION NUMBERS	OCEANOGRAPHIC DISCIPLINE	CHIEF SCIENTIST	WORKING AREA	DATES	CRUISE REPORT
87	-	Geophysics and Biology Instrument Tests	Dr. R.B. Whitmarsh	N.E. Atlantic (west of Portugal)	08 Oct-19 Oct 1977	58
88	9624-9641	Geochemistry, Biology	Dr. A.L. Rice	N.E. Atlantic (off Iberian Peninsula, Porcupine Seabight)	23 Oct-16 Nov 1977	65
89	9642-9746	Physics	Dr. W.J. Gould	N.E. Atlantic (NEADS sites, passages)	23 Nov-20 Dec 1977	67
90	9747-9749	Geophysics	Mr. D.G. Roberts	N.E. Atlantic (European-North African Continental Margin)	20 Jan-03 Mar 1978	68
91	9750-9751	Geophysics	Dr. R.C. Searle	N.E. Atlantic (Azores Triple Junction, Azores - Biscay Rise)	05 Mar-28 Mar 1978	69
92	9752-9801	Biology	Dr. M.V. Angel	N.E. Atlantic (Porcupine Seabight, along 13°W and 17°W, around 42°N, 17°W)	04 Apr-23 May 1978	70
93	9802-9828	Geophysics, Geology	Dr. R.B. Whitmarsh	N.E. Atlantic (Azores - Biscay Rise, Mid-Atlantic Ridge, passage to UK)	26 May-05 Jul 1978	71
94	9829-9837	Physics ('JASIN 1978')	Dr. P.M. Saunders	N.E. Atlantic (North Rockall Trough)	12 Jul-16 Aug 1978	74
94	legs 3	Physics ('JASIN 1978')	Dr. R.T. Pollard	N.E. Atlantic (North Rockall Trough)	20 Aug-17 Sep 1978	74
95	9904-9924	Physics (tides et al) ('FGGE')	Dr. D.E. Cartwright	Tropical Atlantic (Equatorial sections at 27½° and 32½° W)	25 Oct-17 Nov 1978	77
96	9925-9926	Geology, Geophysics	Mr. R.H. Belderson	Equatorial Atlantic (Mid Ocean Canyon, Romanche Fracture Zone)	21 Nov-04 Dec 1978	79

CRUISE NO	STATION NUMBERS	OCEANOGRAPHIC DISCIPLINE	CHIEF SCIENTIST	WORKING AREA	DATES	CRUISE REPORT
97	-	Physics (tides) ('FGGE')	Dr. L.M. Skinner	Tropical Atlantic	06 Dec-21 Dec 1978	77
98	9927-9933	Physics, Geophysics	Dr. R.T. Pollard	S. Atlantic (Recife to Cape Town)	27 Dec-10 Jan 1979	75
99	9934-9953	Geochemistry, Chemistry, Biochemistry	Dr. S.E. Calvert	S. Atlantic (Cape Basin)	16 Jan-27 Jan 1979	78
100	9954-10005	Physics, Biology, Geophysics	Mr. J. Crease	Indian and Southern Oceans	31 Jan-04 Apr 1979	-
101	10005-10013	Geophysics	Mr. D.G. Roberts	S.W. Indian Ocean, northern Mascarene Plateau	10 Apr-06 May 1979	94
102	10014-10093	Physics ('FGGE')	Dr. J.C. Swallow	W. Equatorial Indian Ocean (Somali Current)	10 May-06 Jul 1979	83
103	10094-10103	Geology, Geophysics	Dr. R.C. Searle	Gulf of Aden, Red Sea	09 Jul-25 Jul 1979	88
104	10103-10104	Geology, Geophysics, Chemistry	Mr. N. Kenyon	Mediterranean Sea, Gulf of Cadiz	27 Jul-19 Aug 1979	105
105	10105-10162	Biology, Chemistry	Dr. P.J. Herring	N.E. Atlantic (Rockall Trough, Porcupine Seabight, and N.W. African coast)	29 Aug-23 Oct 1979	82
106	-	Geophysics, Equipment Trials	Dr. R.B. Kidd	N. Atlantic (Tyneside to San Juan)	05 Dec-22 Dec 1979	90
107	-	Geophysics ('LADLE')	Dr. R.B. Whitmarsh	Caribbean Sea (Lesser Antilles)	28 Dec-09 Feb 1980	100
108	10163-10172	Geochemistry, Chemistry, Geophysics	Dr. F. Culkin	W. Equatorial Atlantic (Nares Abyssal Plain)	18 Feb-03 Mar 1980	99
109	-	Geology, Geophysics	Dr. A.H.B. Stride	W. Equatorial Atlantic (Antilles), passage to Panama	10 Mar-19 Apr 1980	98
110	10173-10194	Geophysics, Geochemistry	Dr. R.C. Searle	E. Equatorial Pacific	22 Apr-18 Jun 1980	102

CRUISE NO	STATION NUMBERS	OCEANOGRAPHIC DISCIPLINE	CHIEF SCIENTIST	WORKING AREA	DATES	CRUISE REPORT
111 leg 1	-	Geophysics (GLORIA)	Dr. R.B. Kidd	W. Atlantic (Blake-Bahama Outer Ridges)	21 Jun-03 Jul 1980	103
111 leg 2	10195-10206	Geophysics	Dr. D.G. Roberts	W. Atlantic (Grand Banks, Laurentian Fan)	08 Jul-30 Jul 1980	104
112	10207-10215	Physics (tides), Geophysics	Dr. D.E. Cartwright	N. Atlantic (Grand Banks to W. Biscay)	03 Aug-18 Aug 1980	112
113	10216-10220	Instrument & Equipment trials	Dr. J.S.M. Rusby	N.E. Atlantic (Celtic Sea, N. Biscay)	06 Oct-13 Oct 1980	106
114	10221-10254	Biology, Physics, Chemistry	Dr. M.V. Angel	N.E. Atlantic (UK/Azores, Madeira Abyssal Plain)	16 Oct-30 Nov 1980	108
115	10254	Physics (tides)	Dr. D.E. Cartwright	N. Atlantic (between Grand Banks & West Biscay)	04 Dec-17 Dec 1980	112
116	10255-10260	Physics, gear and instrument trials	Dr. B.S. McCartney	N.E. Atlantic (UK to Madeira)	06 Jan-16 Jan 1981	109
117	10261-10294	Physics	Dr. P.M. Saunders	N.E. Atlantic (Madeira Basin)	19 Jan-12 Feb 1981	111
118	10295-10335	Geophysics, Geology	Dr. T.J.G. Francis	N.E. Atlantic (Great Meteor, Cape Verde One, King's Trough)	16 Feb-30 Mar 1981	117
119	10336-10356	Physics	Dr. W.J. Gould	N.E. Atlantic (Biscay/Azores)	07 Apr-05 May 1981	130
120	10357-10376	Biology, Physics	Dr. M.J.R. Fasham	N.E. Atlantic (south-west of the Azores)	09 May-01 Jun 1981	124
121	10377-10382	Biology	Dr. M.V. Angel	N.E. Atlantic (south-west of the Azores)	05 Jun-26 Jun 1981	115
122	10383-10397	Physics	Dr. W.J. Gould	N.E. Atlantic (Azores/Biscay)	30 Jun-27 Jul 1981	118
123	10398	Geology, Geophysics	Dr. J.B. Wilson	N.E. Atlantic, Norwegian Sea (Continental Slope to the west of the British Isles and Norway)	05 Aug-10 Sep 1981	131

CRUISE NO	STATION NUMBERS	OCEANOGRAPHIC DISCIPLINE	CHIEF SCIENTIST	WORKING AREA	DATES	CRUISE REPORT
124	-	Equipment trials	Dr. J.S.M. Rusby	N.E. Atlantic (Celtic Sea, Biscay)	09 Jan-18 Jan 1982	129
125	10399-10404	Geochemistry, Physics	Dr. J. Thomson	N.E. Atlantic (Passage from UK, Madeira/Cape Verde Abyssal Plains)	30 Jan-25 Feb 1982	125
126	10405-10408	Geology, Geophysics	Dr. T.J.G. Francis	N.E. Atlantic (Azores/Canaries)	04 Mar-03 Apr 1982	141
NOTE A						
127	10409-10511	Physics	Dr. P. Hughes	N.E. Atlantic (off N.W. Africa)	11 Apr-29 Apr 1982	*
128	10512-10546	Geochemistry, Biology	Dr. R.J. Morris	Tropical E. Atlantic (Guinea Basin)	02 May-26 May 1982	134
129	10547-10554	Geochemistry, Chemistry	Dr. T.R.S. Wilson	Tropical & Subtropical E. Atlantic	29 May-22 Jun 1982	138
130	10555-10599	Physics	Dr. W.J. Gould, Dr. P.M. Saunders	N.E. Atlantic (Discovery Gap)	25 Jun-05 Aug 1982	136
131	10600-10619	Geology, Geophysics	Dr. R.B. Whitmarsh	N. Atlantic (Gibraltar/St. Johns/Falmouth, Charlie-Gibbs Fracture Zone)	12 Aug-23 Sep 1982	137
132	10620-10650	Physics, Meteorology	Dr. R.T. Pollard	N.E. Atlantic (Porcupine & Iberian Abyssal Plains)	27 Jan-20 Feb 1983	147
133	-	Instrument & Equipment trials	Dr. J.S.M. Rusby	N.E. Atlantic (Tagus Abyssal Plain)	22 Feb-27 Feb 1983	142
134	10653-10699	Geology, Geophysics	Dr. T.J.G. Francis	N.E. Atlantic (Great Meteor East, King's Trough Flank)	01 Mar-26 Mar 1983	-
135	10700-10709	Geochemistry, Chemistry	Dr. T.R.S. Wilson	N.E. Atlantic (Discovery Gap, King's Trough, Torre Seamount, W. Mediterranean)	30 Mar-24 Apr 1983	160

CRUISE NO	STATION NUMBERS	OCEANOGRAPHIC DISCIPLINE	CHIEF SCIENTIST	WORKING AREA	DATES	CRUISE REPORT
136	-	Geology, Geophysics	Prof. G. Kelling Univ. of Keele	W. Mediterranean (Messina Basin Plain, Central Hellenic Trench)	29 Apr-15 May 1983	*
137	-	Geology, Geophysics, Physics	Prof. M. Brooks, U.C. Cardiff, Dr. M. Collins, U.C. Swansea	W. Mediterranean (Gulf of Corinth, N.W. Aegean Sea, passage to Gibraltar)	18 May-12 Jun 1983	-
138	10784-10824	Physics	Dr. W.J. Gould	N.E. Atlantic (Discovery Gap, Madeira Basin)	17 Jun-09 Jul 1983	152
139	10825-10869	Physics	Dr. A.J. Elliott	N.E. Atlantic (Madeira/Cape Verde)	12 Jul-03 Aug 1983	148
140	10870-10942	Biology, Biochemistry, Geochemistry	Dr. P.J. Herring	N.E. Atlantic (Dakar/Madeira/Grand Meteor Seamount/Galicia Bank/UK)	05 Aug-13 Sep 1983	155
141	10943-10949	Physics, Instrument trials, Engineering tests	Dr. B.S. McCartney	N.E. Atlantic (Madeira Rise, Great Meteor East/Dakar)	26 Oct-16 Nov 1983	156
142	10950-10958	Geophysics, Geology	Dr. R.C. Searle	Equatorial Atlantic (Romanche & St. Paul Fracture Zones)	20 Nov-18 Dec 1983	157
143	-	Geophysics	Dr. R.S. White, Univ. of Cambridge	N.E. Atlantic (Cape Verdes Rise)	22 Dec-19 Jan 1984	*
144	10959-10984	Geology, Geophysics	Dr. P.J. Schultheiss	N.E. Atlantic (Great Meteor Seamount, passages from Dakar/to Gibraltar)	22 Jan-20 Feb 1984	161
145	10985-11029	Physics, Meteorology	Dr. R.T. Pollard	N.E. Atlantic (Iberia & Biscay Abyssal Plains)	25 Feb-24 Mar 1984	166
146	11030-11096	Biology, Physics	Dr. M.V. Angel	N.E. Atlantic (Iberia & Biscay Abyssal Plains)	27 Mar-24 Apr 1984	168

CRUISE NO	STATION NUMBERS	OCEANOGRAPHIC DISCIPLINE	CHIEF SCIENTIST	WORKING AREA	DATES	CRUISE REPORT
147	11097-11116	Biogeochemistry, Physics	Dr. W.R. Simpson	N.E. Atlantic (Abyssal Plains, Procupine Seabight)	26 Apr-17 May 1984	164
148	11116-11134	Biology, Physics	Mr. H.S.J. Roe	N.E. Atlantic (King's Trough Flank, passages from UK/to Madeira)	21 May-12 Jun 1984	163
149	11135-11147	Geochemistry	Dr. T.R.S. Wilson	N.E. Atlantic ('GME', Madeira Abyssal Plain)	15 Jun-10 Jul 1984	169
150	-	Geophysics (seismics)	Dr. M.C. Sinha, Univ. of Cambridge	N.E. Atlantic (west of Outer Hebrides)	23 Aug-06 Sep 1984	*
151	11153-11156	Physics	Dr. W.J. Gould	N.E. Atlantic (Azores/Biscay area)	18 Sep-29 Sep 1984	-
152	11157-11167	Equipment & Instrument trials	Dr. J.S.M. Rusby	N.E. Atlantic (Tagus Abyssal Plain, passages to/from UK)	04 Oct-15 Oct 1984	170
153	11168-11192	Geology, Geophysics	Dr. R.C. Searle	N.E. Atlantic (Great Meteor East, Madeira Abyssal Plain)	20 Oct-17 Nov 1984	172
154	11193-11250	Geophysics, Geology	Dr. P. Barker, Univ. of Birmingham/ BAS	Southern Ocean (Antarctic Peninsula and Weddell Sea)	08 Dec-11 Apr 1985	*
155	-	Geophysics (seismics)	Dr. R.S. White, Univ. of Cambridge	N.E. Atlantic (Hatton Bank-Rockall)	17 May-11 Jun 1985	*
156	11252-11272	Biology, Physics	Mr. H.S.J. Roe	N.E. Atlantic (Great Meteor East, passage from/to UK)	18 Jun-29 Jul 1985	176
157	-	Equipment & Instrument trials	Dr. J.S.M. Rusby	N.E. Atlantic (S.W. Approaches, Biscay, Iberia Abyssal Plain)	27 Mar-09 Apr 1986	181

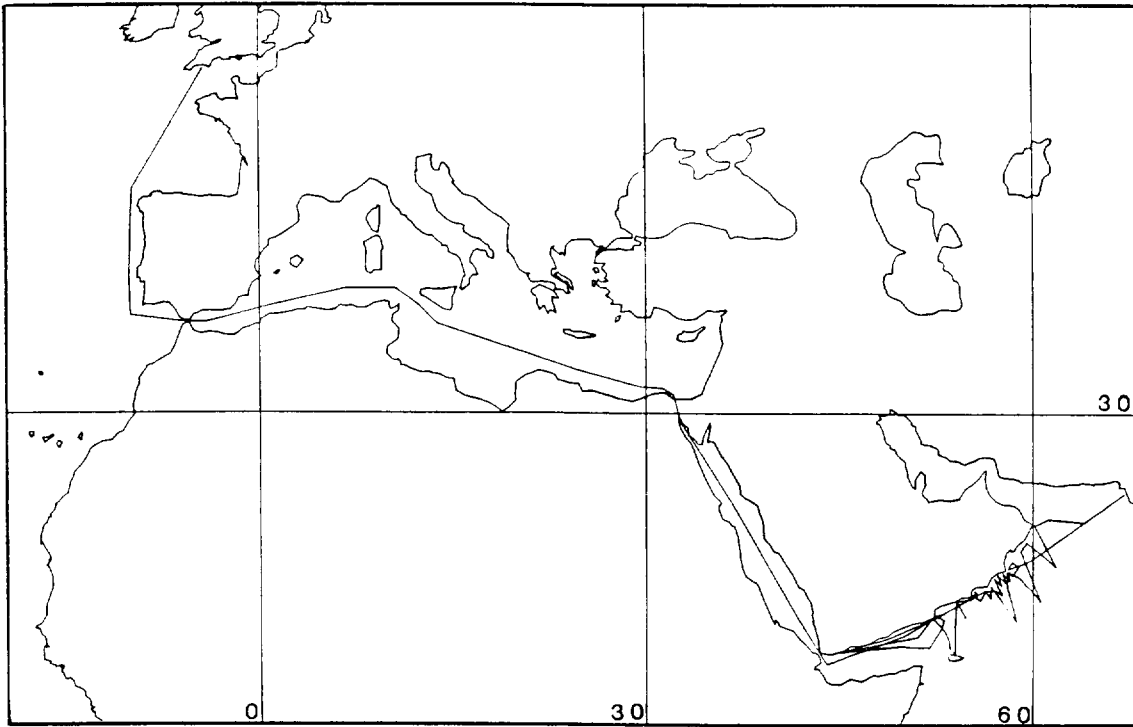
CRUISE NO	STATION NUMBERS	OCEANOGRAPHIC DISCIPLINE	CHIEF SCIENTIST	WORKING AREA	DATES	CRUISE REPORT
158	11263-11301	Biology, Physics, Chemistry	Dr. A.L. Rice	N.E. Atlantic (Porcupine Seabight, Iberia Abyssal Plain)	12 Apr-12 May 1986	189
159	11287-11316	Biogeochemistry, Biology, Physics	Dr. W.R. Simpson	N.E. Atlantic (GME, 26°N transect and TAG hydrothermal field)	15 May-25 Jun 1986	193
160	11317-11343	Geochemistry	Dr. J. Thomson	N.E. Atlantic (Madeira & Porcupine Abyssal Plains)	30 Jun-25 Jul 1986	187
160A	11344-11348	Geochemistry, Physics	Dr. D.J. Hydes	English Channel, N.E. Atlantic (Shelf Edge)	28 Jul-09 Aug 1986	195
161	11349-11357	Geophysics (seismics)	Dr. R.B. Whitmarsh	N.E. Atlantic (Iberia & Tagus Abyssal Plains, Madeira)	15 Aug-19 Sep 1986	188
162	11359-11380	Physics	Dr. P.M. Saunders	N.E. Atlantic (Madeira Abyssal Plain, Iberian Basin, Western Approaches)	22 Sep-09 Oct 1986	186
163	11381-11398	Geophysics, Geology	Dr. R.C. Searle	N.E. Atlantic (Madeira Abyssal Plain, Cruiser Seamount, passages from UK/to Gibraltar)	26 Oct-19 Nov 1986	194
164	11399-11461	Physics	Dr. R.T. Pollard	Southwest Indian and Southern Oceans from 22°S to 52°S	19 Dec-21 Jan 1987	191
165A	11462-11471	Physics	Dr. J. Luyten, Woods Hole	E. South Atlantic	26 Jan-26 Feb 1987	-
165B	11471-11535	Physics	Dr. F.A. Aikman, Lamont Doherty Geol.Obs.	South Atlantic, off S.W. Africa	20 Apr-26 May 1987	-
168	11535-11638	Biology, Physics	Dr. P.J. Herring	N.E. Atlantic (N.W. African slope, passages to/from UK)	23 Jun-07 Aug 1987	200

CRUISE NO	STATION NUMBERS	OCEANOGRAPHIC DISCIPLINE	CHIEF SCIENTIST	WORKING AREA	DATES	CRUISE REPORT
169	11639-11705	Physics	Prof. S.A. Thorpe, Univ. of Southampton	N.E. Atlantic (West Slope of Porcupine Bank)	12 Aug-31 Aug 1987	*
170	11705-11719	Instrument trials	Dr. J.S.M. Rusby, Dr. M.C. Sinha, Univ. of Cambridge	N.E. Atlantic (Iberia Abyssal Plain, Porcupine Seabight)	04 Sep-23 Sep 1987	199
171	-	Geophysics	Dr. R.S. White, Univ of Cambridge	Western Atlantic Basin	23 Oct-15 Dec 1987	-
172	-	Geophysics	Dr. P. Barker, BAS	South Atlantic Ocean (Scotia & Weddell Seas)	17 Dec-31 Mar 1988	*
173	11719-11729	Physics	Prof. S.A. Thorpe	N.E. Atlantic (West Slope of Porcupine Bank)	29 Apr-09 May 1988	*
174	11730-11791	Physics, Chemistry	Dr. P.M. Saunders	N.E. Atlantic (Faroe Islands to Charlie-Gibbs Fracture Zone)	19 May-12 Jun 1988	203
175	11792-11794	Biology, Physics, Chemistry	Dr. P.R. Pugh	N.E. Atlantic (Porcupine Seabight & Abyssal Plain)	18 Jun-15 Jul 1988	204
176	11795-11796	Geochemistry, Physics	Dr. H. Elderfield,	N. Atlantic (Mid Atlantic Ridge at 31°N and 26°N)	22 Jul-22 Aug 1988	*

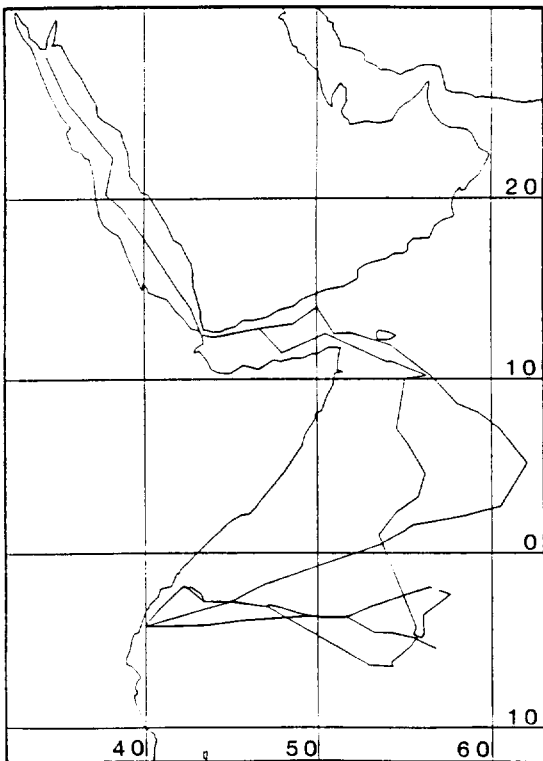
RRS DISCOVERY

SHIP'S TRACKS, CRUISES 1 - 176

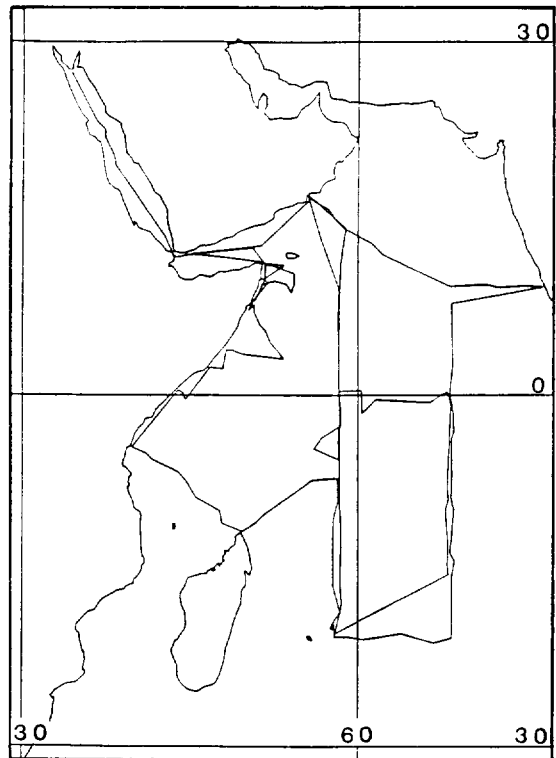
DISCOVERY 1



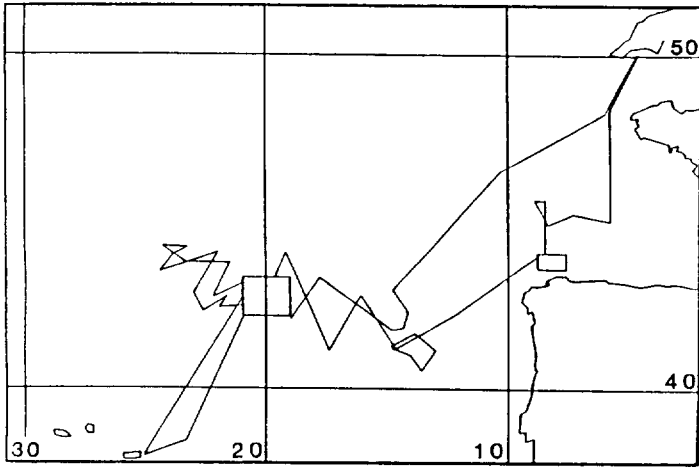
DISCOVERY 2



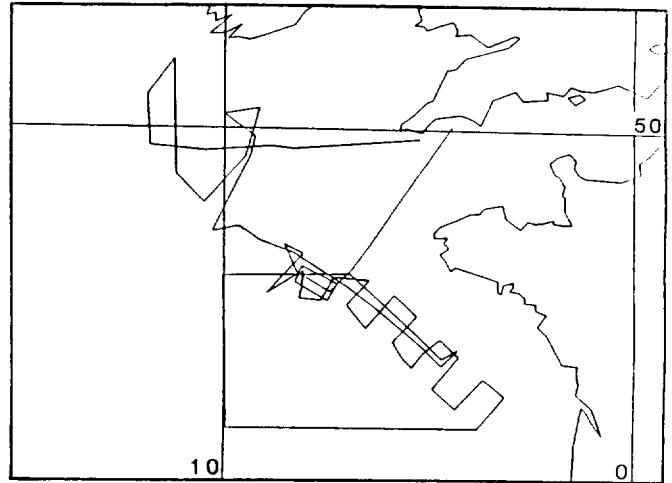
DISCOVERY 3



DISCOVERY 4



DISCOVERY 5

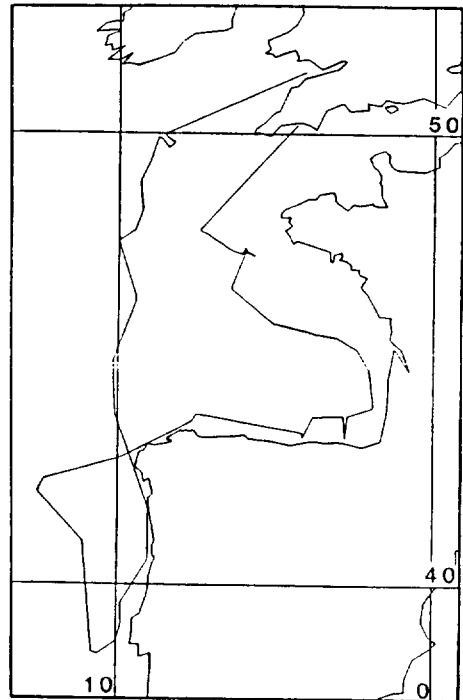


DISCOVERY 6

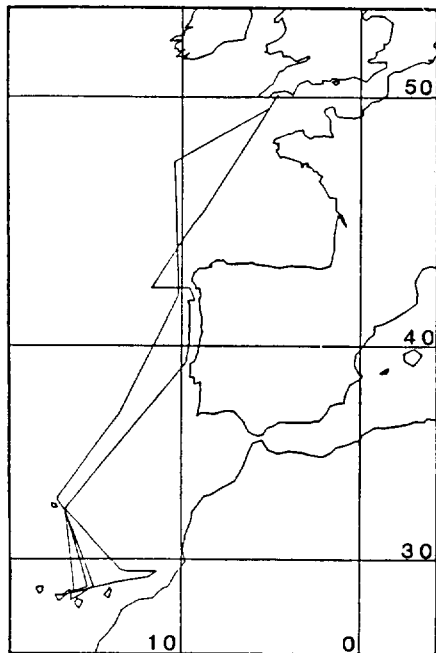
TRACK CHART

UNAVAILABLE

DISCOVERY 7



DISCOVERY 8

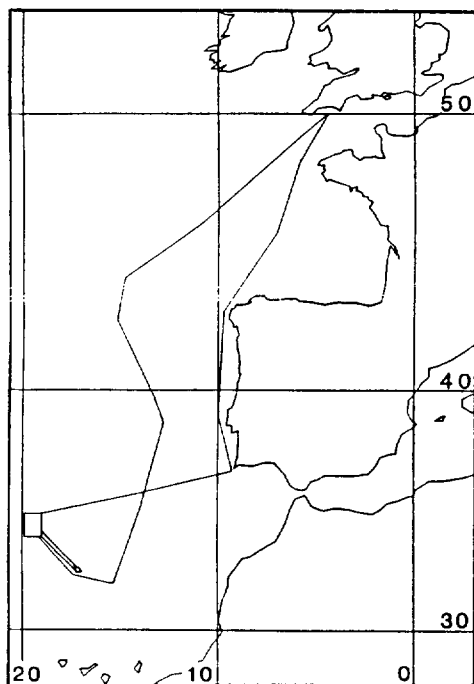


DISCOVERY 9

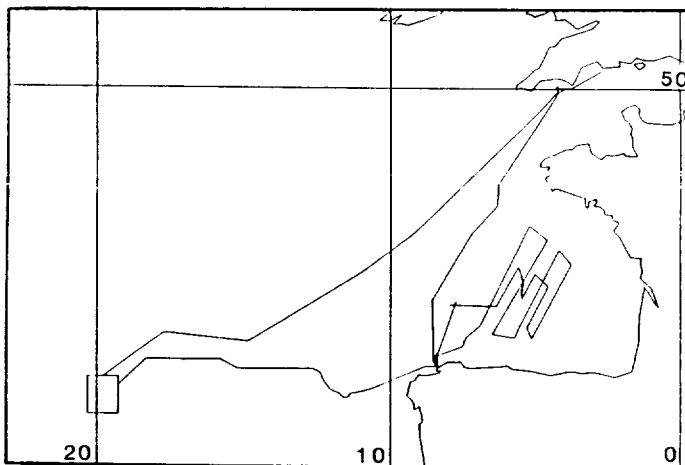
TRACK CHART

UNAVAILABLE

DISCOVERY 10



DISCOVERY 11

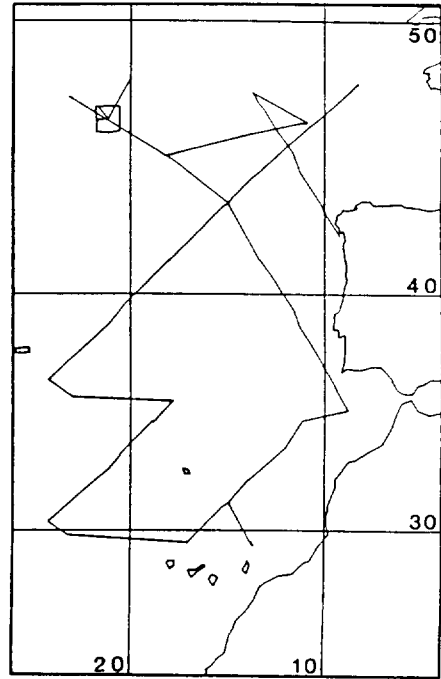


DISCOVERY 12

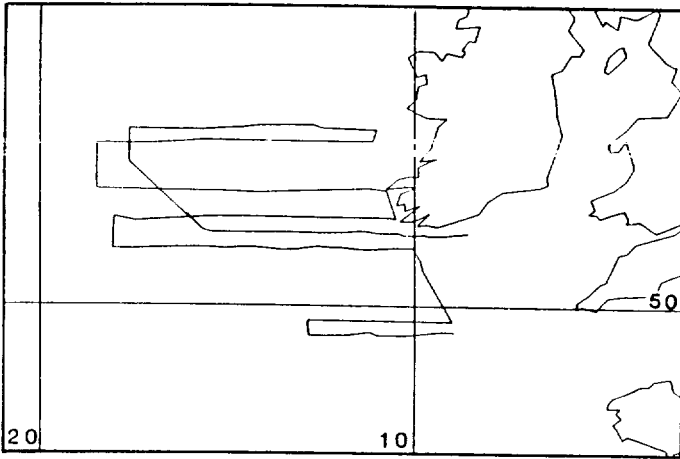
TRACK CHART

UNAVAILABLE

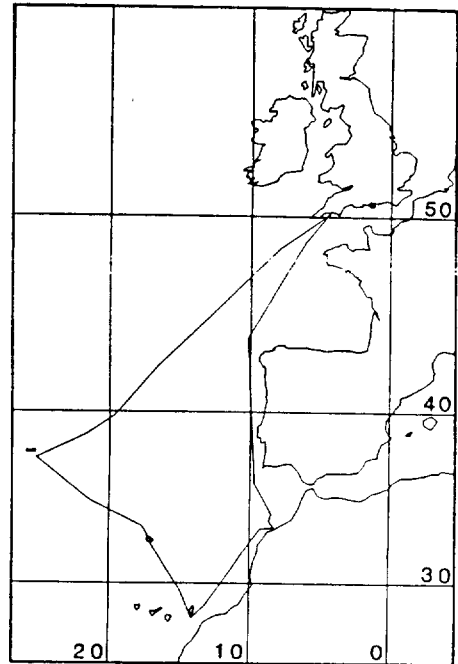
DISCOVERY 13



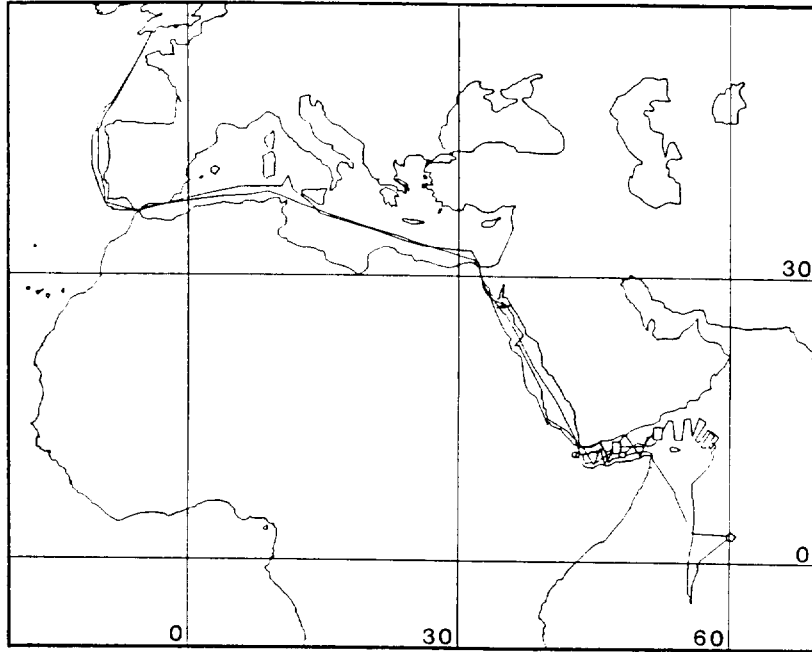
DISCOVERY 14



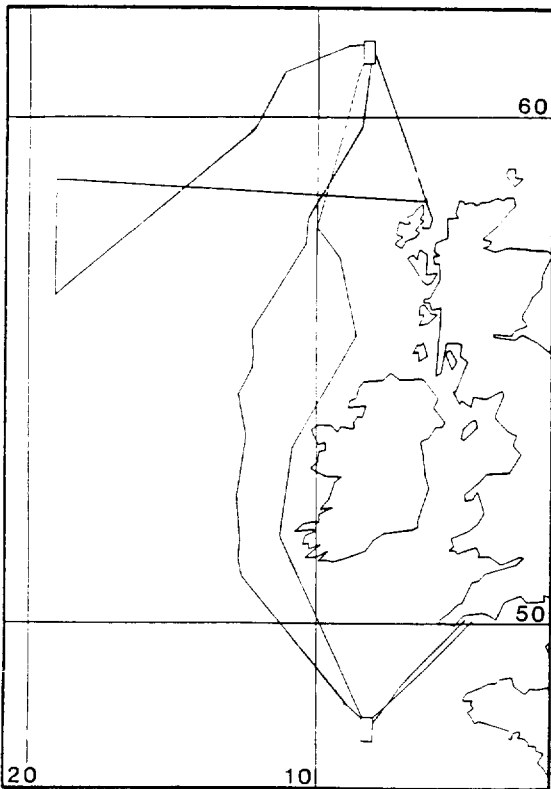
DISCOVERY 15



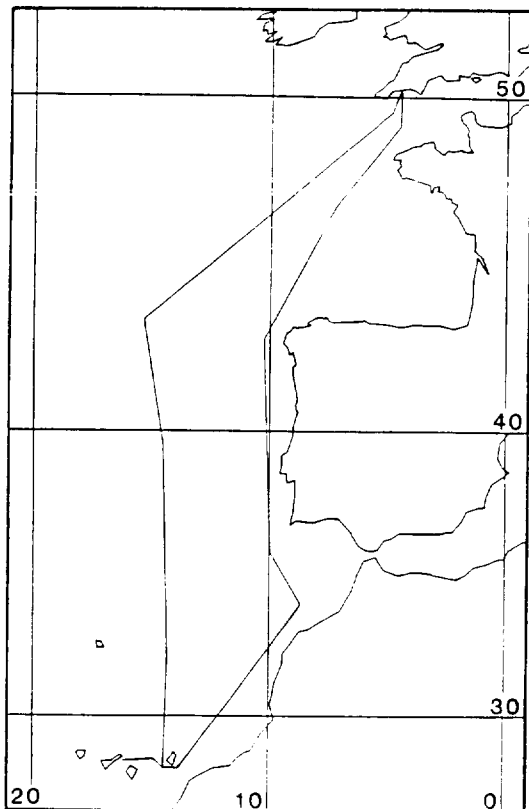
DISCOVERY 16



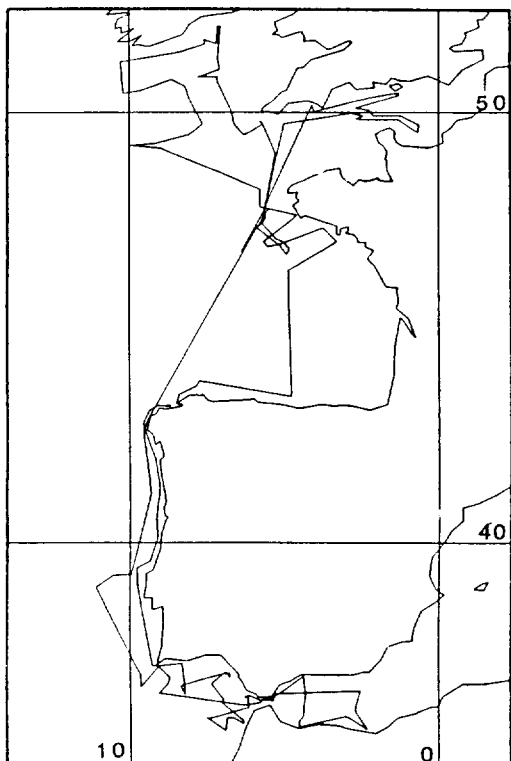
DISCOVERY 17



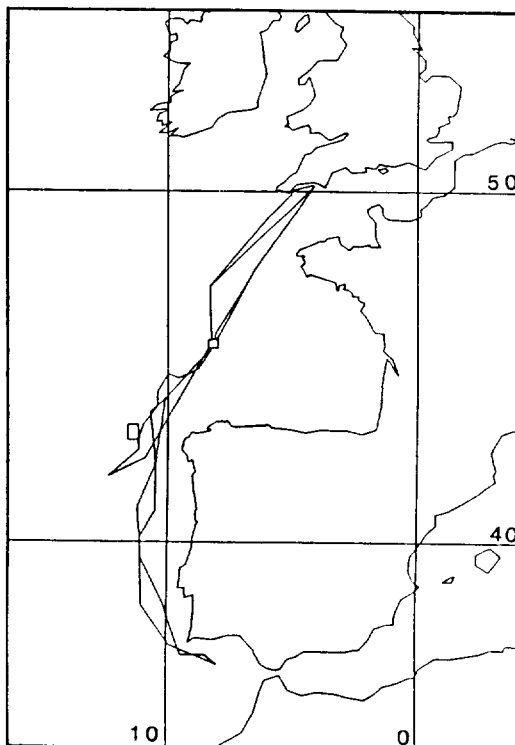
DISCOVERY 18



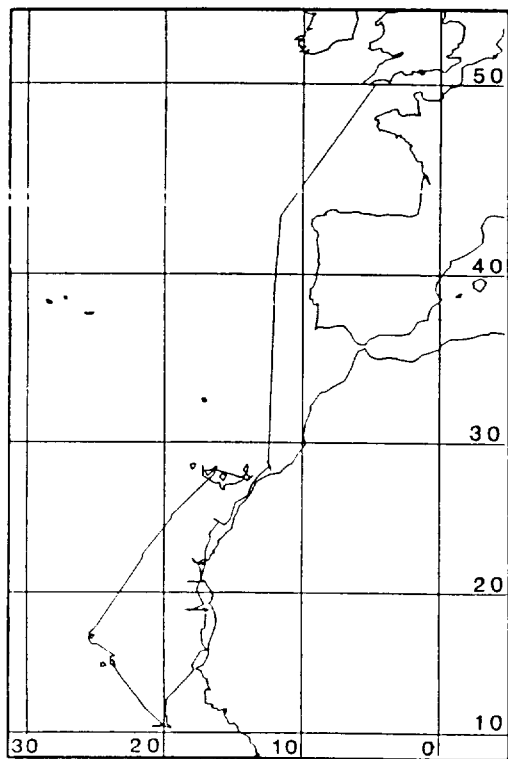
DISCOVERY 19



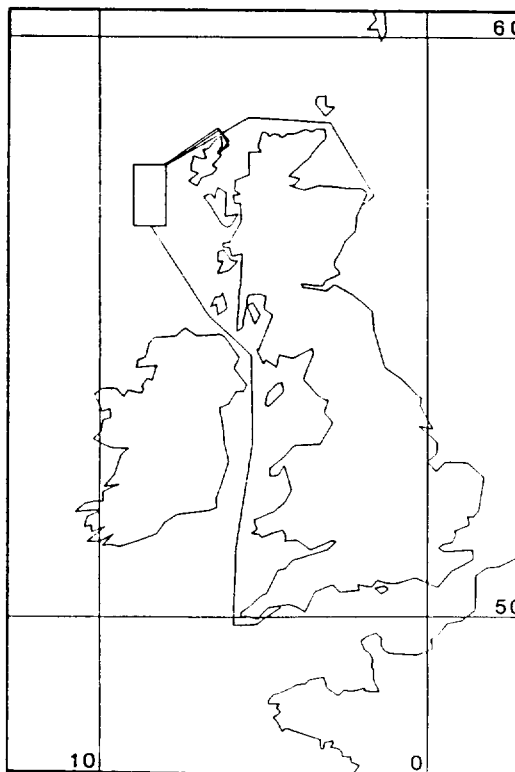
DISCOVERY 20



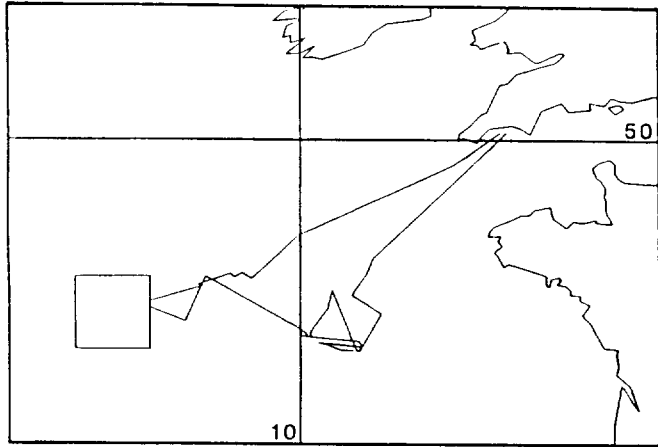
DISCOVERY 21



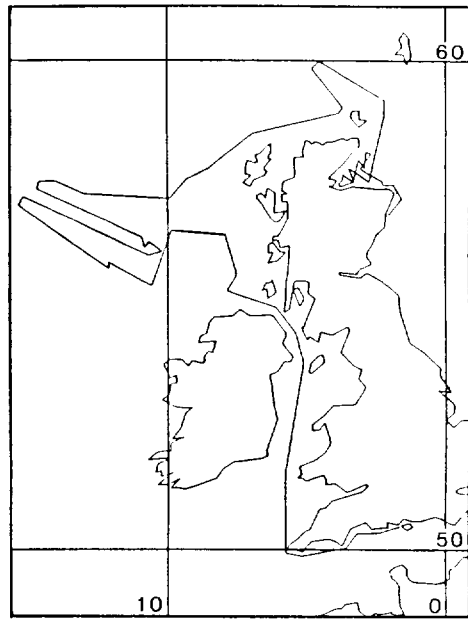
DISCOVERY 22



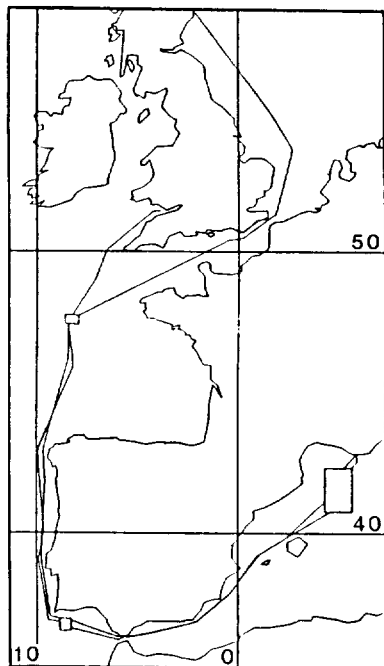
DISCOVERY 23



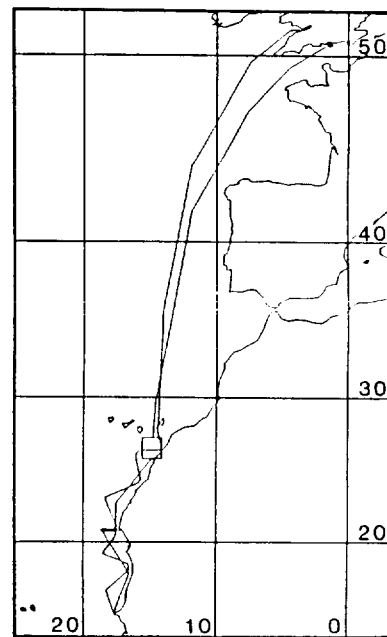
DISCOVERY 24



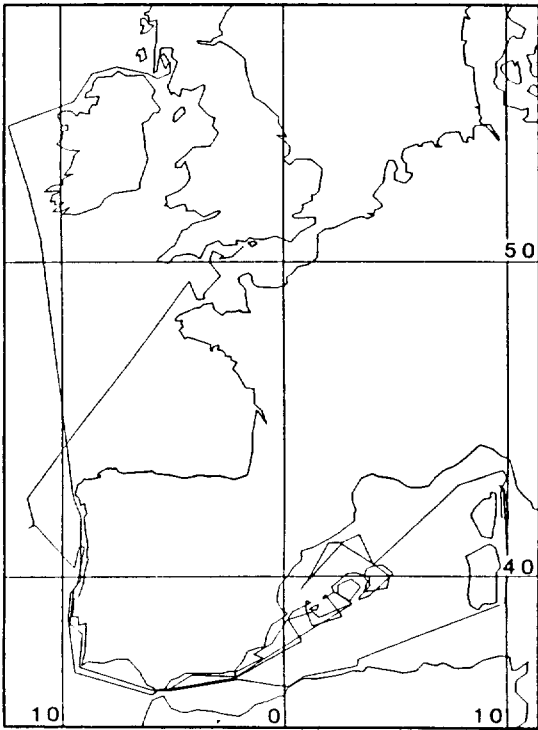
DISCOVERY 25



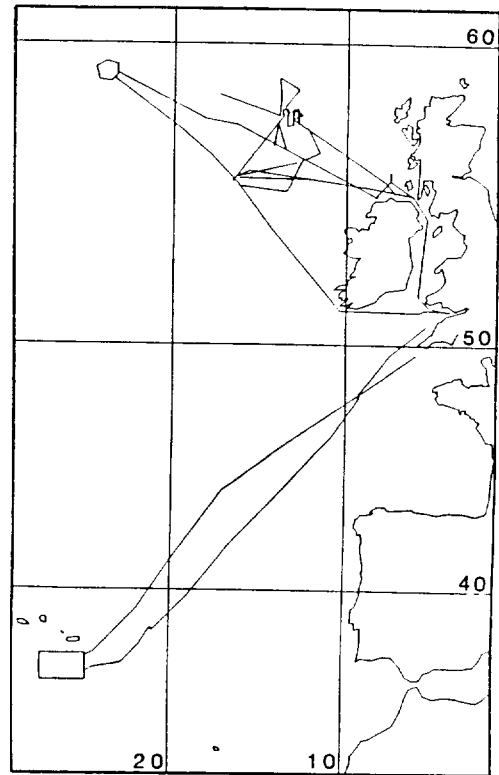
DISCOVERY 26



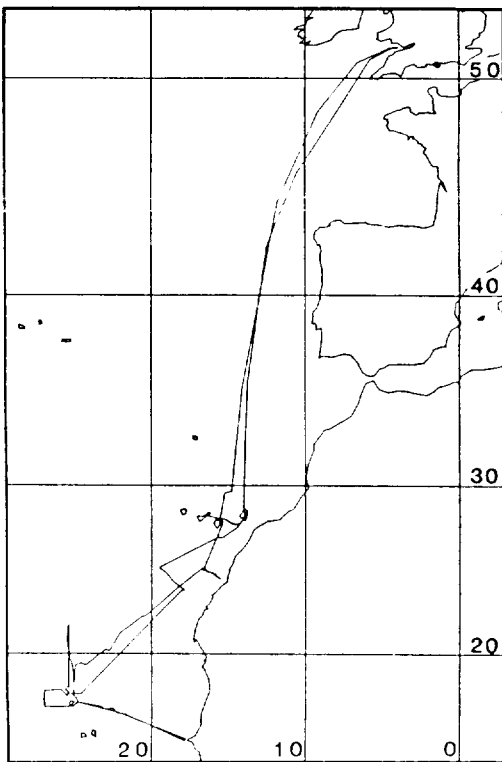
DISCOVERY 27/28



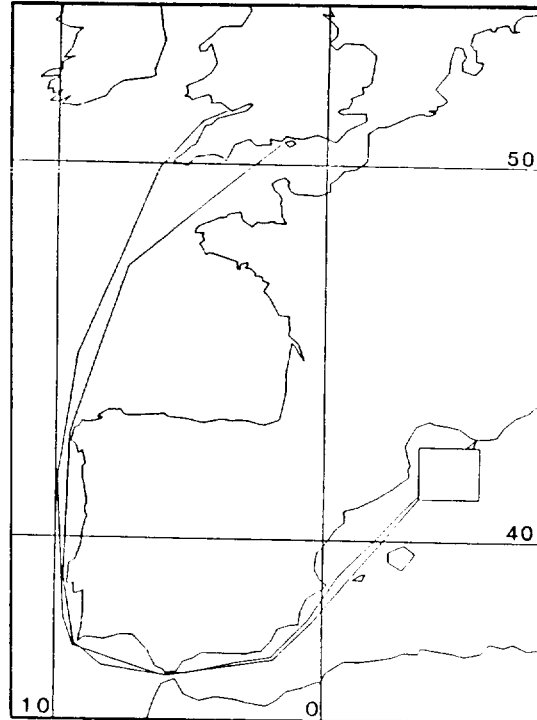
DISCOVERY 29



DISCOVERY 30



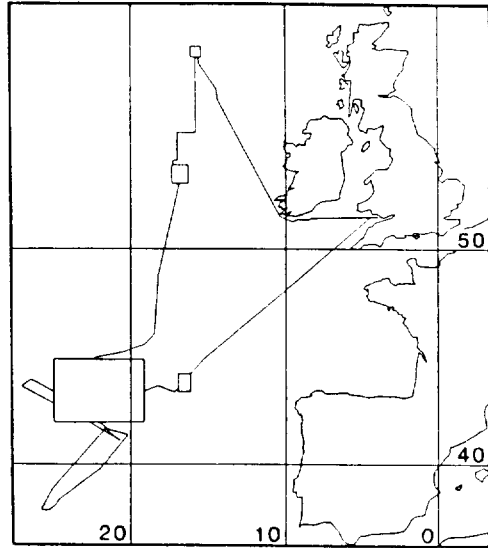
DISCOVERY 31



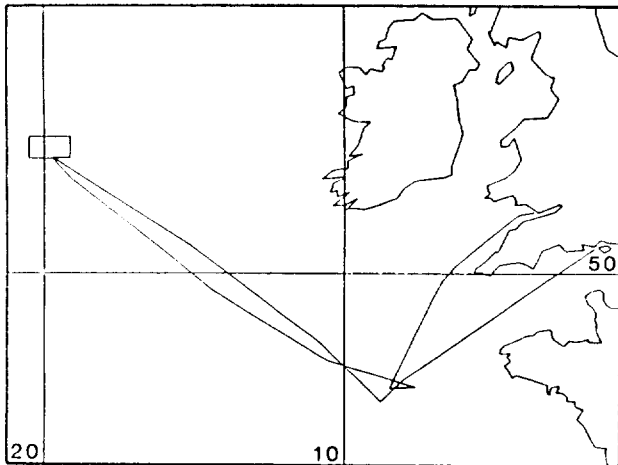
DISCOVERY 32

TRACK CHART
UNAVAILABLE

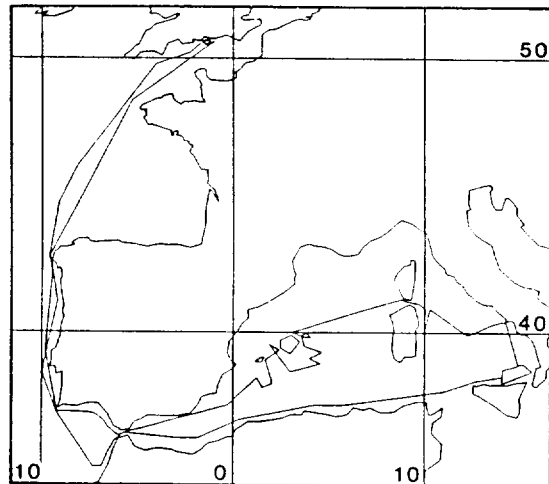
DISCOVERY 33



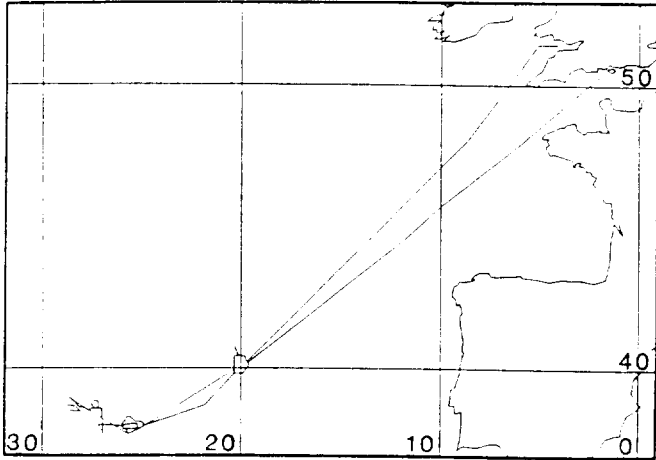
DISCOVERY 34



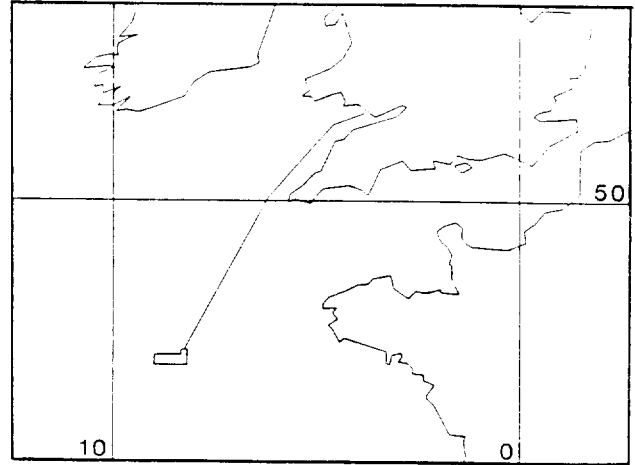
DISCOVERY 35



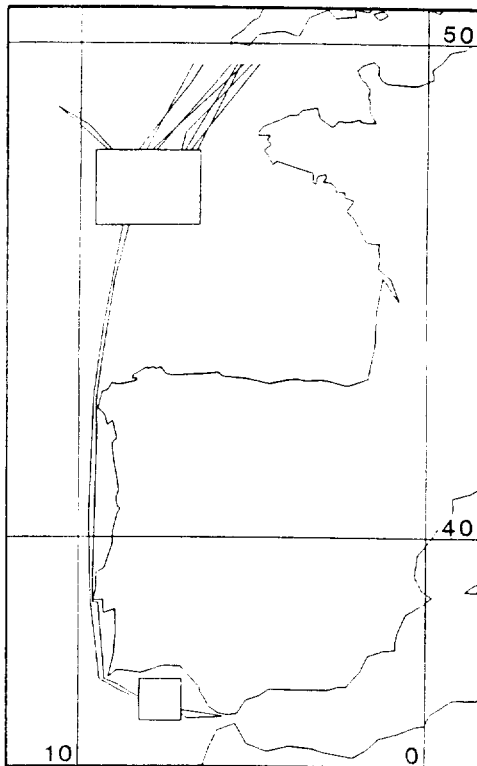
DISCOVERY 36



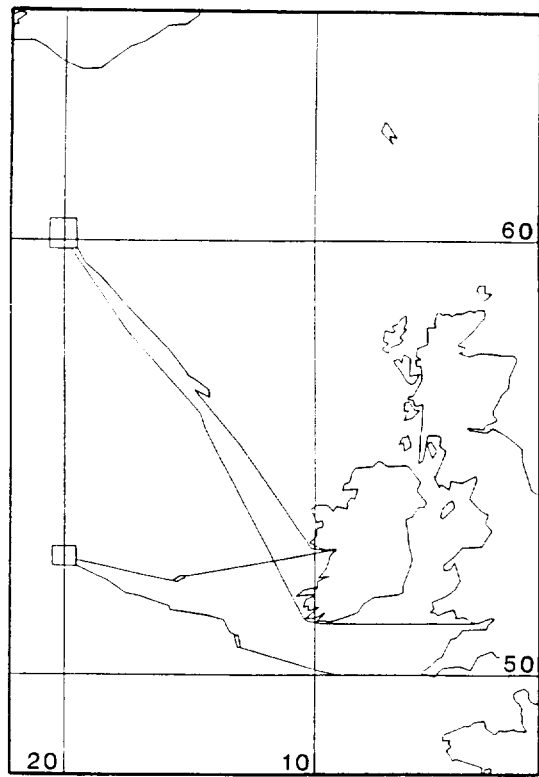
DISCOVERY 37



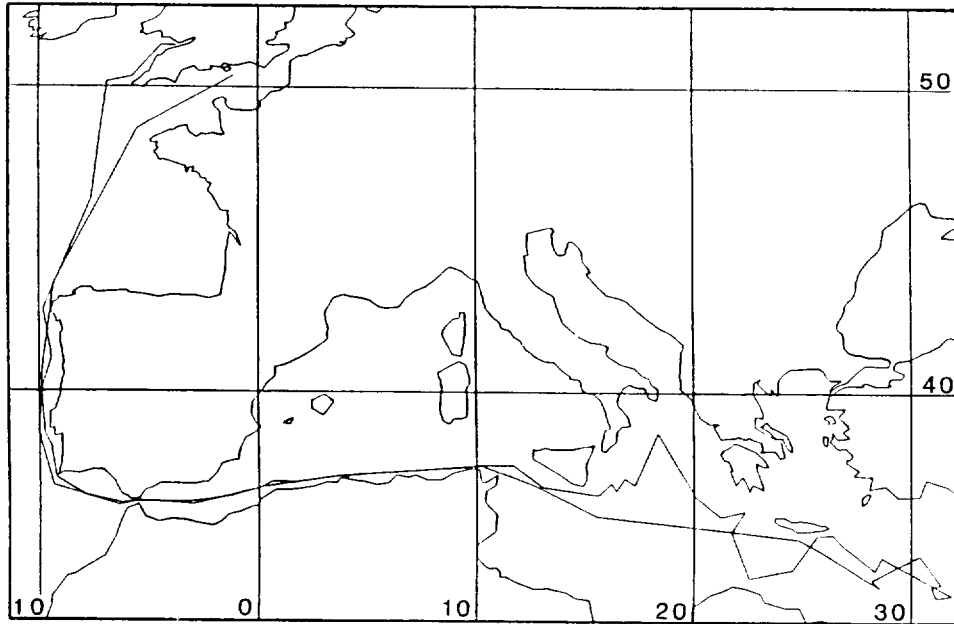
DISCOVERY 38



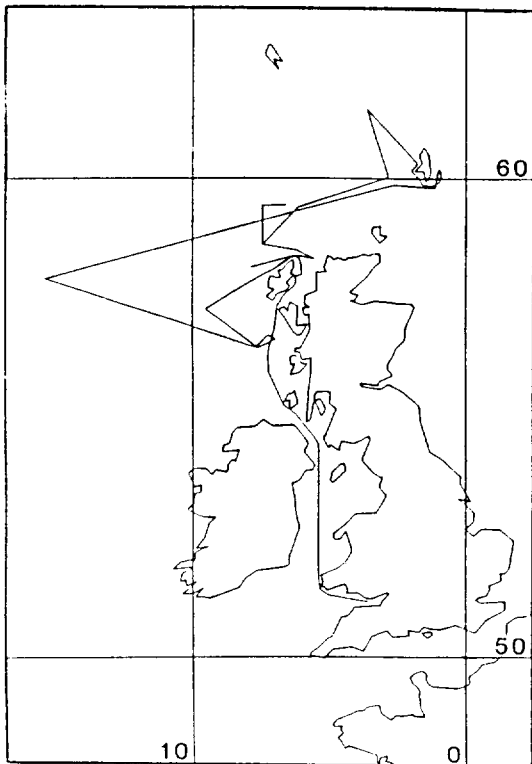
DISCOVERY 39



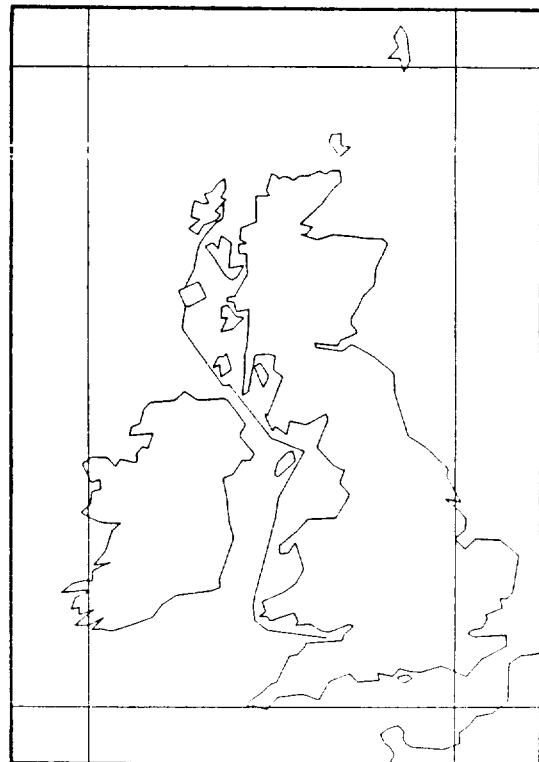
DISCOVERY 40



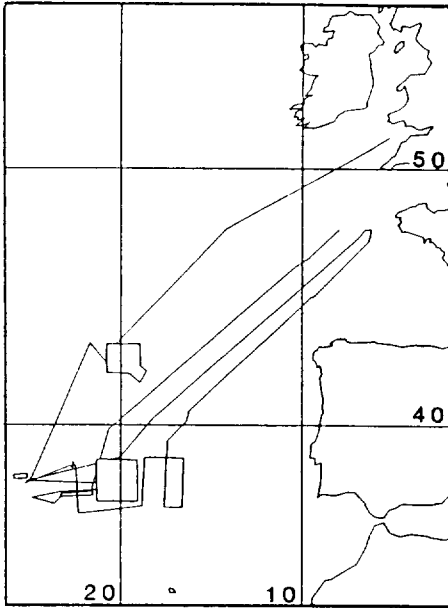
DISCOVERY 41



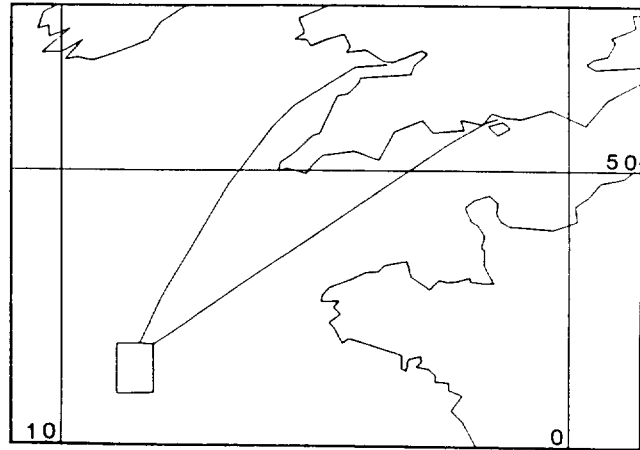
DISCOVERY 42



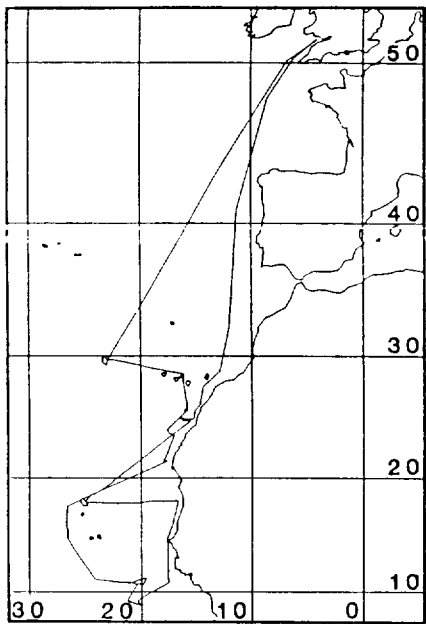
DISCOVERY 43



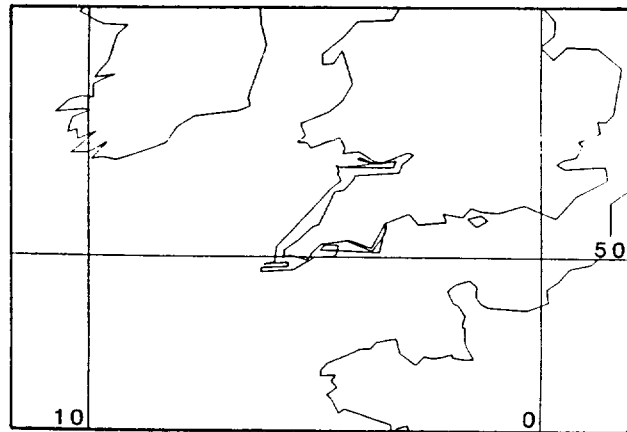
DISCOVERY 44



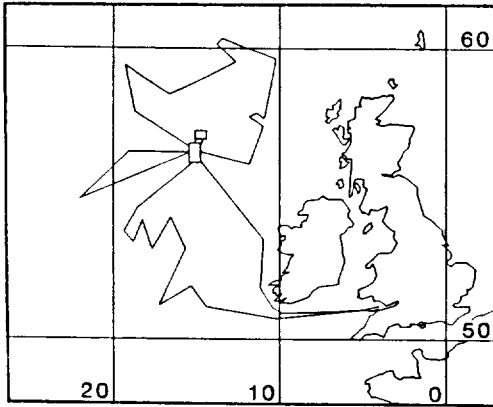
DISCOVERY 45



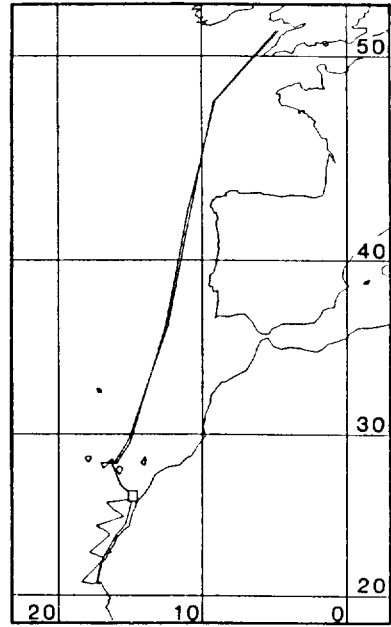
DISCOVERY 46



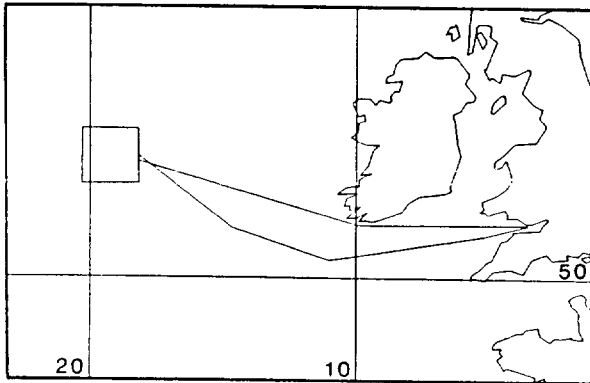
DISCOVERY 47



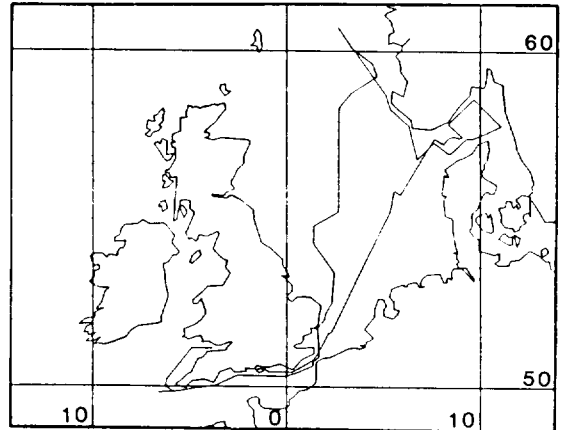
DISCOVERY 48



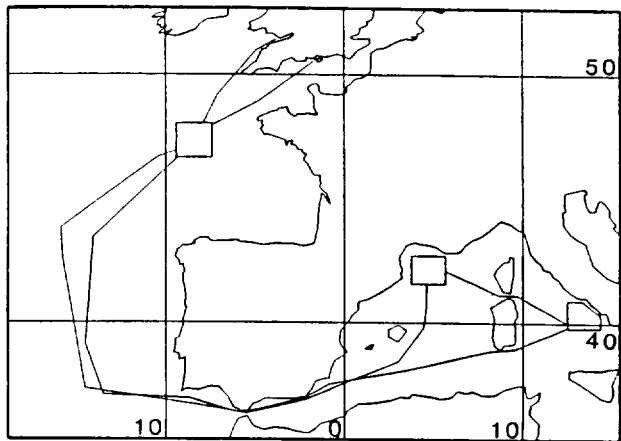
DISCOVERY 49



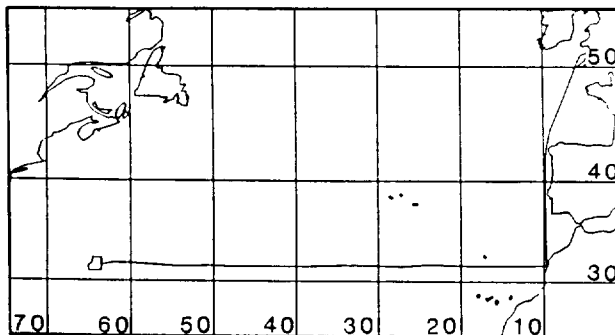
DISCOVERY 50



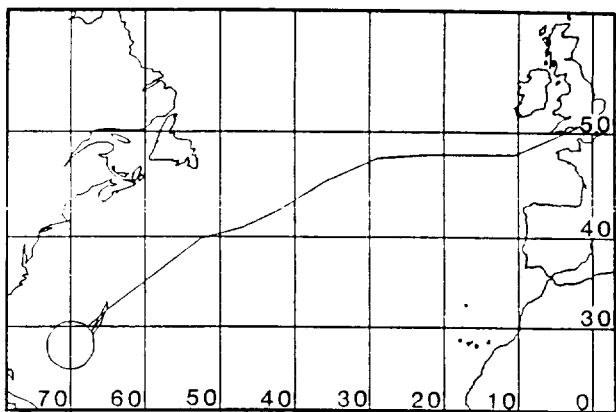
DISCOVERY 51



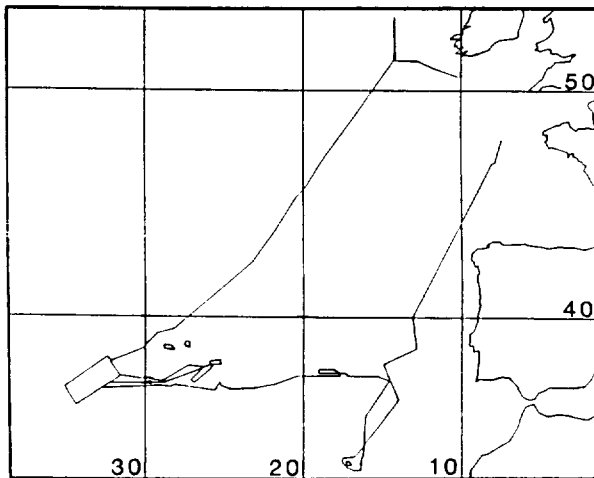
DISCOVERY 52



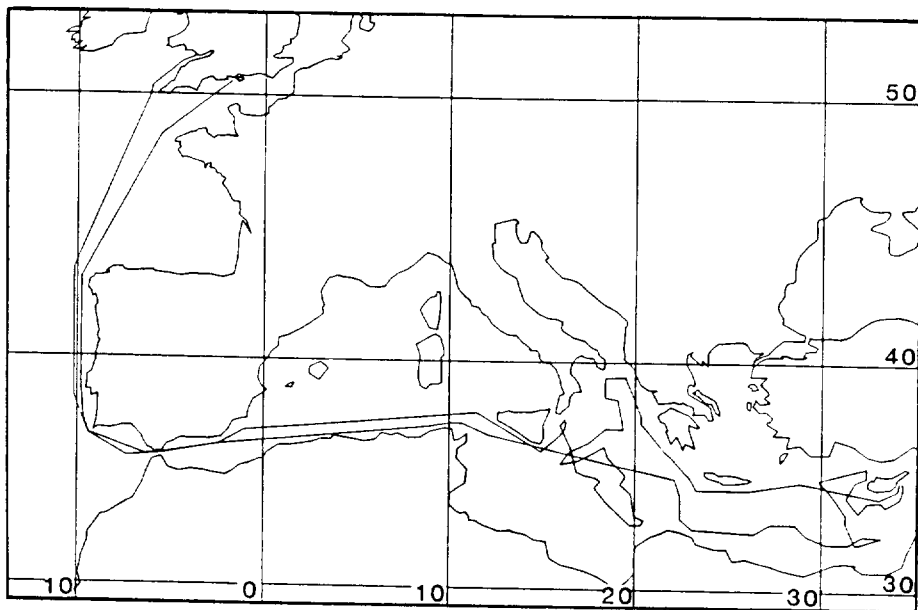
DISCOVERY 53



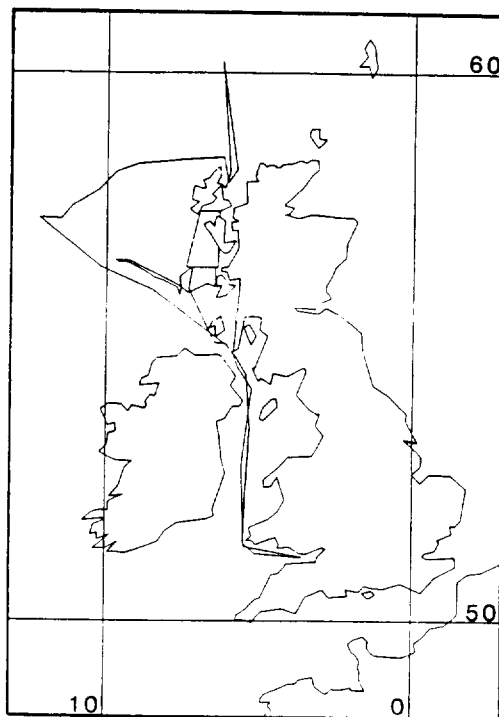
DISCOVERY 54



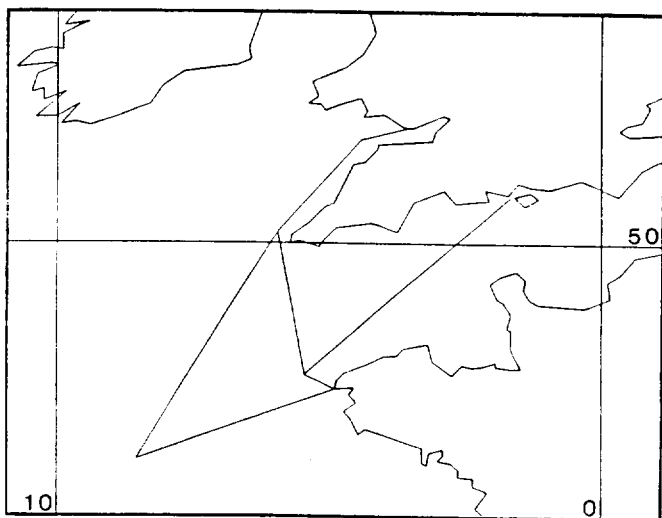
DISCOVERY 55



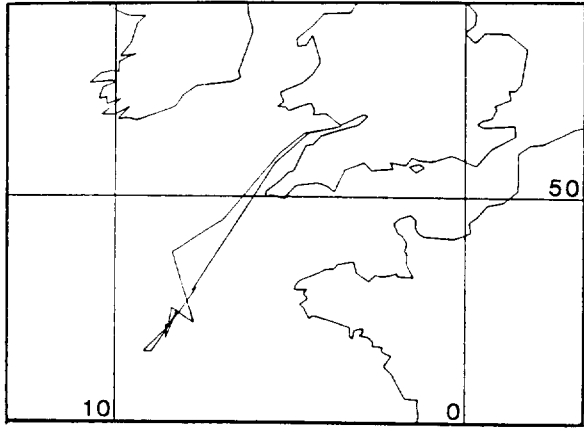
DISCOVERY 57



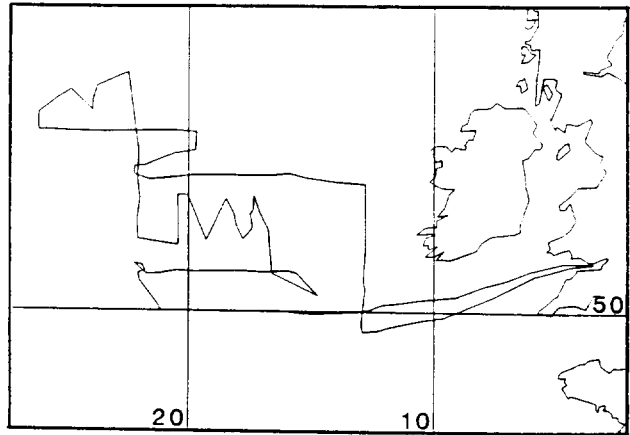
DISCOVERY 56/8



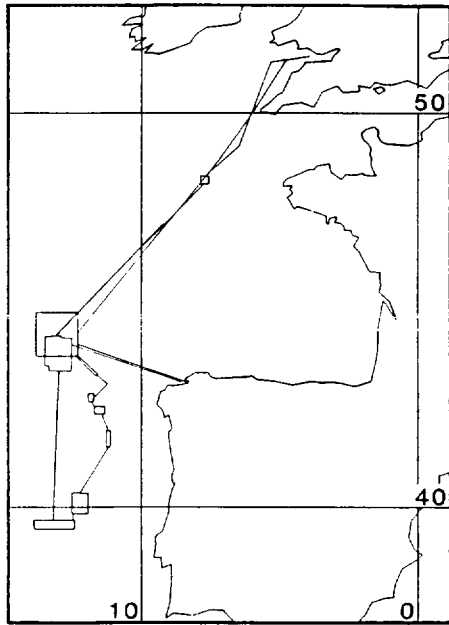
DISCOVERY 59



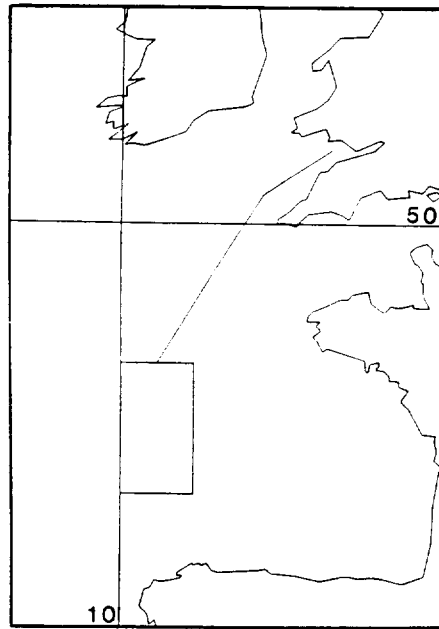
DISCOVERY 60



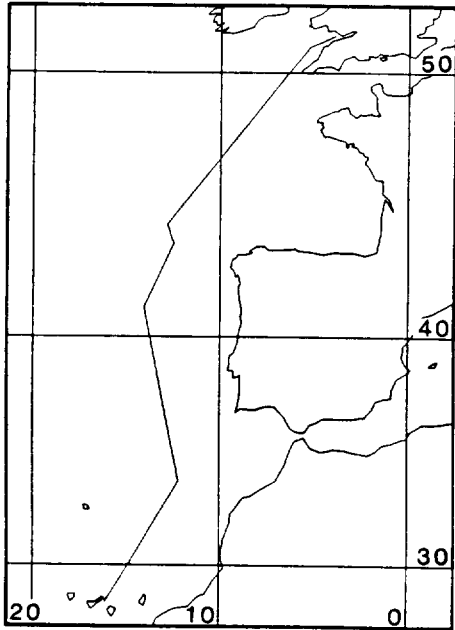
DISCOVERY 61



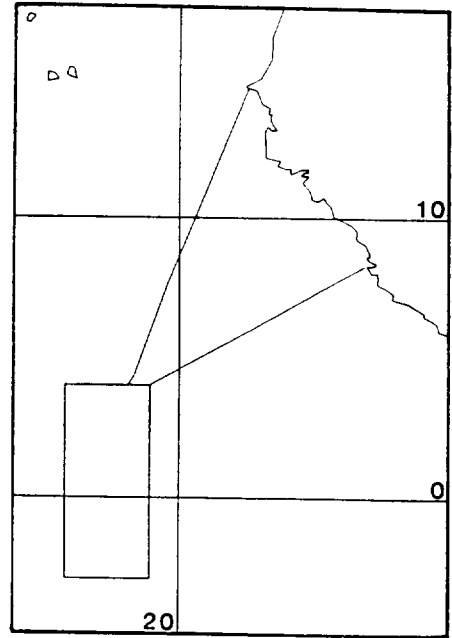
DISCOVERY 62



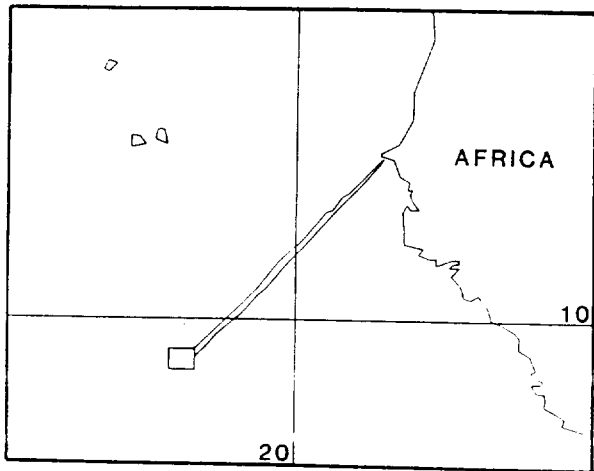
DISCOVERY 63



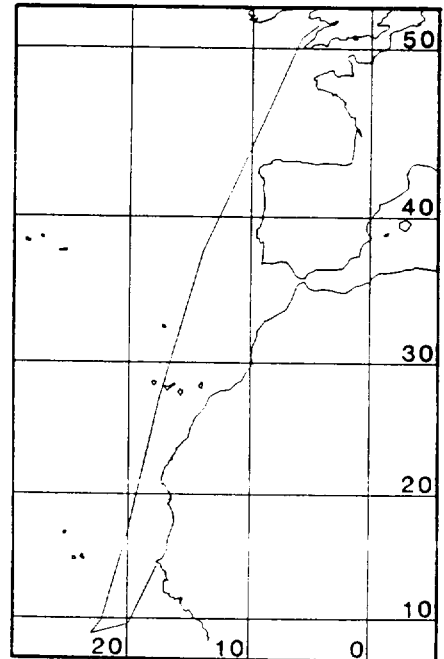
DISCOVERY 64



DISCOVERY 65



DISCOVERY 66

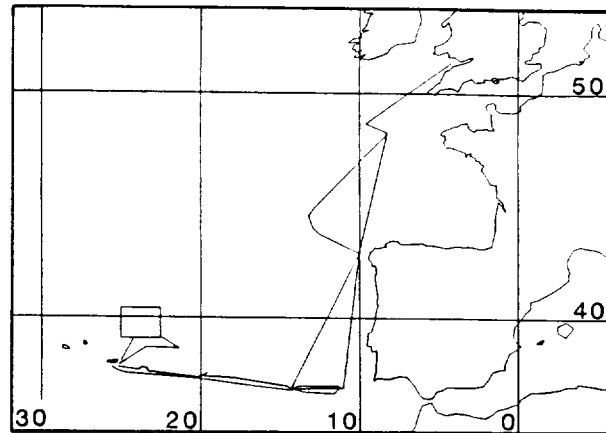


DISCOVERY 67

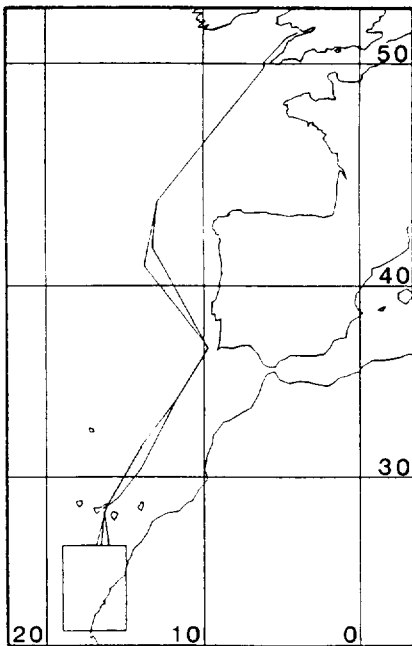
TRACK CHART

UNAVAILABLE

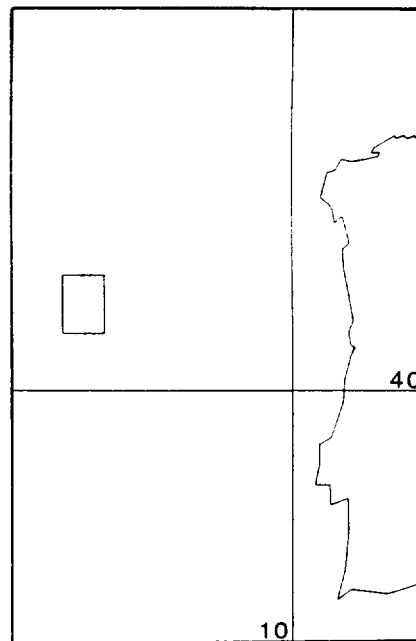
DISCOVERY 68



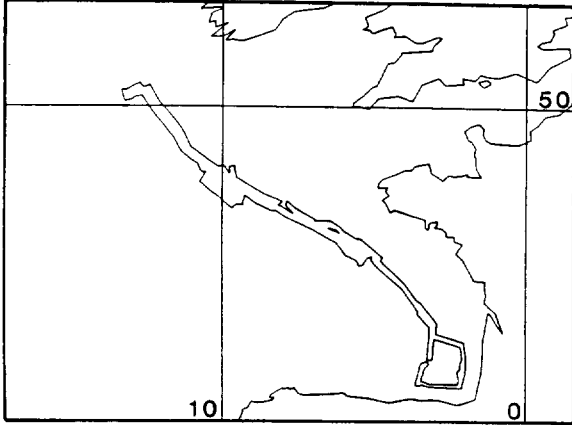
DISCOVERY 69



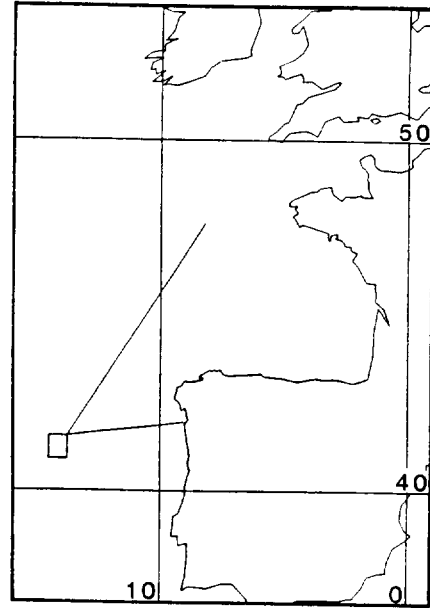
DISCOVERY 70



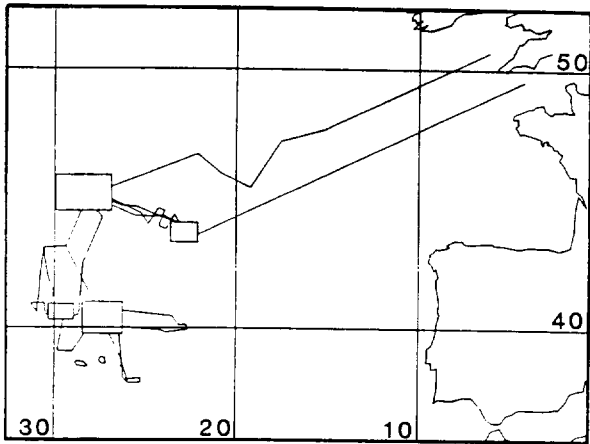
DISCOVERY 71



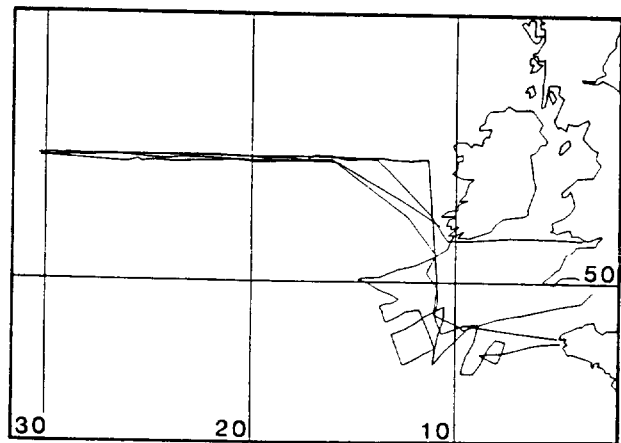
DISCOVERY 72



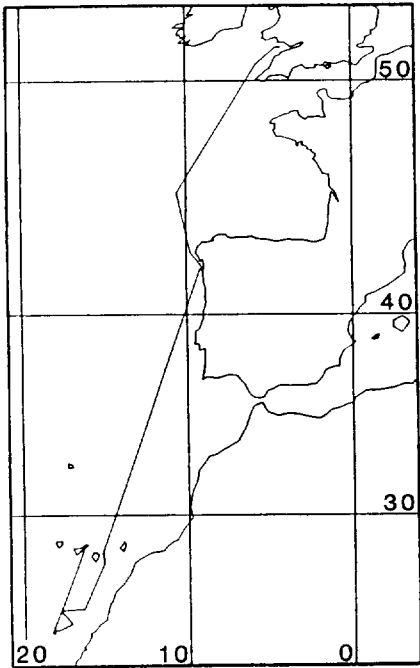
DISCOVERY 73



DISCOVERY 74



DISCOVERY 75

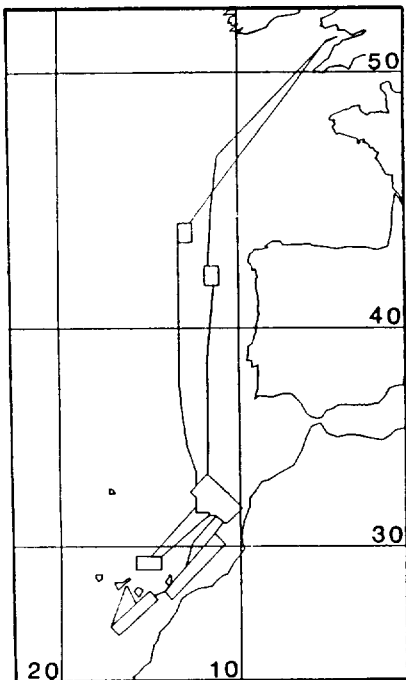


DISCOVERY 76

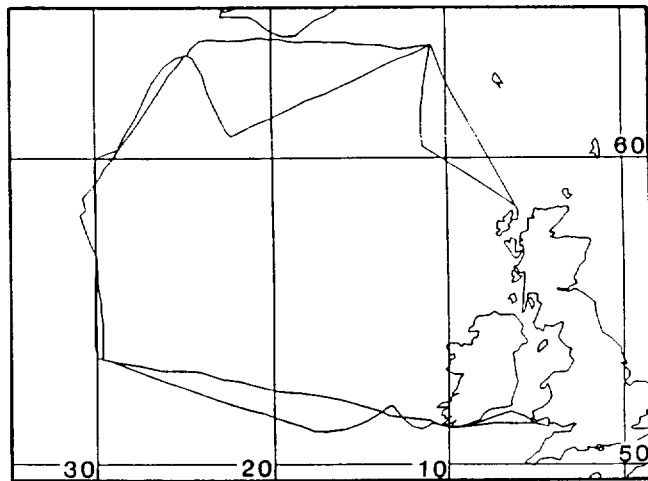
TRACK CHART

UNAVAILABLE

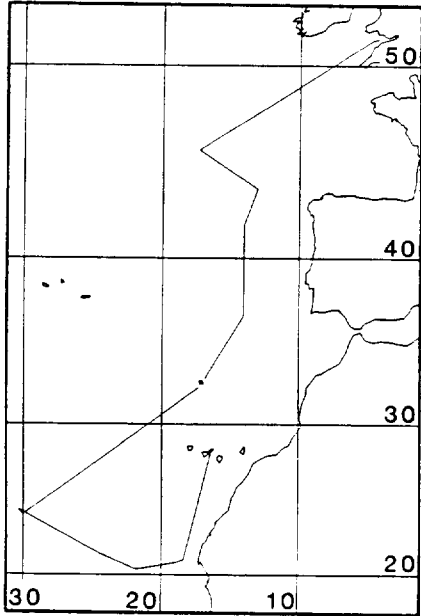
DISCOVERY 77



DISCOVERY 78



DISCOVERY 79

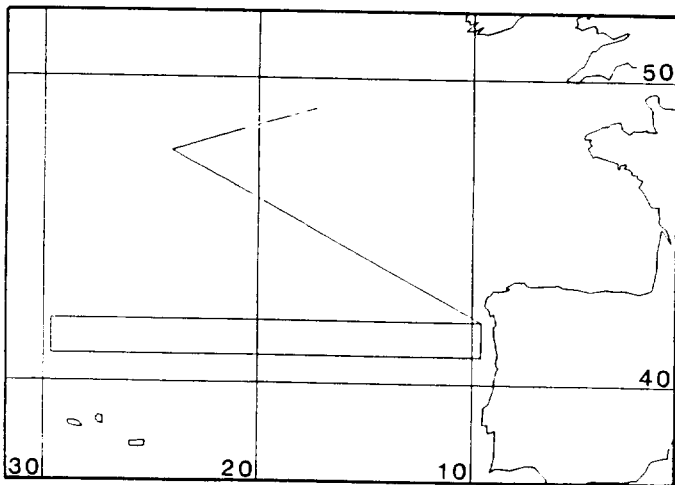


DISCOVERY 80

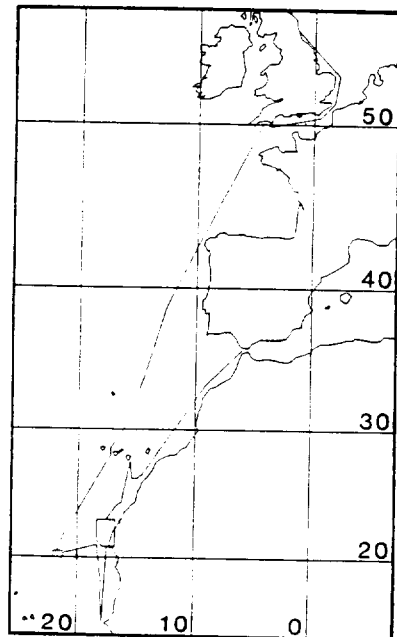
TRACK CHART

UNAVAILABLE

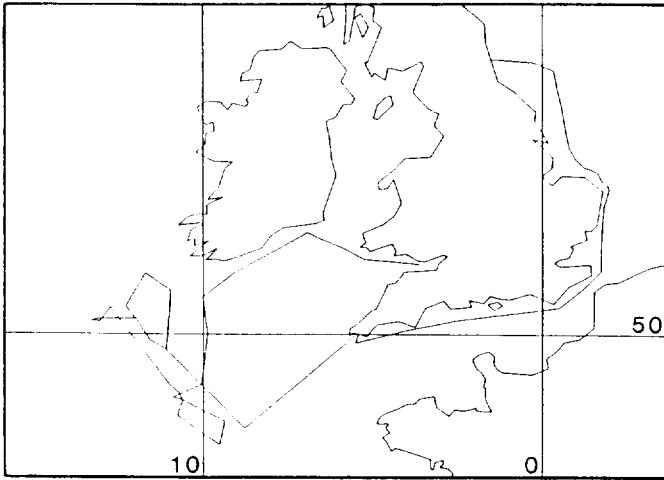
DISCOVERY 81



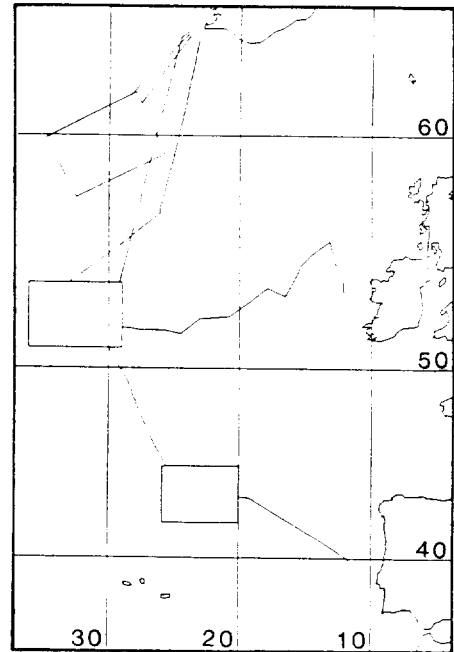
DISCOVERY 82



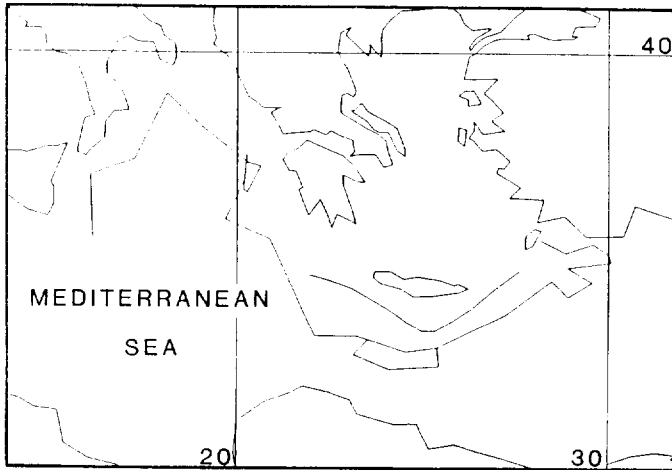
DISCOVERY 83



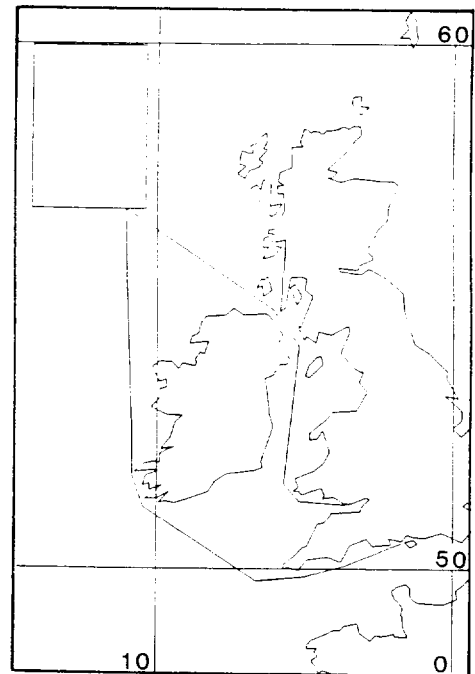
DISCOVERY 84



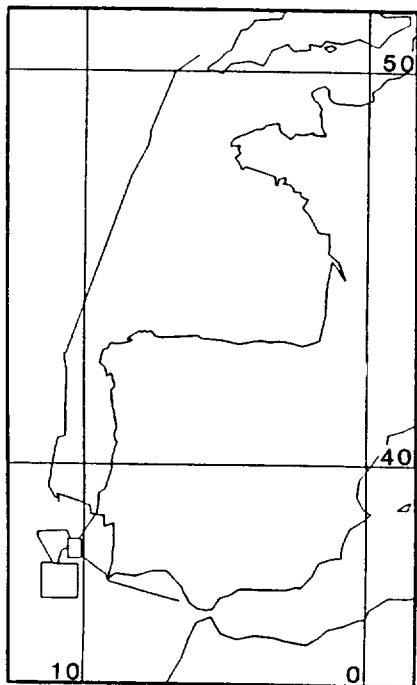
DISCOVERY 85



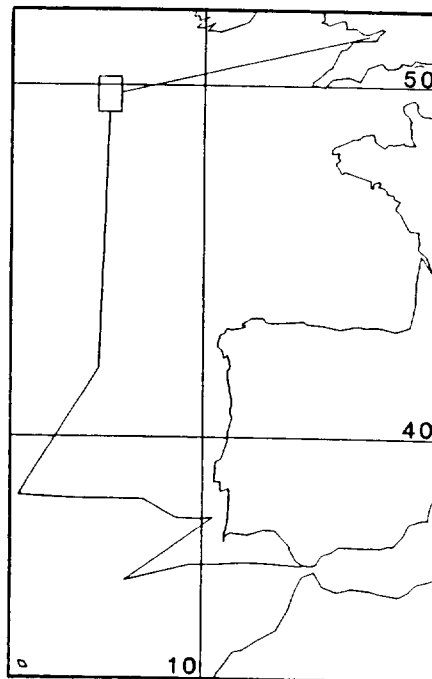
DISCOVERY 86



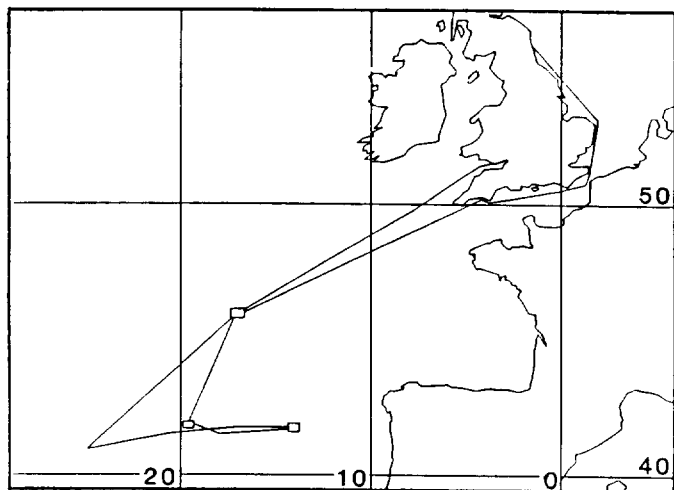
DISCOVERY 87



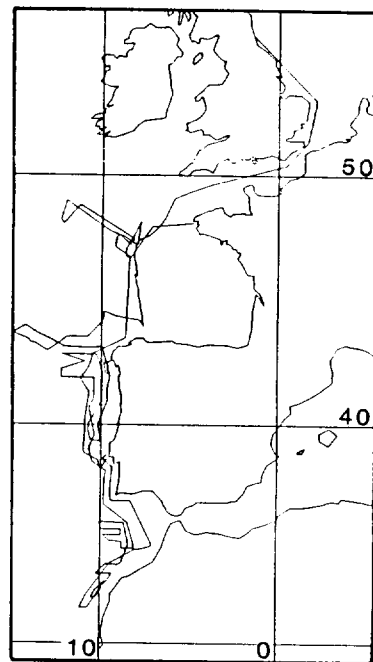
DISCOVERY 88



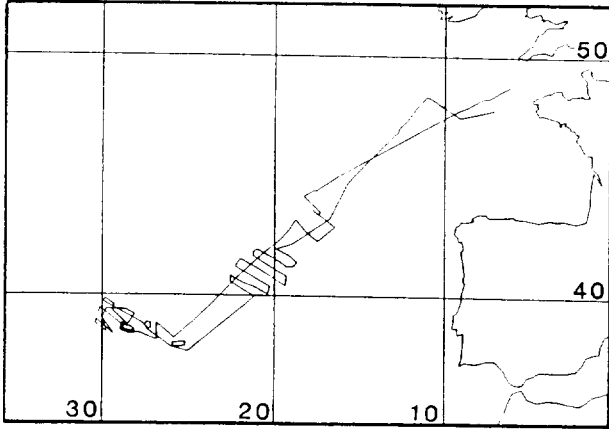
DISCOVERY 89



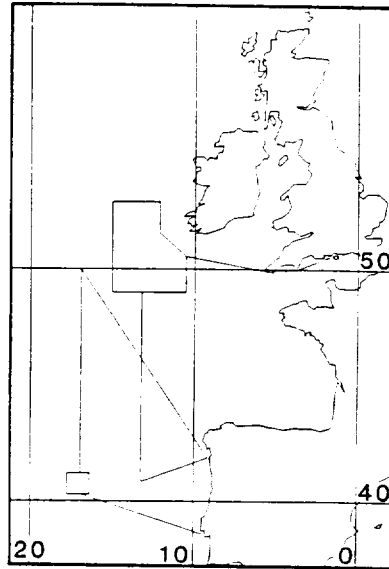
DISCOVERY 90



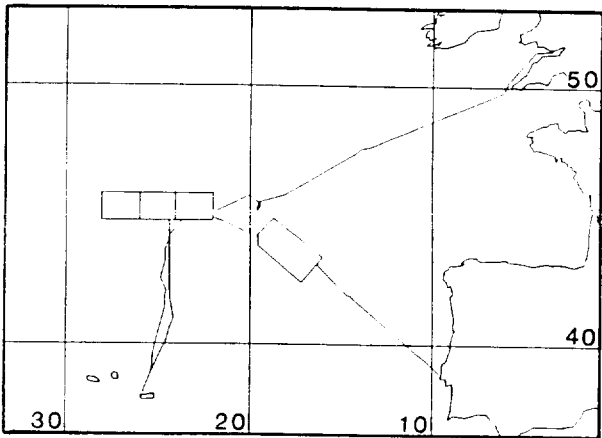
DISCOVERY 91



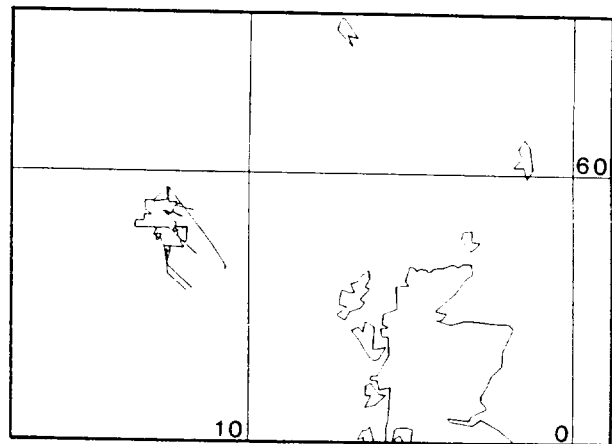
DISCOVERY 92



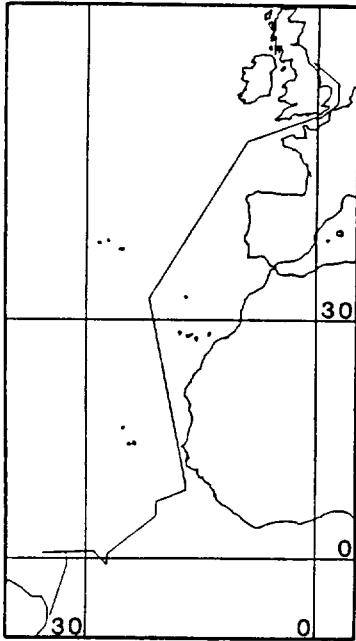
DISCOVERY 93



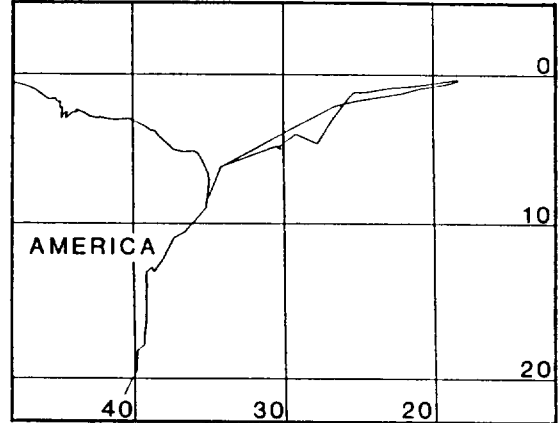
DISCOVERY 94



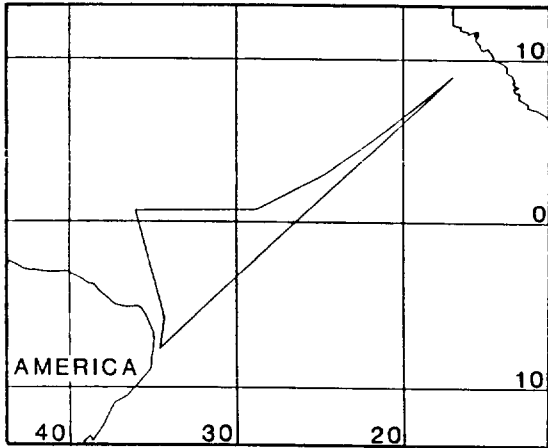
DISCOVERY 95



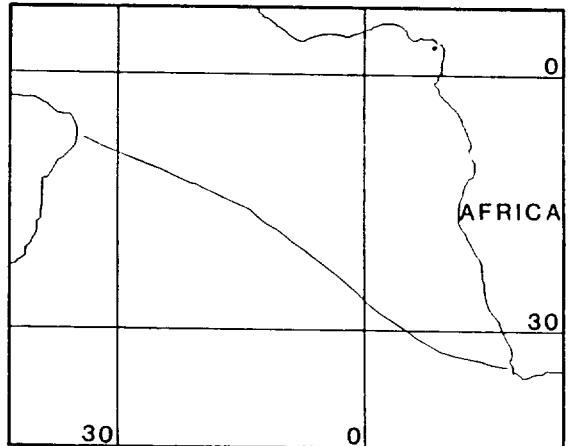
DISCOVERY 96



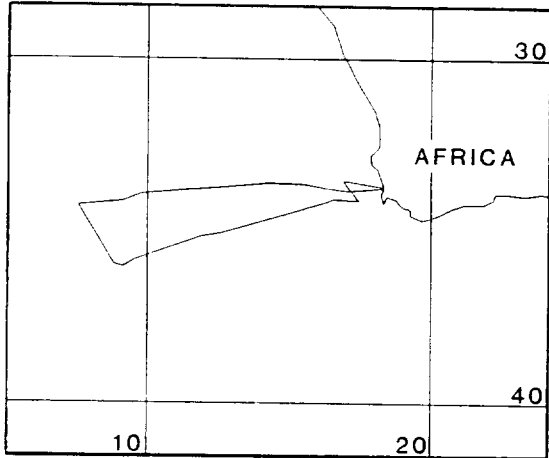
DISCOVERY 97



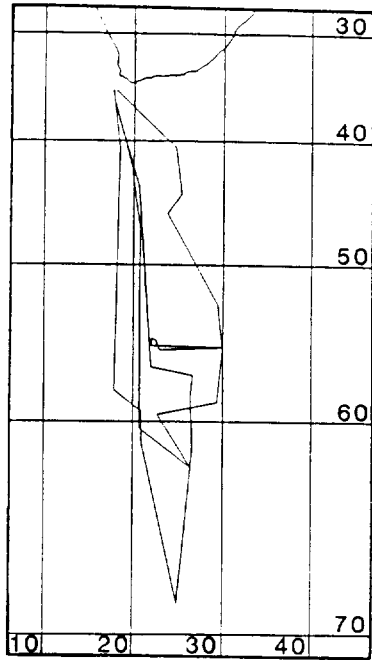
DISCOVERY 98



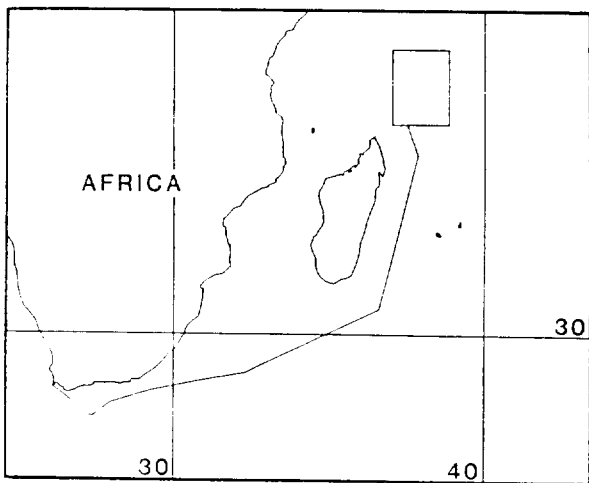
DISCOVERY 99



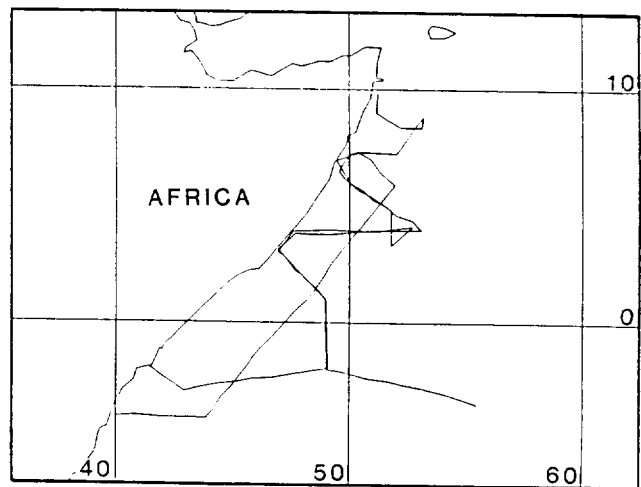
DISCOVERY 100



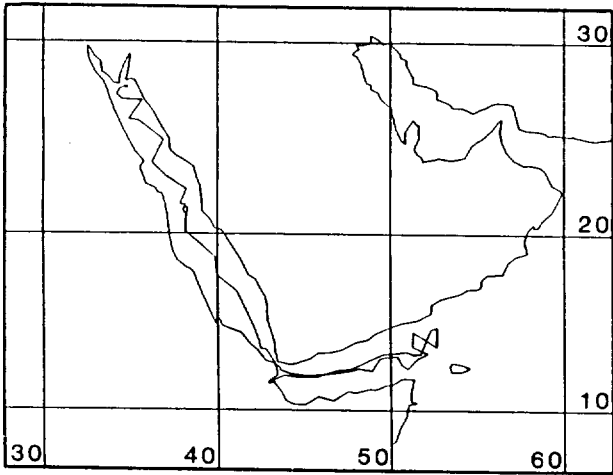
DISCOVERY 101



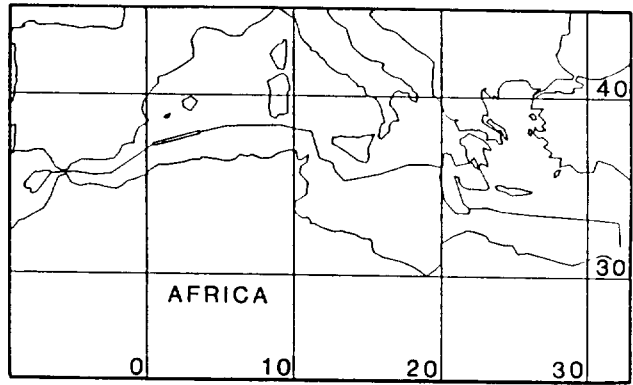
DISCOVERY 102



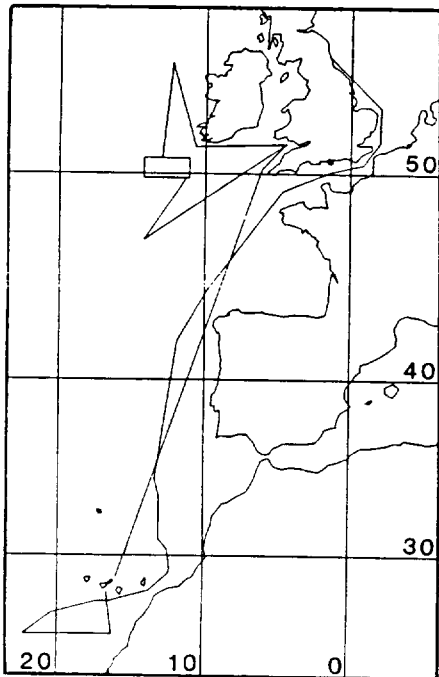
DISCOVERY 103



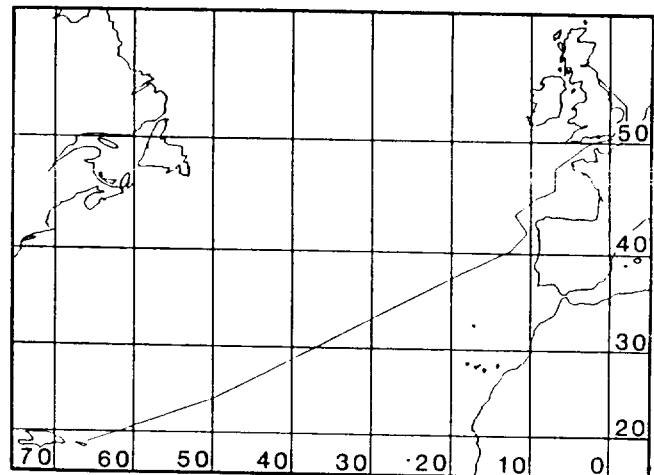
DISCOVERY 104



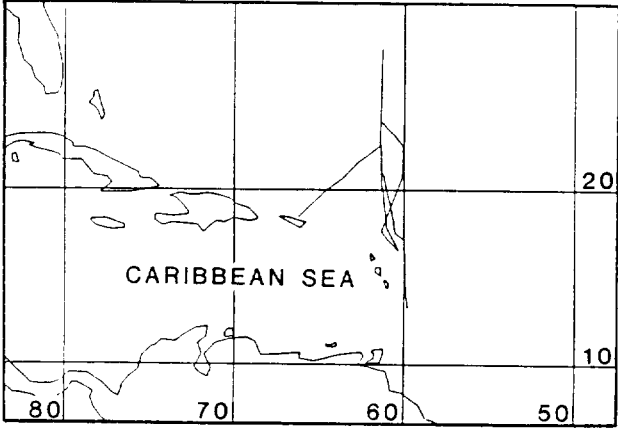
DISCOVERY 105



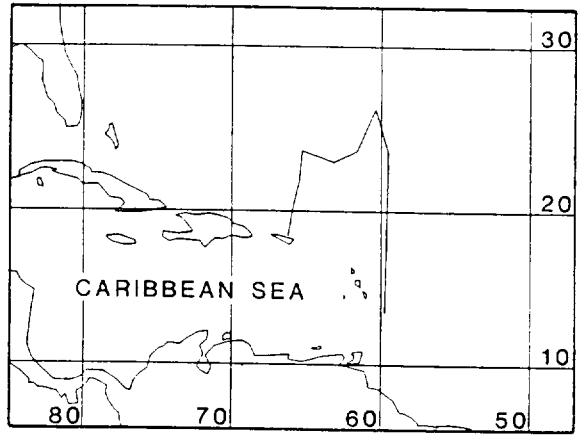
DISCOVERY 106



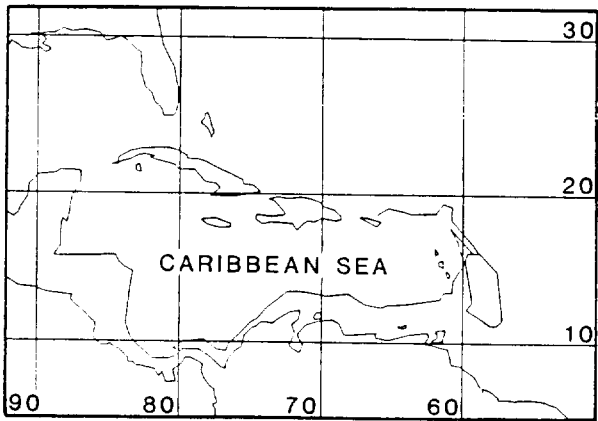
DISCOVERY 107



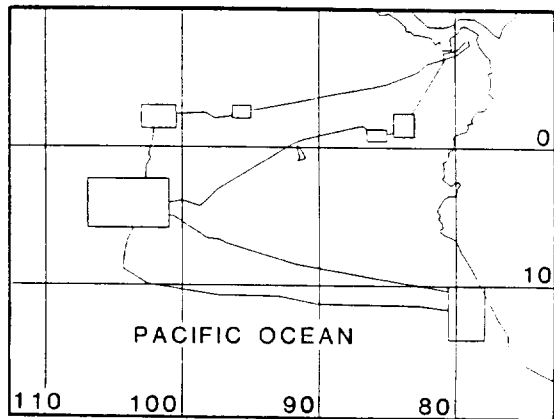
DISCOVERY 108



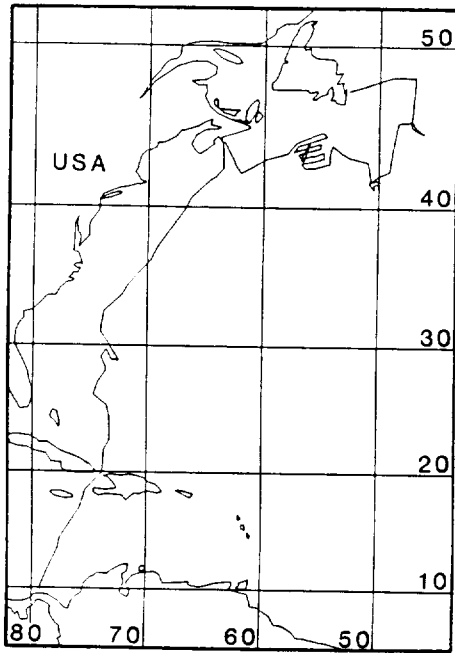
DISCOVERY 109



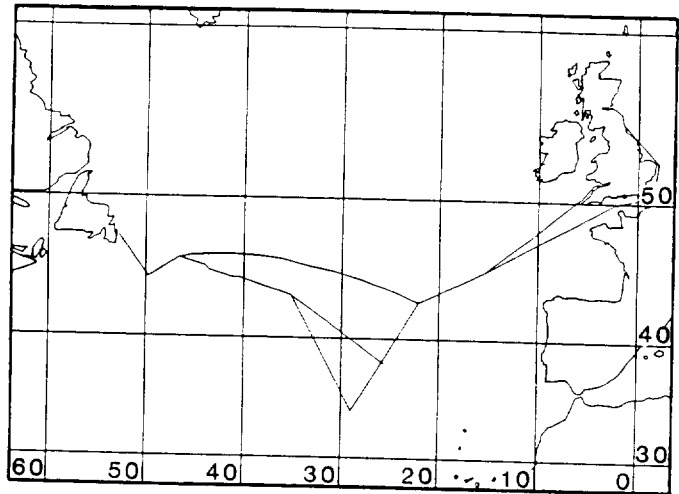
DISCOVERY 110



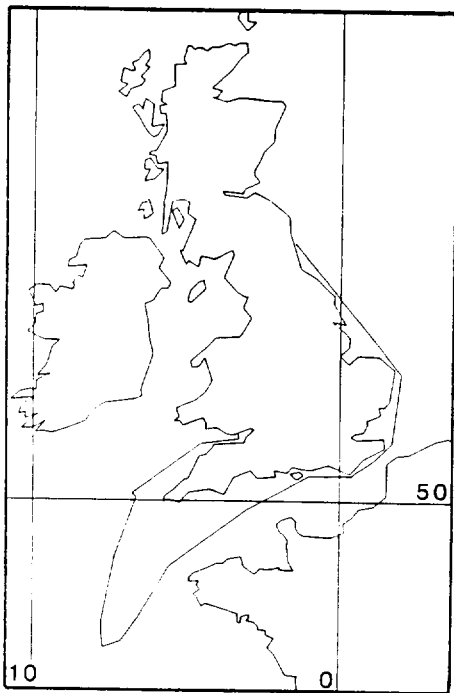
DISCOVERY 111



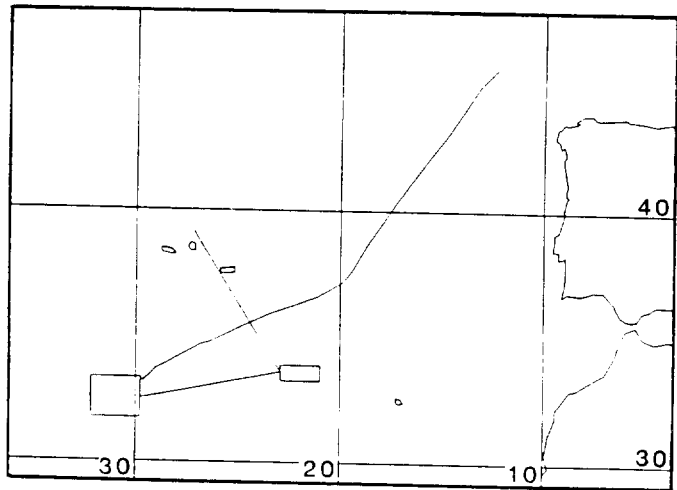
DISCOVERY 112/115



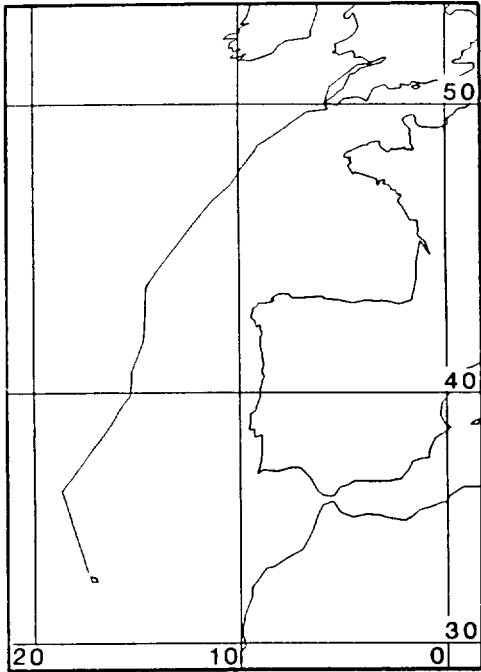
DISCOVERY 113



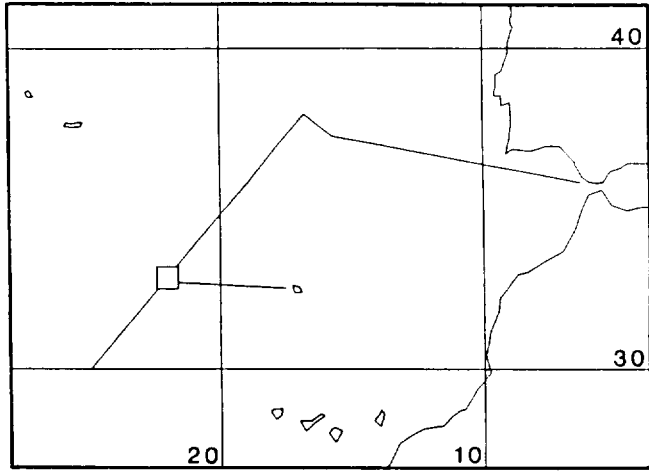
DISCOVERY 114



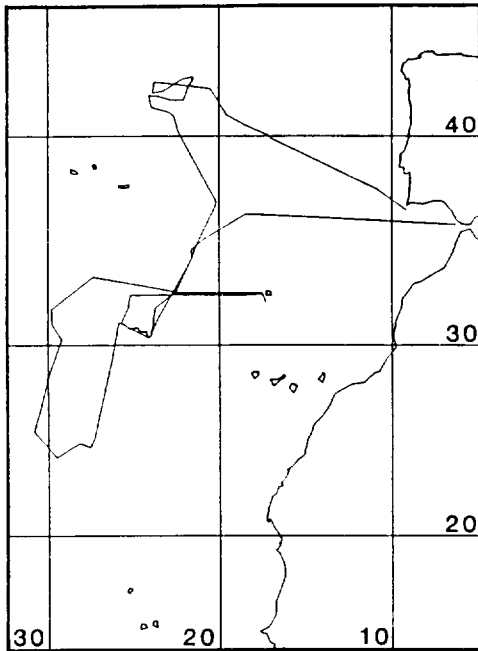
DISCOVERY 116



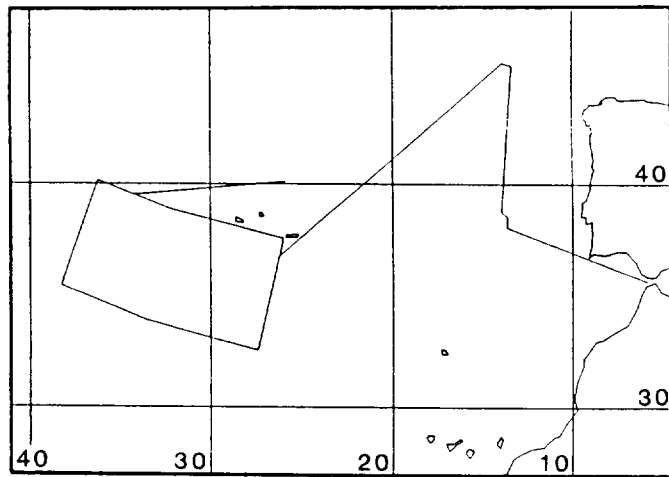
DISCOVERY 117



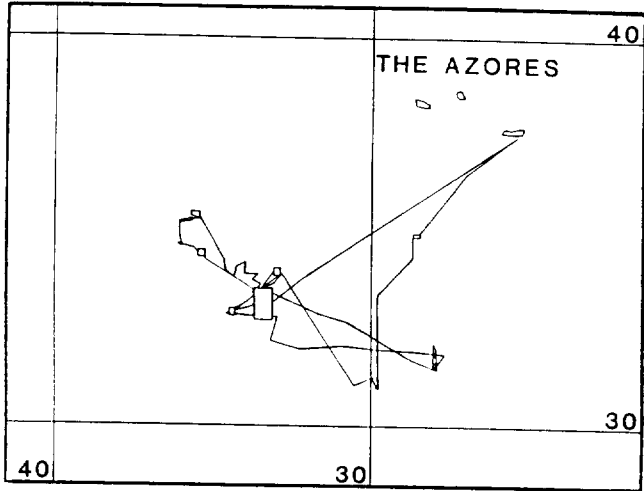
DISCOVERY 118



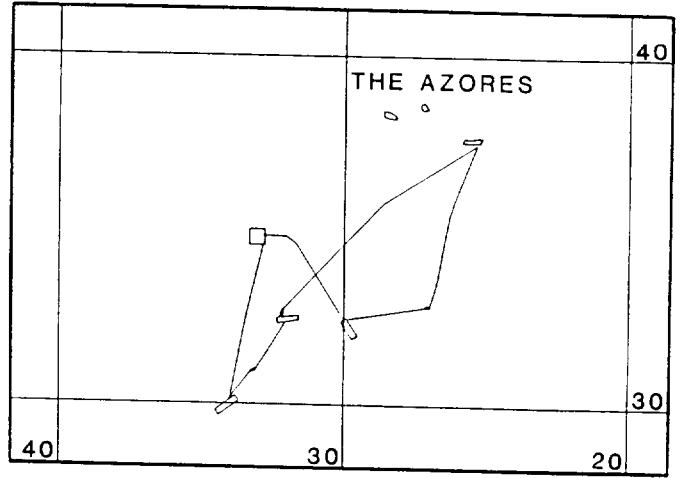
DISCOVERY 119



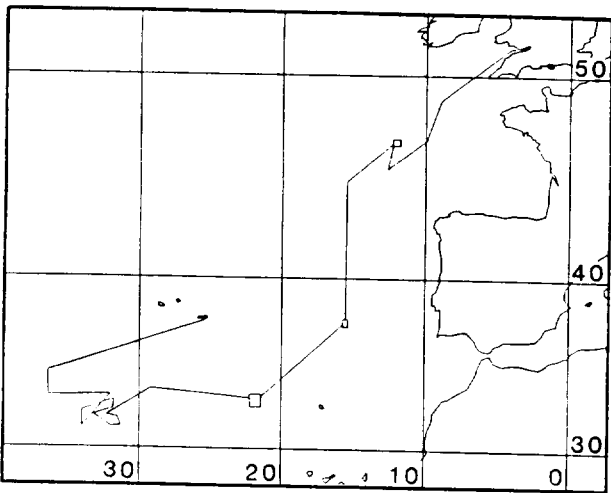
DISCOVERY 120



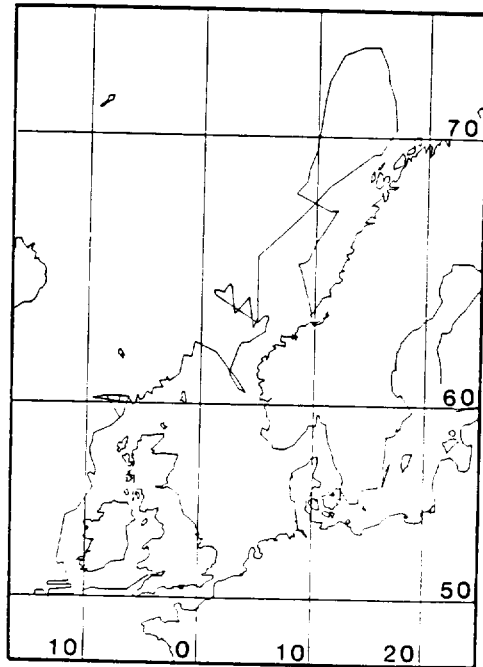
DISCOVERY 121



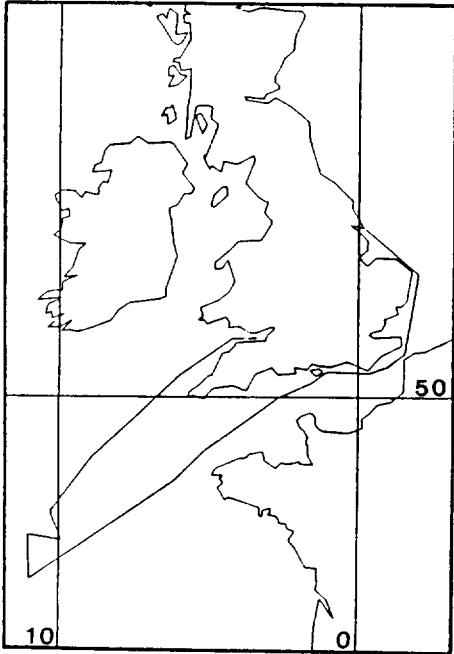
DISCOVERY 122



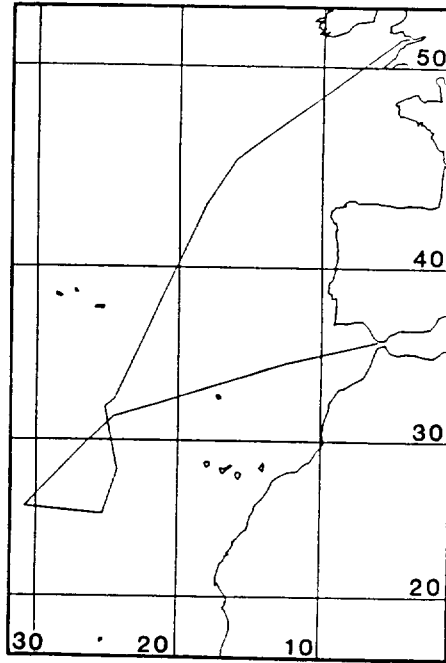
DISCOVERY 123



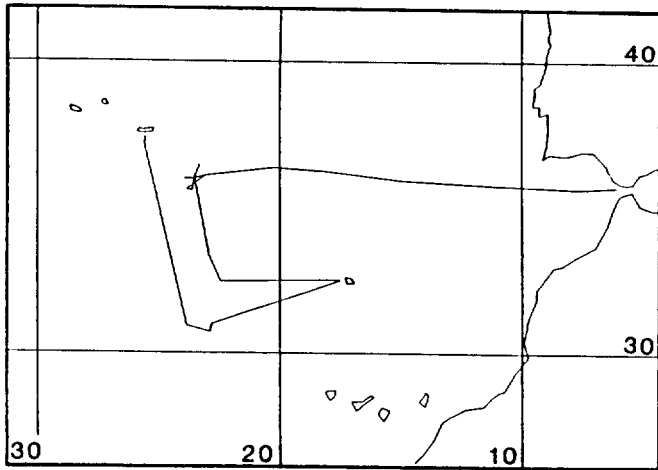
DISCOVERY 124



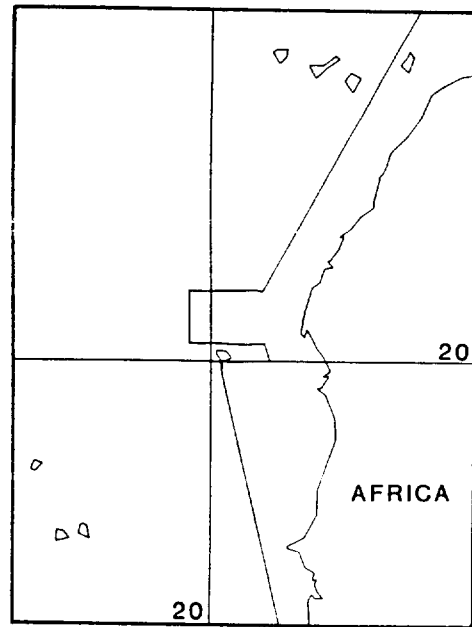
DISCOVERY 125



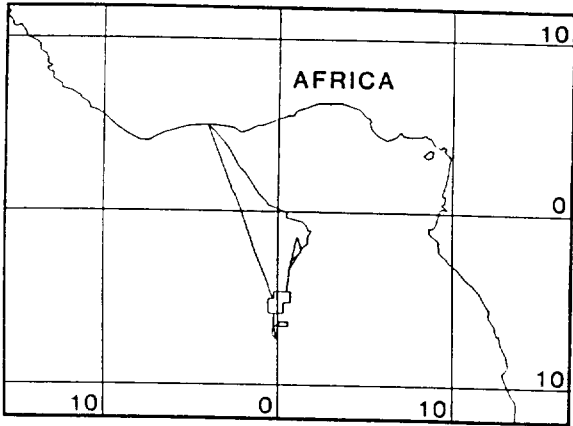
DISCOVERY 126



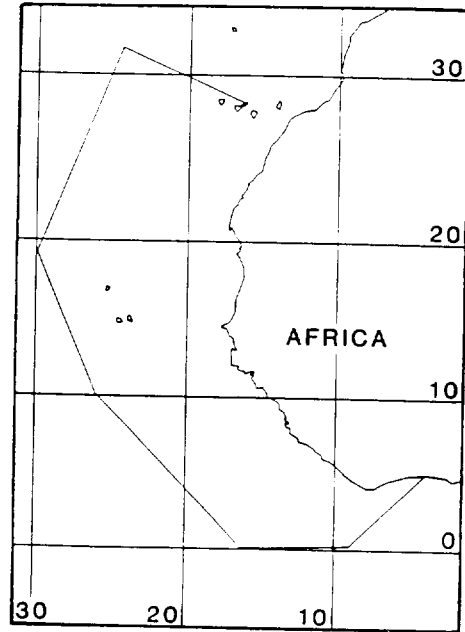
DISCOVERY 127



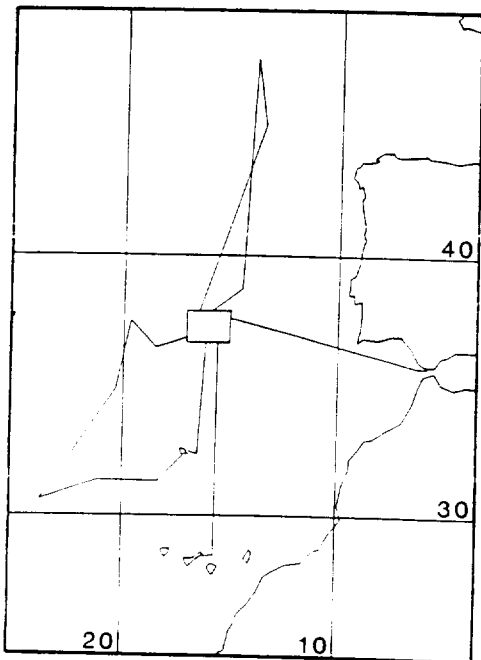
DISCOVERY 128



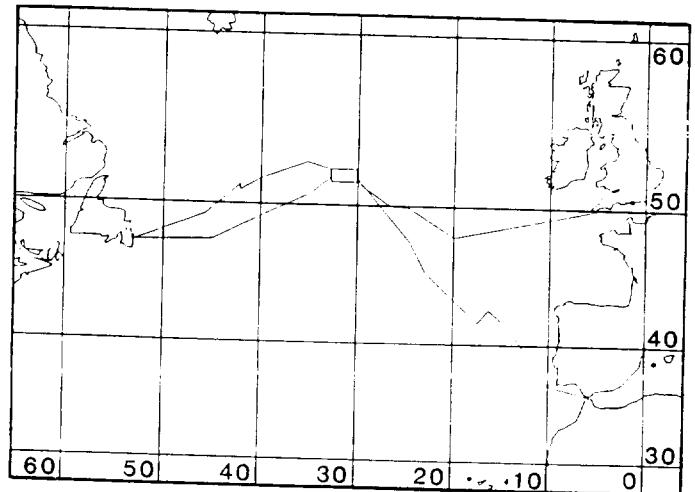
DISCOVERY 129



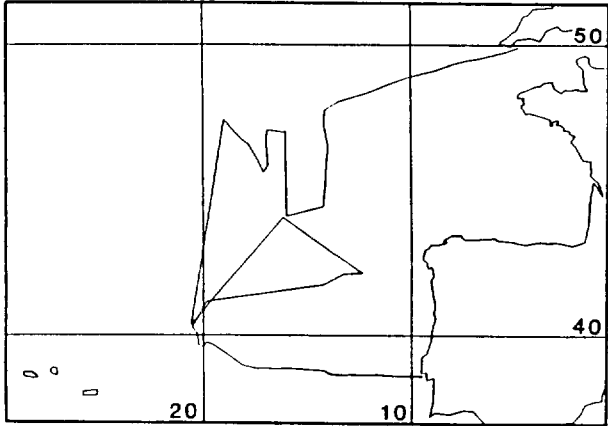
DISCOVERY 130



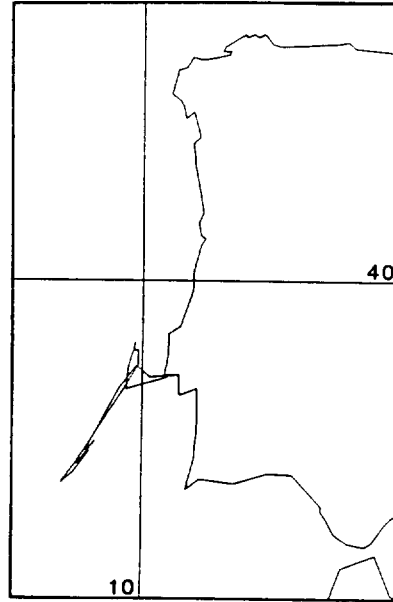
DISCOVERY 131



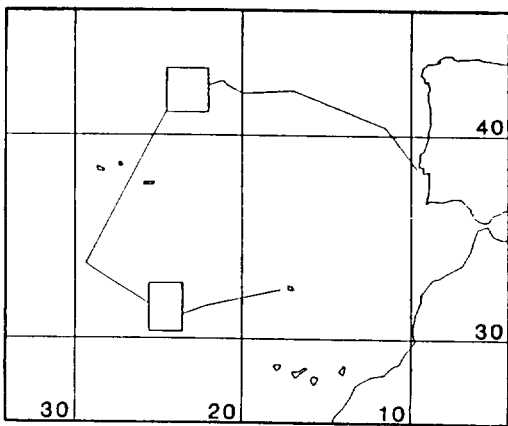
DISCOVERY 132



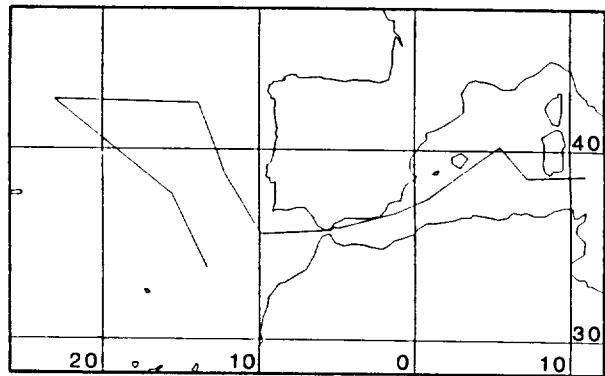
DISCOVERY 133



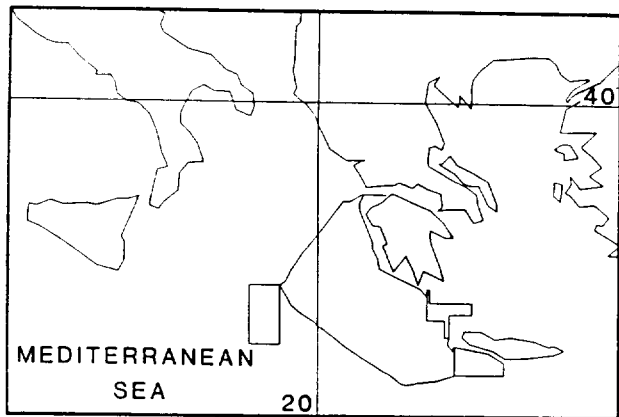
DISCOVERY 134



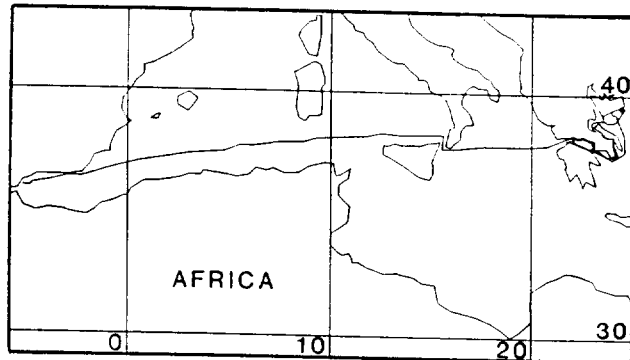
DISCOVERY 135



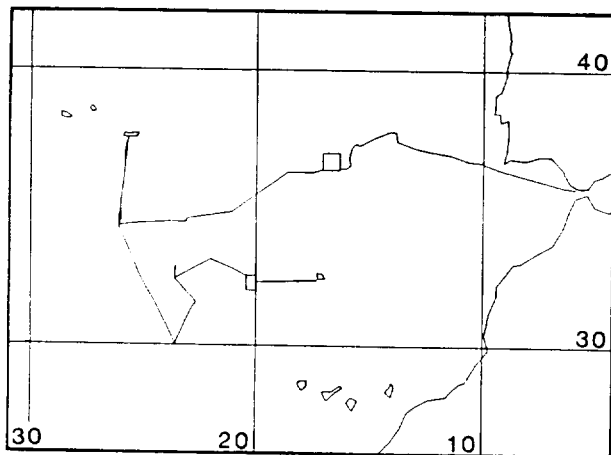
DISCOVERY 136



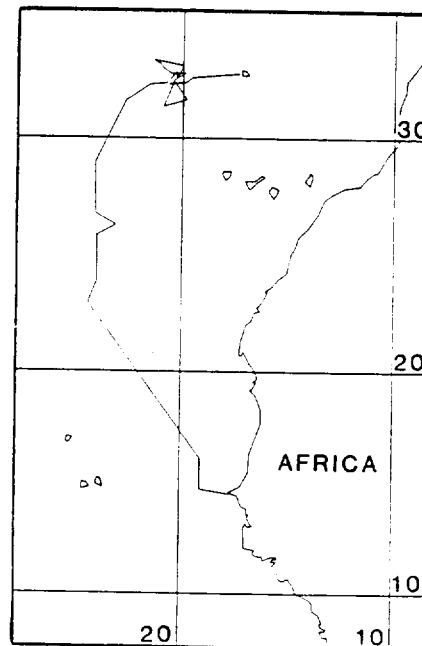
DISCOVERY 137



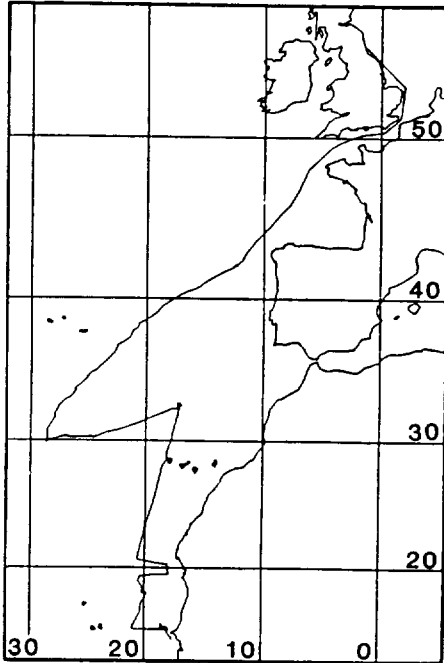
DISCOVERY 138



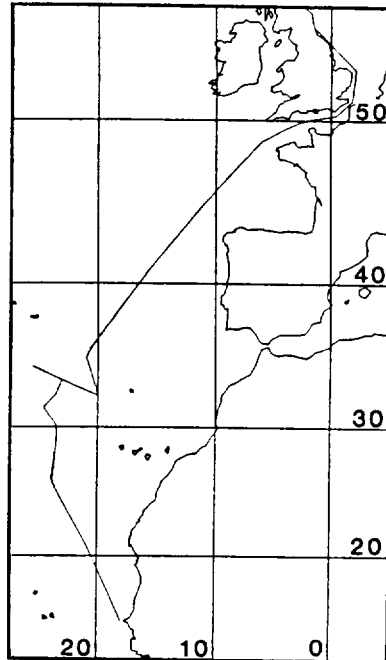
DISCOVERY 139



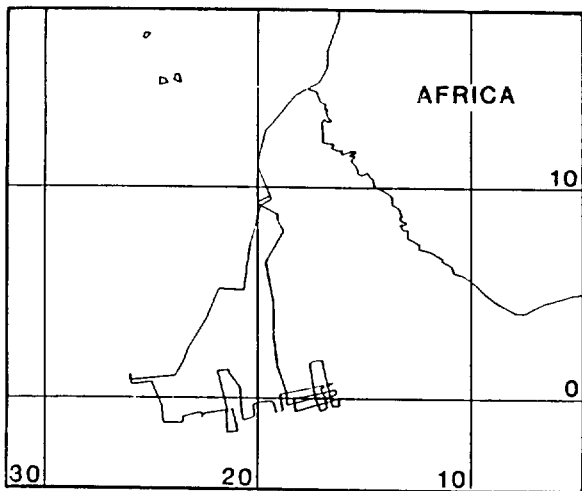
DISCOVERY 140



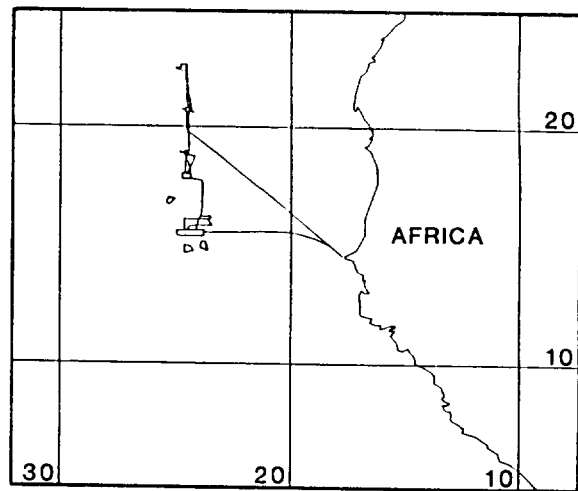
DISCOVERY 141



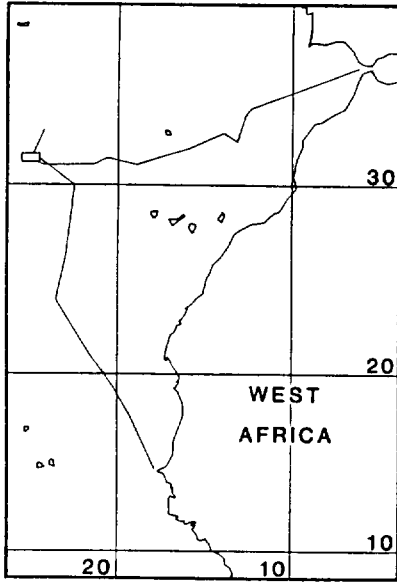
DISCOVERY 142



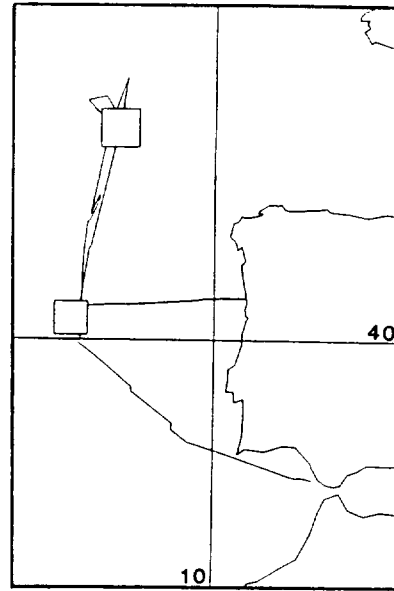
DISCOVERY 143



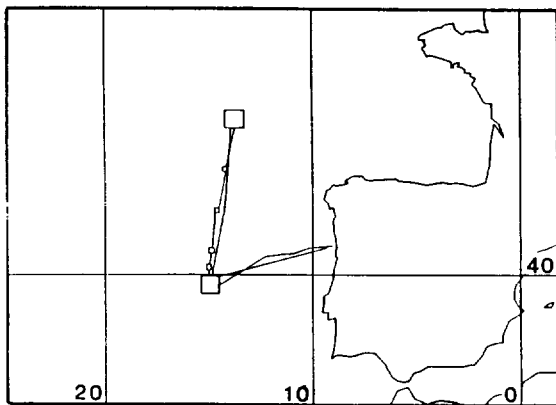
DISCOVERY 144



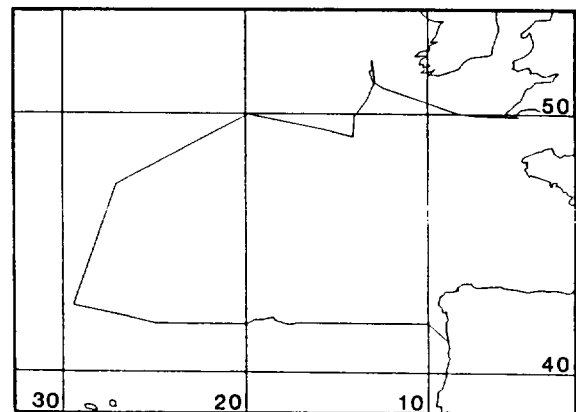
DISCOVERY 145



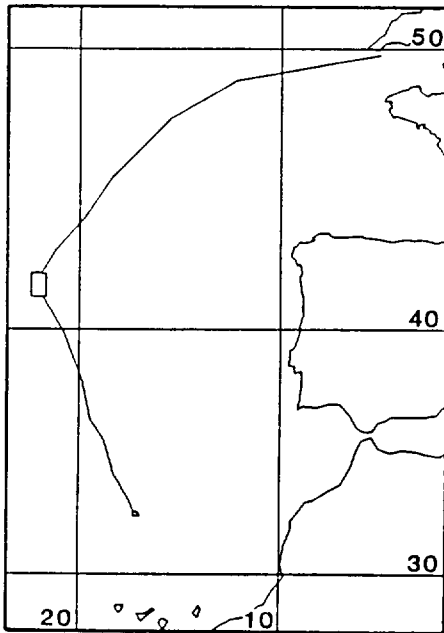
DISCOVERY 146



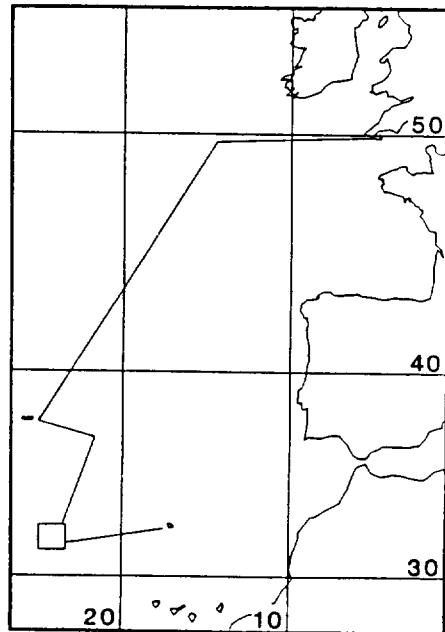
DISCOVERY 147



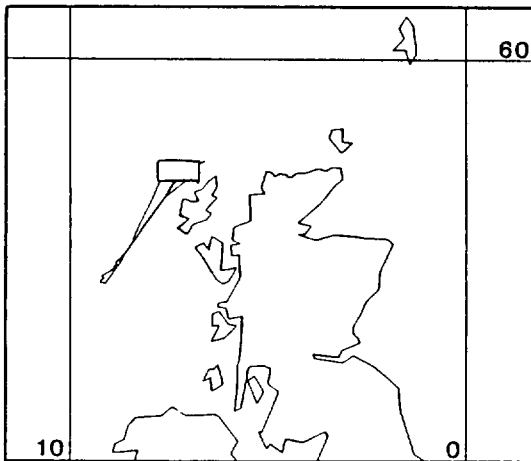
DISCOVERY 148



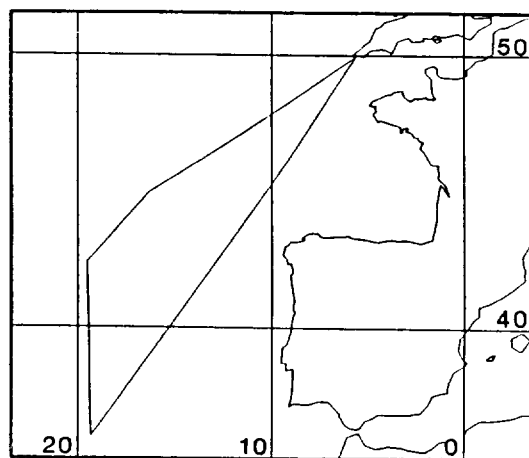
DISCOVERY 149



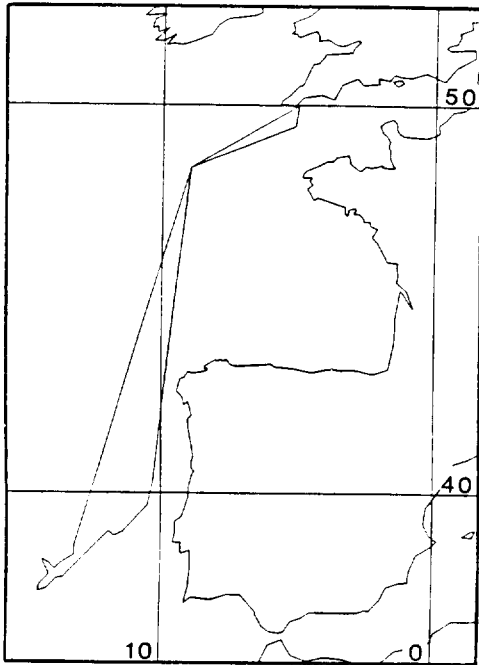
DISCOVERY 150



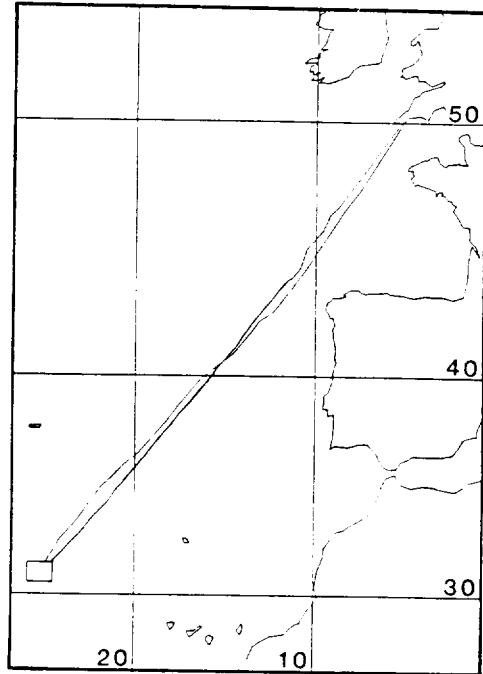
DISCOVERY 151



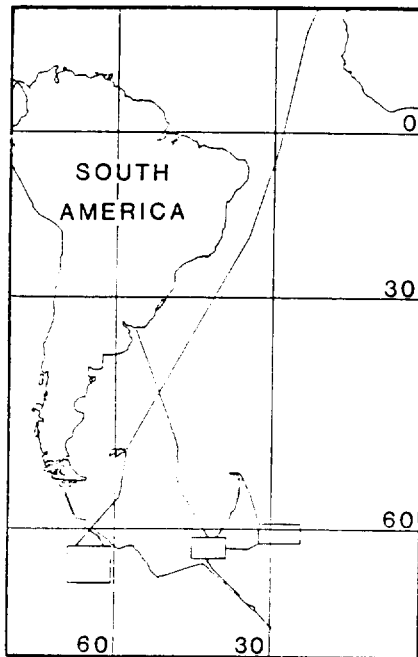
DISCOVERY 152



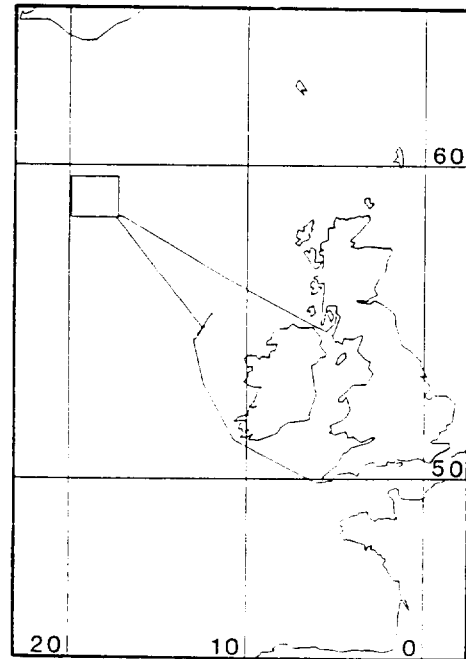
DISCOVERY 153



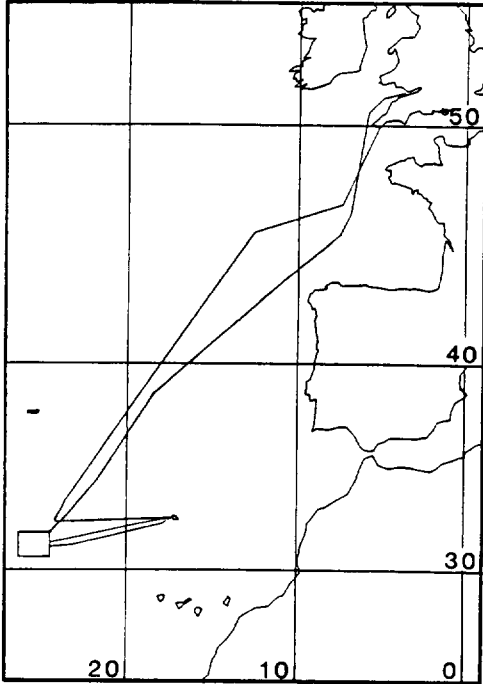
DISCOVERY 154



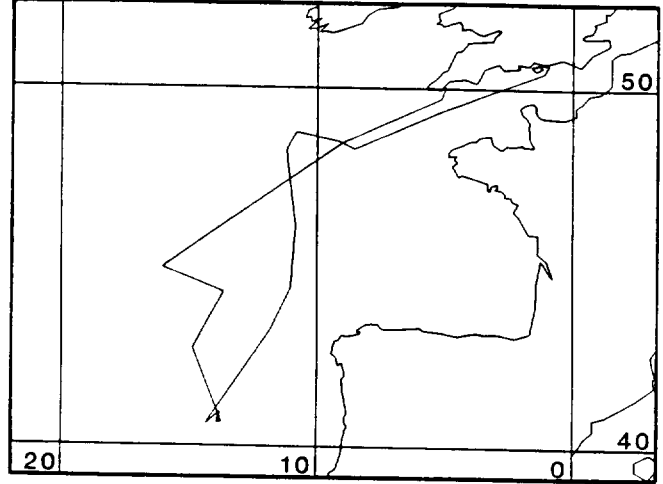
DISCOVERY 155



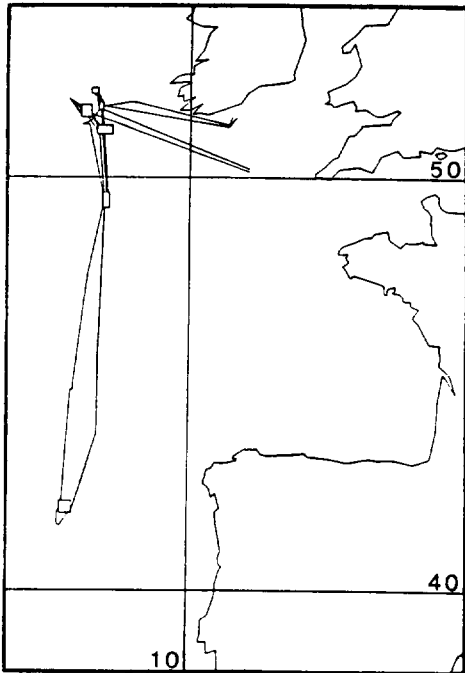
DISCOVERY 156



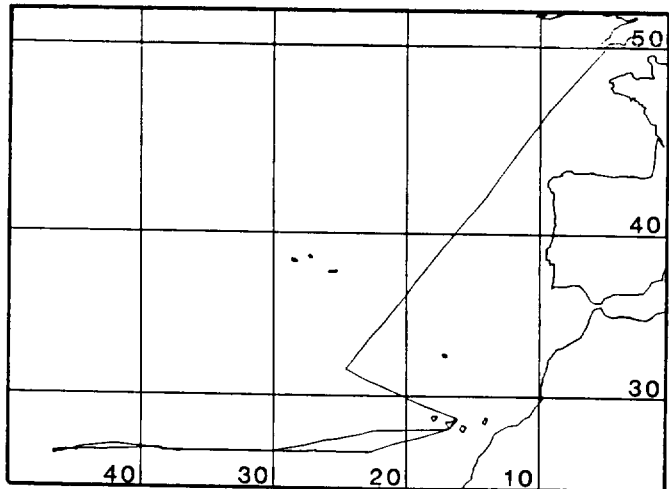
DISCOVERY 157



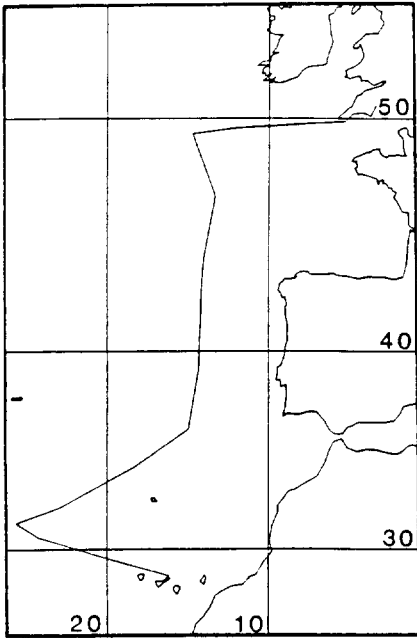
DISCOVERY 158



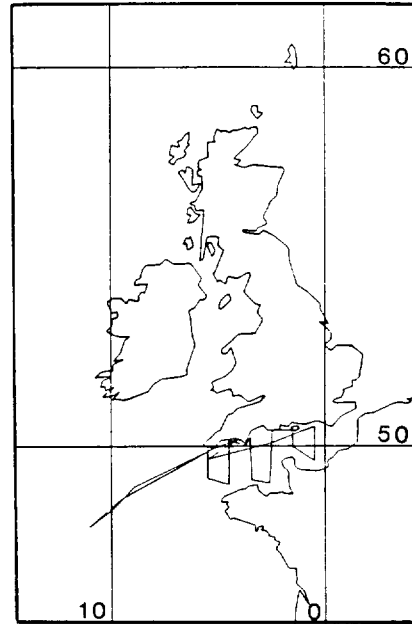
DISCOVERY 159



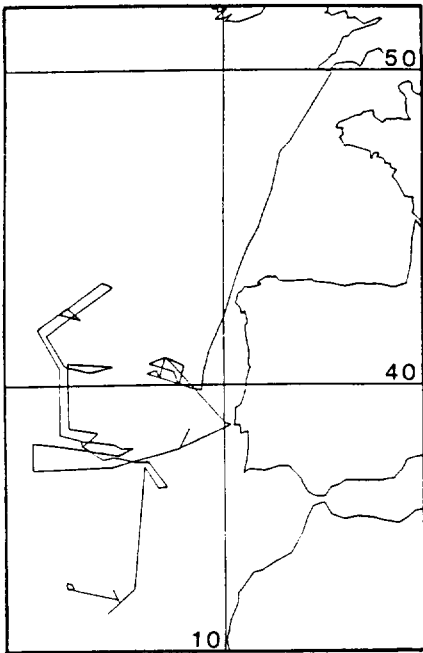
DISCOVERY 160



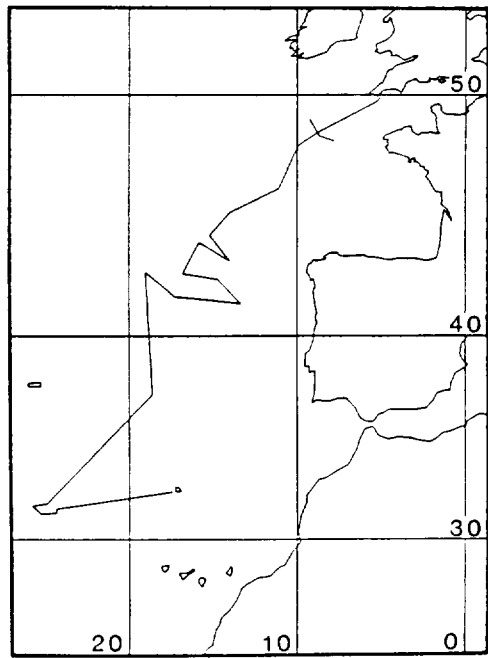
DISCOVERY 160A



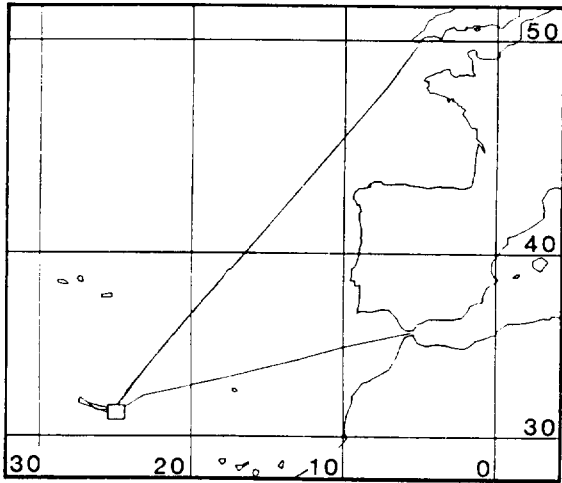
DISCOVERY 161



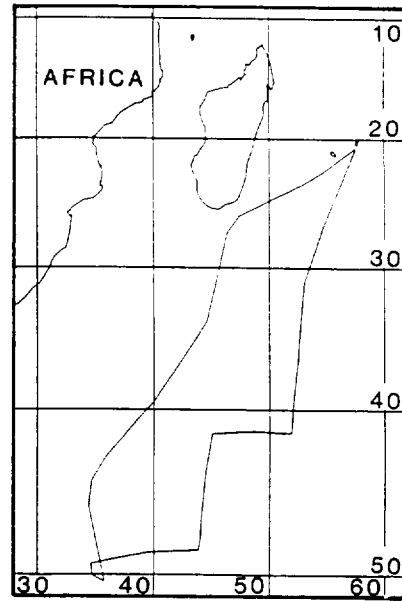
DISCOVERY 162



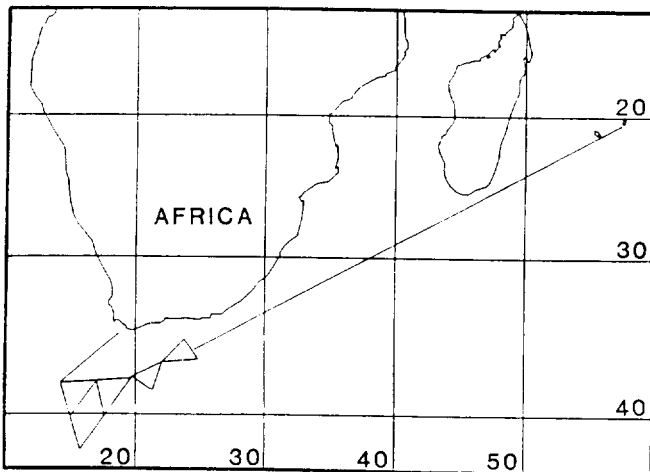
DISCOVERY 163



DISCOVERY 164



DISCOVERY 165A

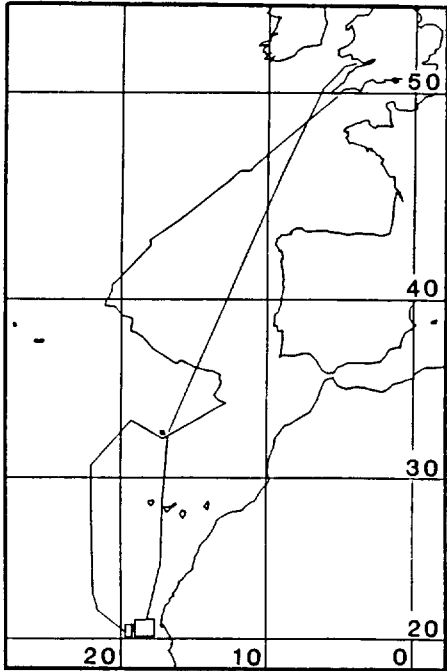


DISCOVERY 165B

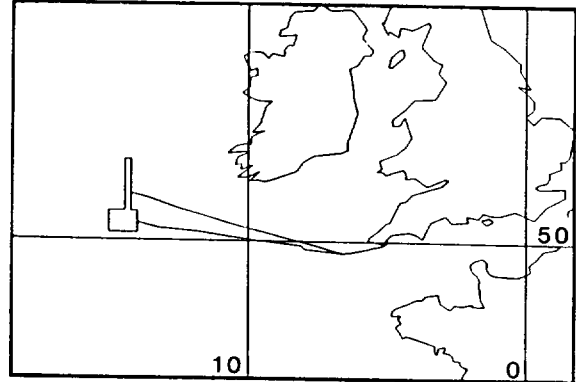
TRACK CHART

UNAVAILABLE

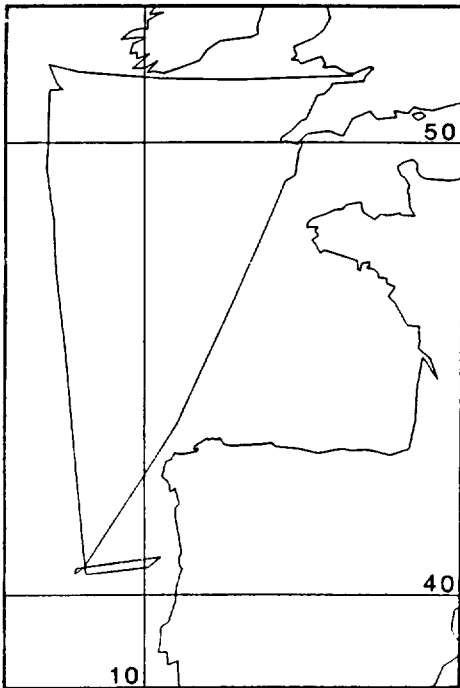
DISCOVERY 168



DISCOVERY 169



DISCOVERY 170

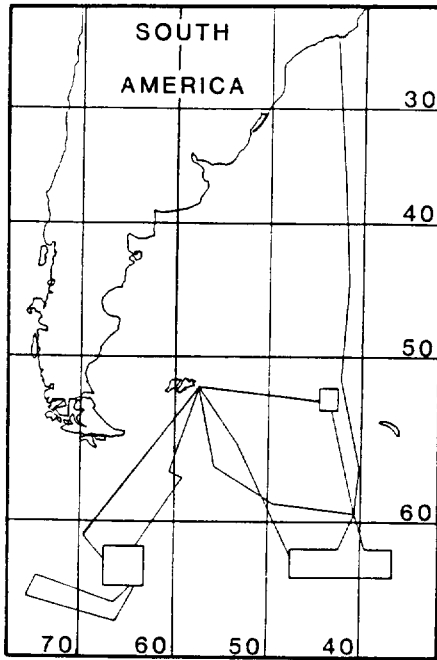


DISCOVERY 171

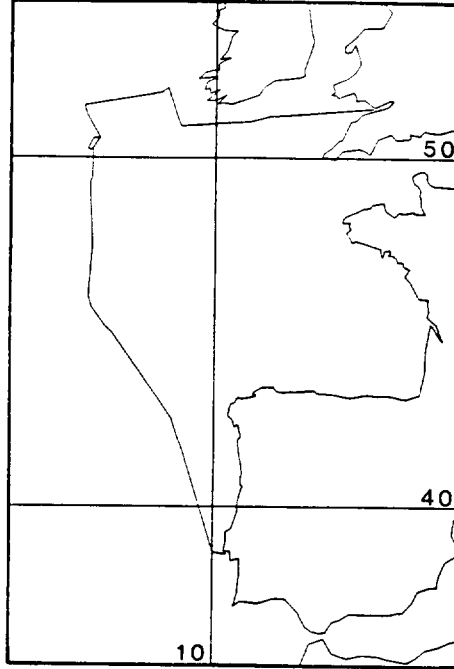
TRACK CHART

UNAVAILABLE

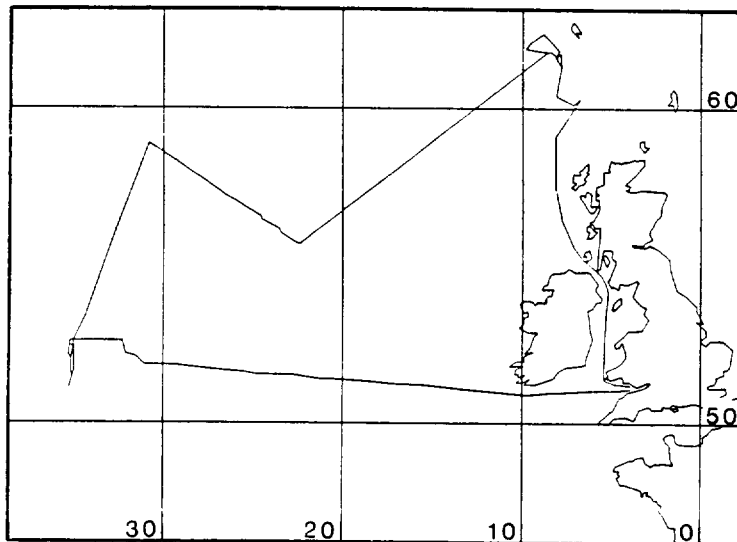
DISCOVERY 172



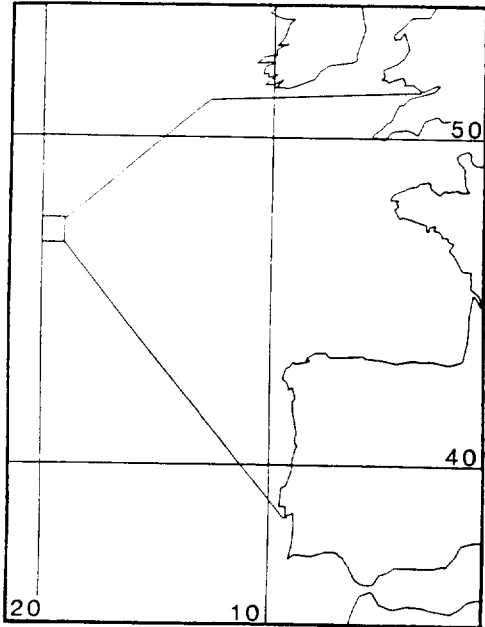
DISCOVERY 173



DISCOVERY 174



DISCOVERY 175



DISCOVERY 176

