MINISTRY OF AGRICULTURE, FISHERIES AND FOOD,
FISHERIES LABORATORY, LOWESTOFT, SUFFOLK, ENGLAND

1976 RESEARCH VESSEL PROGRAMME

REPORT: RV CIROLANA: CRUISE 5

(PROVISIONAL: Not to be quoted without prior reference to the author)

STAFF

Part 1

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DURATION

Part 1 Sailed Grimsby 1000 h 21 April, docked Aberdeen 1500 h 29 April.

Part 2 Sailed Aberdeen 1400 h 2 May, docked Grimsby 1700 h 13 May.

(All times are Greenwich Mean Time.)

LOCALITY

Central and northern North Sea.

AIMS

Part 1

(i) To service the North East Coast (NE 1-4) and JONSIS (J1-2) moored current meter stations (JONSDAP 76 stations 33, 34, 28, 29, 30 and 31 respectively).

(ii) To recover:
(a) the Lowestoft-Denmark moored current meter stations laid during CIROLANA 3/76 (JONSDAP 76 stations 35-45);
(b) the DAFS Aberdeen moored current meter stations laid in early March (JONSDAP 76 stations 46-521).

(iii) To re-launch the current meters supplied by Denmark at a station inside the FLEX square.

(iv) To put in hand during passage between current meter stations but especially during hours of darkness one or more of the following operations:
   (a) Continuous surface temperature and chlorophyll-A measurements with particular reference to a run between the Farne Islands and the coast of Northumberland.
   (b) Particle-size counting.
   (c) A series of runs at 5 knots during which chlorophyll-A, temperature and particle size will be monitored.
   (d) Grab sampling for superficial benthos.

   (This work forms part of the North East Coast project which, at this time of the year, is a sub-set of the FLEX phase of JONSDAP 76.)

Part 2

(i) To sample conditions between Aberdeen and the FLEX box with the continuous plankton recorder (CPR).

(ii) To steam round the FLEX box grid at 5 knots:
   (a) monitoring conditions with the High Speed Loch Ewe (HSLE) plankton sampler during the period 7-10 May;
   (b) a little way behind RV EXPLORER for as long as possible in the period 11-13 May comparing measurements of near-surface chlorophyll-A, temperature, salinity and nitrate;
   (c) to sample several stations on the grid for a variety of hydrographic and biological parameters.

NARRATIVE

Part 1

The ship sailed from Grimsby at 1000 h 21 April and serviced successfully JONSDAP 76 stations 28 and 29 before nightfall; the first of these stations lying near a long line of fishing dhans. Passage was made to station 30 (see Figure 1) during the night but the light could not be seen on arrival. Just after dawn (22 April) the rig was found intact with its warning beacon faulty, and serviced before the vessel moved on to stations 31 and 32. These were also dealt with on 22 April. In each case, as from station 31, the various acoustic release frequencies were fully tested if at all possible before recovery began. A general description of the performance of the units is given in Table 1: a more detailed appraisal is available on request.

During the night the ship steamed to station 35 in order to be able to re-lay some of its components at station 33, the final station that required servicing. An initial 5 knot traverse was made for one hour during this period to allow the various continuous monitoring devices to be tested and then routine sampling for nanno- and total plankton at hourly intervals of water from the ship's salt-water system began. Tests were also made of the HIAC particle counter. The routine hourly sampling, annotation of the continuous traces and HIAC trials, together with intermittent grab stations, continued throughout the rest of this part of the cruise.

At 0500 h 23 April station 35 was sighted and promptly recovered; the ship being on course by 0625 h for the transit whenever possible of the Inner Sound between the Farne Islands and the Mainland that has become

part of the North East Coast project. This transit was made between 0830 and 0930 h and then the ship moved to station 33 which was serviced during the afternoon with station 36 being recovered just before darkness fell. All the stations had been free of any sign of interference by other mariners.

In the early hours of 24 April one of the crew became ill - he suffered some distress on the first day out but had appeared to recover from it - and the ship had to steam to Aberdeen and put him ashore so that he could be given medical attention. During the run to Aberdeen, which lay through the stated position of station 38, nothing was seen of the rig and on return it was found by means of its MAFF acoustic release to be some 2½ miles out of position. It was recovered without loss but the fins and A-frames of the instruments were badly damaged. (Some general pointers as to the condition of the instruments on recovery are given in Table 1 and, again, more details are available on request.) Stations 39 and 40 were recovered later that day, the former having lost its surface marker.

At 0600 h 25 April a visual search for the pellets marking the meter wire began in the vicinity of station 41 since the surface buoy was known to be in Denmark. Nothing was found visually but acoustic traverses and sweeps pointed to the meter wire being in the place at which it had been launched. The grapnel was rigged and at 0745 h a dragging operation began. The first tow was unsuccessful but at 1005 h the sub-surface buoy appeared astern of the ship as the grapnel was being brought in. Then between 1525 and 2057 h stations 42, 43 and 44 were recovered, the second of these being dragged in with the pellets being used as a guide. The bridle of the sub-surface buoy at station 42 had snapped at some stage in the observational period and the meter wire had fallen to the bottom: the rotors of the three instruments on the wire breaking on impact apparently.

At 0530 h 26 April acoustic and visual searches were begun for station 45. The former showed quite plainly that the meter wire at least was on station. Since the surface pellets were not visible no attempt was made to cut the wire at this stage. Instead marker buffs were laid and the grapnel streamed and towed in relation to them. After the second tow the buoy weight came in on the grapnel, having parted from the rest of the rig at the snap-shackle.

In this new situation an attempt was made to cut the wire acoustically since further simple dragging tows might be expected to lead to the grapnel running off the now presumably straight piece of wire where first the weight and then the surface buoy had been. However, no signals were received from the acoustic release even though the command to 'fire' was sent out repeatedly. Consequently, bearing in mind the rest of the programme, the marker buffs were collected and the ship steamed to station 521, the first of the DAFS buoys.

Station 521 was closed at 1430 h 26 April, and was seen to be lying over at rather a larger angle than expected with none of its pick-up and marker buffs in place. At this time a northerly wind had created wave and swell conditions that were a little too severe and so the ship began to dodge around the station. At 1800 h the buoy was seen by the Officer-of-the Watch but once daylight had gone visual contact ended since the light was never spotted. At 0300 h 27 April the ship was dodging towards the station and discovered that a large cargo vessel had its booms topped and deck-lights blazing as it lay on the buoy position. As RV CIROLANA approached the vessel moved off. There was no sign of the surface buoy

at dawn and a visual search of the region around the station position proved unsuccessful. Radio contact was made with a Grimsby seiner who confirmed the presence of the buoy on station up to the previous day and gave his version of its position. This was investigated before a formal box search of the region around the known rig position was begun but both ploys were unsuccessful. Two grapnel tows through the original position were also abortive.

Just in case the mysterious vessel seen operating at station 521 had moved along the line of stations the ship steamed westwards leaving that station temporarily to its fate. In quick succession, though with some difficulty on account of their size and paucity of grappling points, the 6 metre spar buoys marking stations 51 and 52 were recovered, together with their complementary instrumentation. Passage was then made into the FLEX box to lay station J76-100 for Dr Kullenberg of the University of Copenhagen before the ship moved back overnight to the original position of station 521.

At 0545 h 28 April another visual (and radar) search of the region began in visibility that was greatly improved on that encountered the previous day. Again nothing was seen and so at 0610 h a marker was put out as close to the original rig position as possible and the grapnel streamed. Half-an-hour later when it was brought in part of the rig wire was firmly wrapped around two of the prongs. The tangle of wire was recovered on the net drum and it was found that one meter was missing and another badly damaged. The top of the meter wire and that of the buoy tow both appeared to have been chopped.

Passage was then made to the south-west of the FLEX box and between 1635 and 2005 h stations 50, 49 and 48 were recovered. No meter-wire pellets were found at any station and awkward tangles of rope and wire occurred immediately beneath each of the surface buoys. No real difficulties were experienced however, though at station 48 the sub-surface float appeared much earlier in the proceedings than it should have done, and in fact it slowly drifted off as the rest of the rig was hove in and had to be recovered as a separate entity later. No really satisfactory explanation of this phenomenon has been put forward as yet.

At first light the next day (29 April) the ship closed in on the position of station 47. There were no surface markers of any kind. After a preliminary visual search the ship moved on to station 46 and a similar situation presented itself. Visual, sonar and grapnel searches of the area at and around the original position were undertaken without any trace of the mooring being found between 0800 and 1130 h. The ship then steamed back to station 47 and began its first grapnel tow at that site at 1305 h. In less than an hour the whole rig, apart from the surface buoy, had been recovered with the grapnel again getting a secure hold on part of the ground wire. Consequently, by 1130 h the vessel was back at station 46 and, after a slight delay for the passage through the area of a pipe-laying barge, a dragging operation began around marker buffs laid at the original station. On the first tow the ship came fast on some unknown object: at 1855 h the warp came taut again and on recovery it was found that the grapnel had caught in the buoy weight and had one of the wires fast in several places also. The wires were brought in quickly and though no instruments were lost it became clear that the surface markers had been deliberately taken.

The ship laid for the night and then steamed to the approaches to Aberdeen Harbour, arriving at 0900 h. In company with several other vessels she had to lay off until the early afternoon before berths were available. By 1500 h, however, the vessel was secured alongside Blaikies Quay and the afternoon was spent unloading DAFS current meter gear and loading plankton sampling equipment.

Part 2

The ship set course for station 45 after leaving Aberdeen Harbour at 1400 h 2 May. During the overnight passage the CPR was streamed and bottle samples taken at hourly intervals for 'calibration' purposes. At 0600 h 3 May acoustic contact was made with the rig at station 45 and the marker buffs anchored close to the original position which was also the area of a clear change of character in the acoustic signal as the ship steamed through it. At 0615 h the grapnel was streamed and after only a single 'Saxby turn' it was brought in with the ground wire knotted around two of the prongs. By 0800 h all the rig except the surface buoy had been recovered and the ship steamed for the FLEX box.

During the early afternoon the surface buoy at station 100 was changed - new batteries for a buoy light having been sent up from Lowestoft - and a practice hydrographic serial station was worked in the immediate vicinity of the rig. The ship then moved a few miles to the Central Station (station 9) of the FLEX box and worked six hourly intervals from 1800 h with the HSLE, the Longhurst-Hardy Plankton Recorder (LHPR) and a serial bottle cast.

When the HSLE was brought inboard the first time it was found that both nets had been torn off their fittings at the forward end. This happened on two other occasions, thus using up all the nets on board even though attempts had been made to reduce the ship's speed and the length of the oblique haul. The reason for the nets 'clogging' was the presence of very heavy concentrations of the flagellate Phaeocystis and Chaetoceros spp. in the euphotic zone. Arrangements were put in hand to get replacement nets from RV METEOR and the Aberdeen Laboratory, and in the meantime the ship worked a nutrient intercalibration station alongside RV METEOR, RV ANTON DOHRN and RV AURELIA at 1200 4 May. The duplicate bottles could not be mutually exchanged immediately with RV METEOR because of heavy swell but this job was accomplished by 1830 h via RV METEOR's boat. RV CIROLANA then steamed to Aberdeen and collected spare nets from the Pilot Boat at 0530 h the next day.

By 1330 h 5 May the ship was working station 1 of the FLEX box grid (Figure 2), and for the next 3½ days she moved steadily round it at 5 knots, making 136 HSLE tows, doing hydrographic serial work at stations 1-8 and re-working the Central Station at the end of this period with the HSLE, LHPR and water bottles. Continuous surface chlorophyll and temperature records, together with hourly chlorophyll extracts, were taken throughout the grid.

Since leaving Aberdeen on 2 May the ship had been in touch from time to time with both the Lowestoft and Aberdeen Laboratories. From the former came a request to investigate the situation at NE4 where the surface buoy had been landed at IJmuiden, and from the latter the news that RV EXPLORER would definitely be in the FLEX box as from the morning of

12 May. Assuming good weather it seemed feasible to steam south to attend to the buoy and then return northwards in order to join up with RV EXPLORER. Consequently, at 0830 h 9 May the ship set course for station J1 where some minor adjustments had to be made prior to visiting the site of station NE4. During the passage a second message was received from the Lowestoft Laboratory asking that the situation at station NE2 should be investigated also.

Despite fog banks and poor visibility for part of the passage, station J1 was encountered at 0830 h 10 May and serviced. By 1540 h that day the ship had reached station NE4 but there was no trace of the rig at the surface. Consequently, the marker buffs and grapnel were brought into action but this time no contact was made with the missing gear. The station was relaid at 1930 h and the ship steamed overnight to station NE2. Again there was no trace of the rig visually, via the grapnel or acoustically - station NE4 had not had an acoustic release on it - either in the immediate vicinity of the site or after a mile-side box search around the station position. Consequently, a new current meter rig was put out and the ship set course for its rendezvous with RV EXPLORER at station 46 of the INOUT network.

By 0005 h 12 May the two vessels were abeam of each other with visibility down to 0.75 mile. RV EXPLORER took up its station 1.7 miles ahead of RV CIROLANA and the ships steamed overnight in line ahead to the south-west corner of the FLEX box, sampling continuously for surface temperature and chlorophyll. At the same time RV EXPLORER towed an Undulating Plankton Recorder and a CPR and RV CIROLANA a second CPR. Between 0800 and 1300 h RV EXPLORER attended to some sedimentation traps and worked a hydrographic series at FLEX station 1. It also sent its boat to RV CIROLANA with Dr Steele and Mr Conway of the Marine Laboratory, Aberdeen on board so that the records taken during the night could be compared, plans made for a second run and the general situation in the FLEX box discussed.

By 1330 h the two ships were steaming up leg 1 of the FLEX box grid in column ahead with a spacing this time of 0.6 mile and plankton recorders in tow. Some interesting surface chlorophyll and temperature records were collected over the first 10 miles of the track particularly, but by 1630 h the chlorophyll trace was very low and straight and the sea and swell were rising rapidly as a north-westerly gale developed. By mutual agreement the exercise was broken off at this point and RV CIROLANA turned and steamed for Grimsby, running most of the way with a north-westerly gale on the starboard quarter. At 0950 h 13 May it was discovered that the CPR towing wire had parted in the previous 10 minutes. The ship docked in Grimsby at 1700 h 13 May and the scientific staff dispersed during the following morning after clearing the ship of their gear with the help of the crew.

RESULTS

All the stated aims were achieved and in addition, firstly, the CPR was towed between Aberdeen and station 45 and, secondly, moored current meter stations J1, NE4 and NE2 were visited a second time in order to meet problems that arose during the cruise.

Part 1 of the cruise was notable in that all the MAFF-laid current meters and all those except one belonging to DAFS that were put out for the project INOUT phase of JONSDAP 76 were recovered. Given the scale

and length of the exercise this is an almost unbelievable state of affairs. From Table 1 it is clear that there will be some gaps in the data return per se but nevertheless the general situation after the field phase is very satisfactory as far as MAFF and DAFS are concerned. There is no doubt that the MAFF acoustic release played a key role in bringing about this situation. At least three rigs were positively located by means of the system, thus cutting down the search-time needed very considerably, whilst the presence of a signal from the rigs during several of the grapnelling exercises helped in the laying of the marker buffs and in the recognition of the fact that a particular tow had got hold of part of a rig.

Part 2 of the cruise was notable in that a very successful quasi-synoptic survey of the horizontal, and to some lesser degree vertical, distribution of plankton in the FLEX box was completed. From Figure 3 in general, and a comparison of chlorophyll levels on leg 1 of Figure 3c with those recorded on 12 May in particular, it would appear that this survey must have been done at or near the time of peak primary production. In fact initial, uncalibrated surface and vertical profiles of chlorophyll show values over twice that previously experienced in the past 15 years. The very rapid decline of the phytoplankton population that seems to have occurred in the period 5-12 May was due to the presence of enormous quantities of Calanus. All in all, in fact, it would appear that this data set is of very great importance to the whole JONSDAP 76 exercise. Not only does it provide a key indication of conditions at the peak of the bloom, but also, via its complete coverage of conditions in the FLEX box, it gives a clear picture of the spatial variability at that time.

J W Ramster (NIC)
24 May 1976

SEEN IN DRAFT T H Finn
W J Saxby

INITIALLED AJL

DISTRIBUTION

Basic list
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J A Durance
J W Horwood
K J Medler
A R Burgess
D G Hughes
J A Swainson
Miss R Harrop
Miss S E Poole
R S Payne
D G Hughes
Miss C M Thomas
R Williams
P C Reid
J Dunn

Table 1 General notes on the performance of MAFF current meters and acoustic releases as assessed on recovery.

(a) Current meters

36 of 36 recovered
18 of 36 in good order in all respects
11 of 36 working on recovery but with some physical damage
6 of 36 not working on recovery: battery pack flat
1 of 36 not working on recovery: leaked

(b) Acoustic Releases

(i) Operationally

9 of 11 releases called-up successfully (1 of failures found to have no scroll on recovery so that 9 of 10 is a fairer estimate).
7 of 9 successfully turned-off
3 of 5 successfully fired

(ii) Laboratory tests done immediately after recovery of releases not tested operationally for various reasons.

2 of 2 releases called-up successfully
1 of 2 releases turned-off
4 of 6 successfully fired

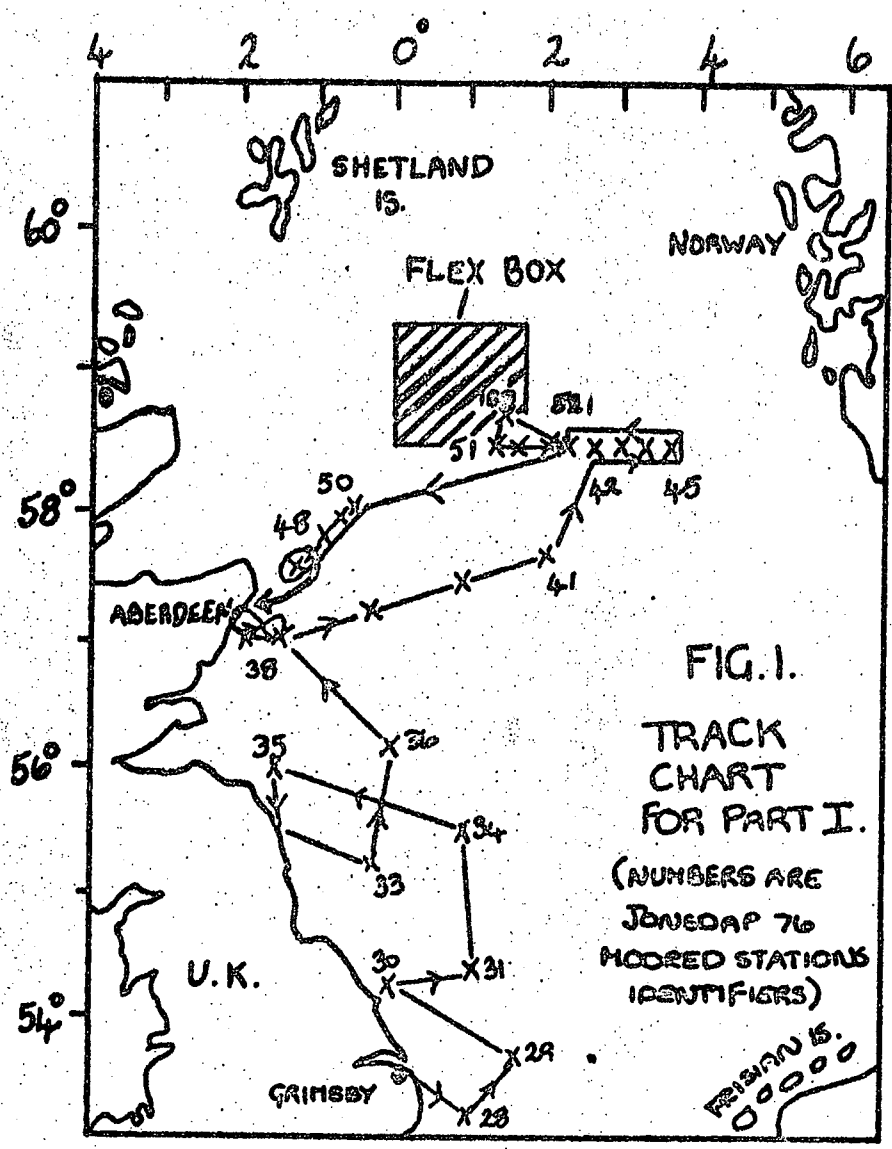


FIG. 1.

TRACK CHART FOR PART I.

(NUMBERS ARE JONSDAP 76 MOORED STATIONS IDENTIFIERS)

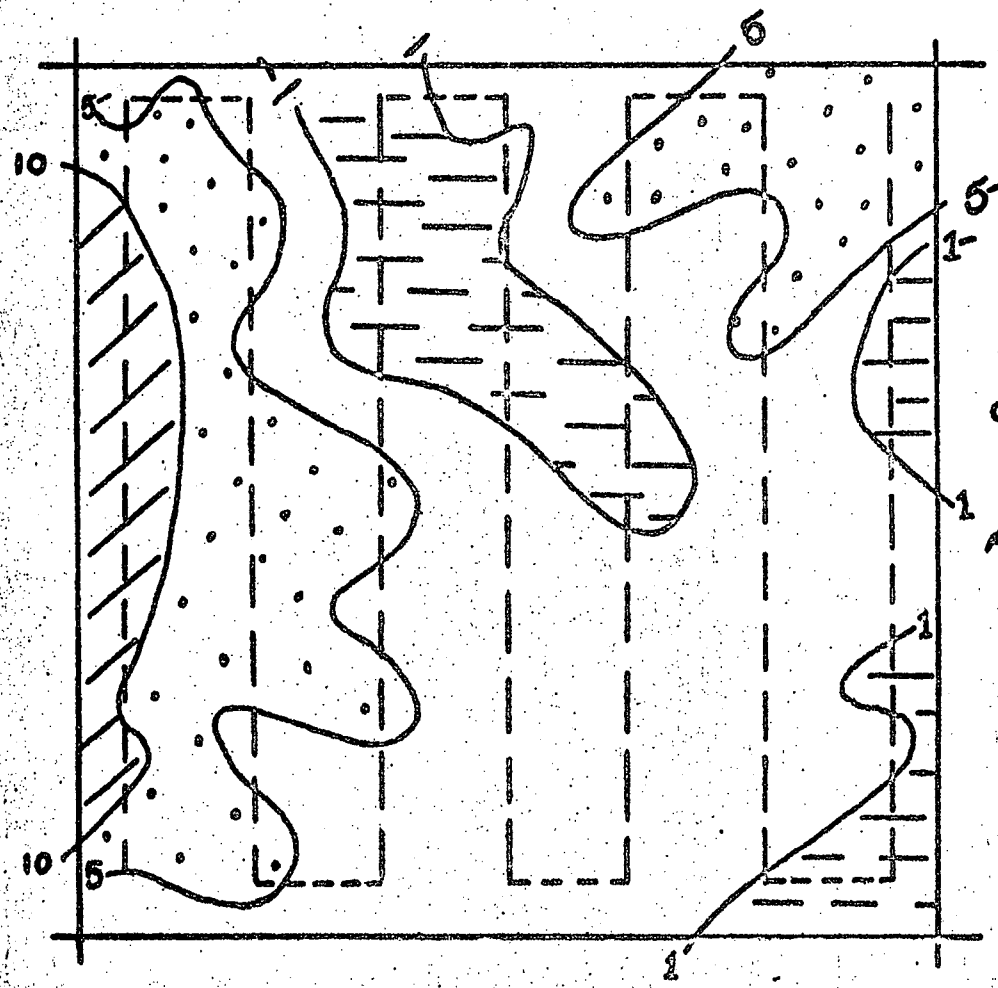


FIG 3. (c)

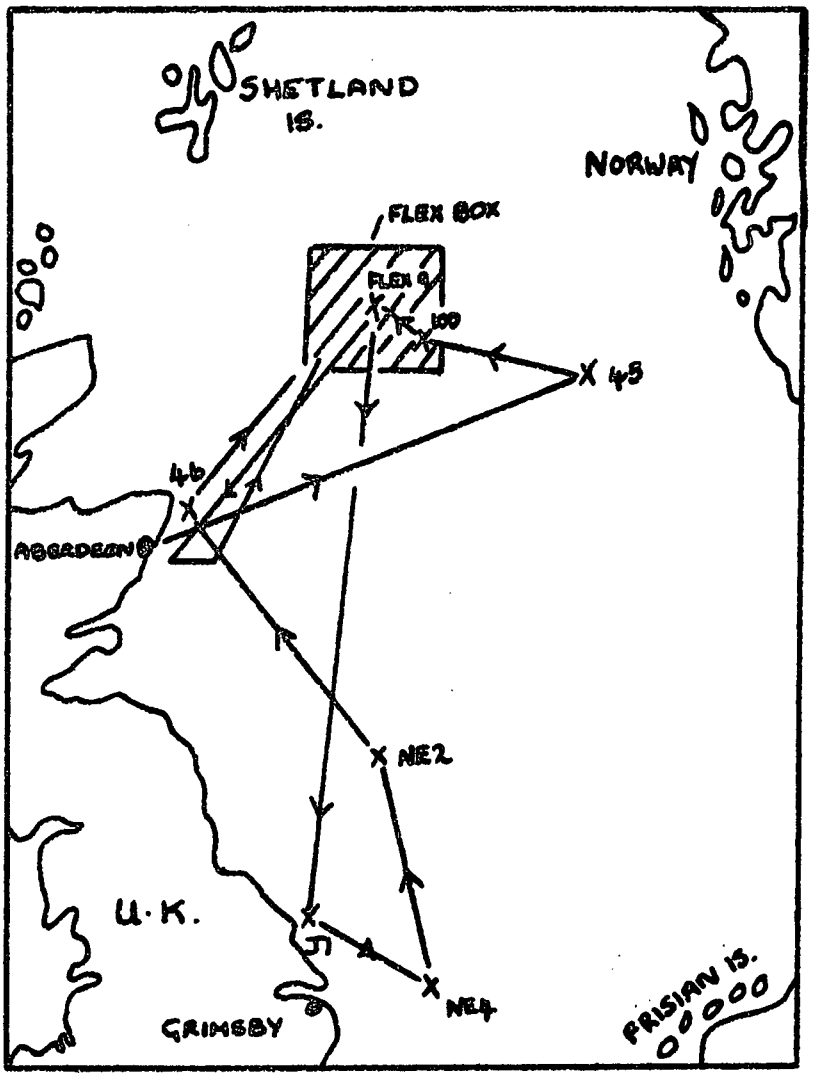
CHLOROPHYLL 5–9 MAY

APPROX. VALUES IN MG/M^3

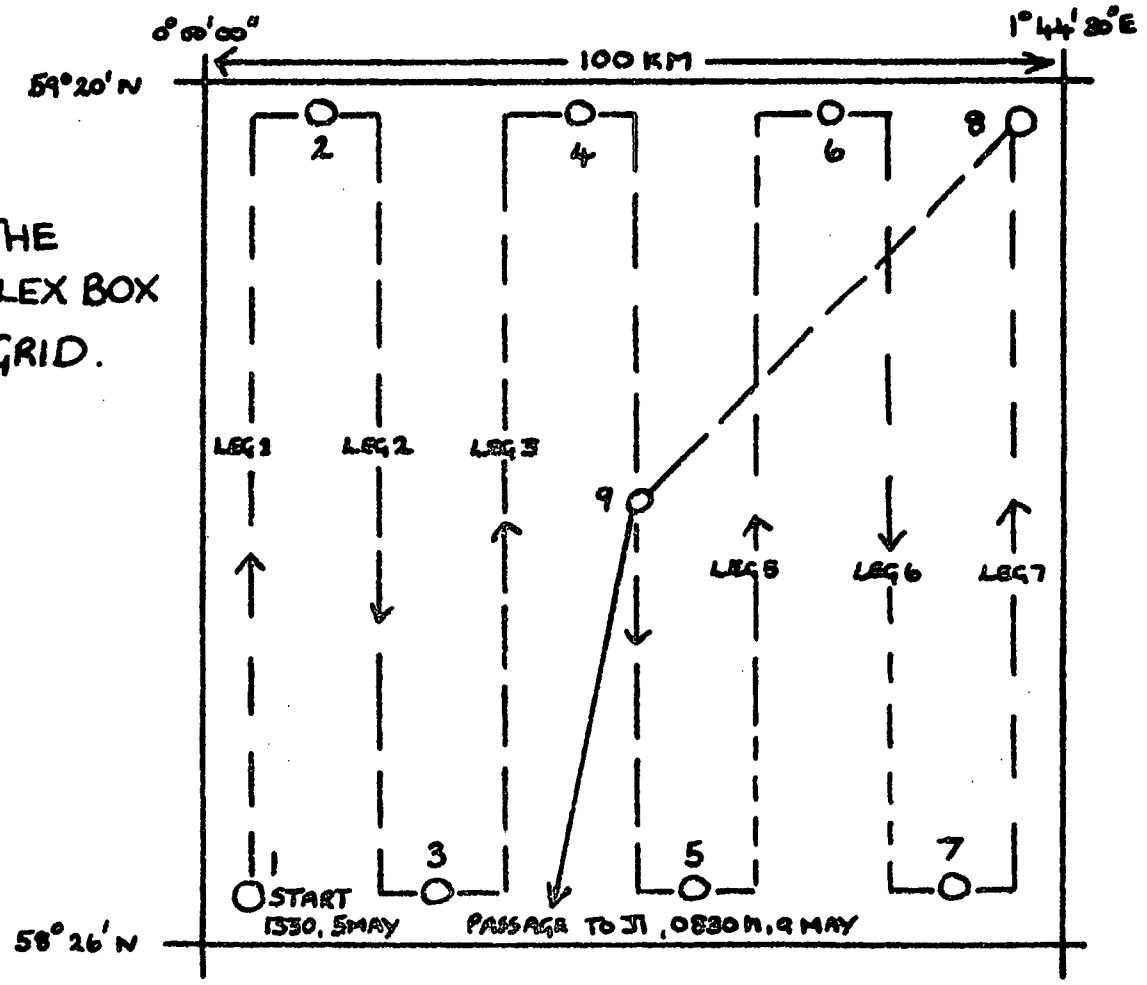
FIG.2.

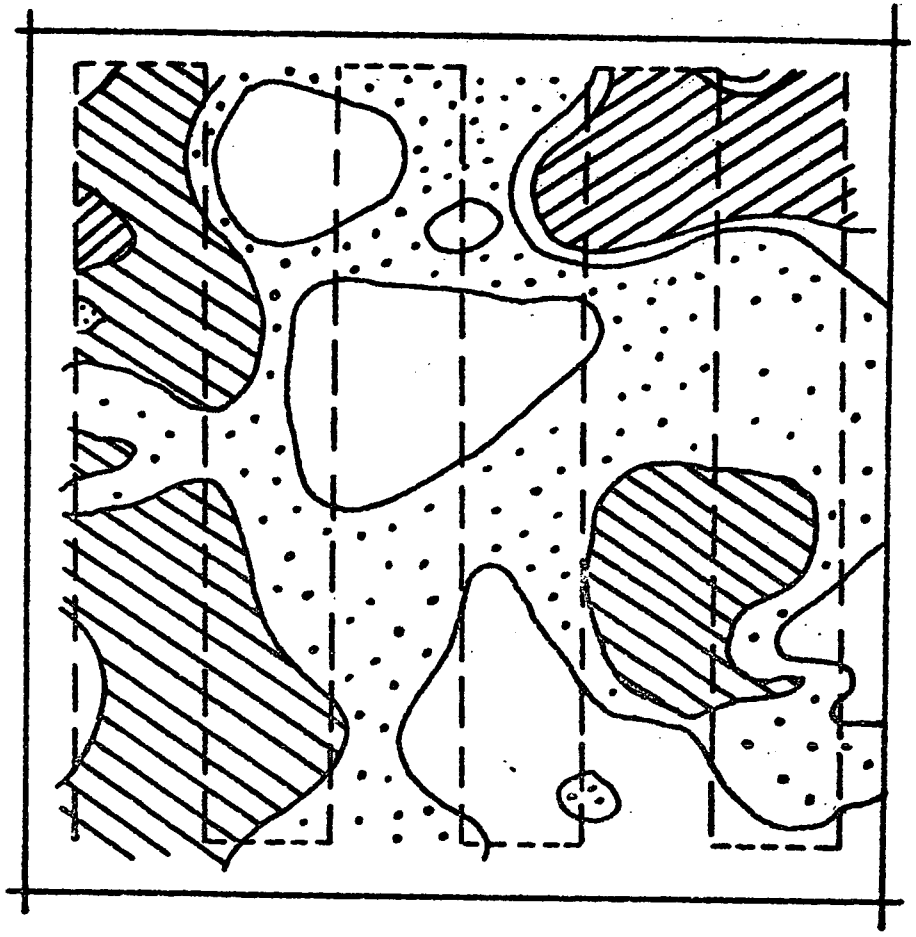
(a) GENERAL TRACK CHART FOR PART 2 OF CRUISE

(FINAL PASSAGE FROM FLEX BOX TO GRIMSBY OMITTED)



(b) THE FLEX BOX GRID.

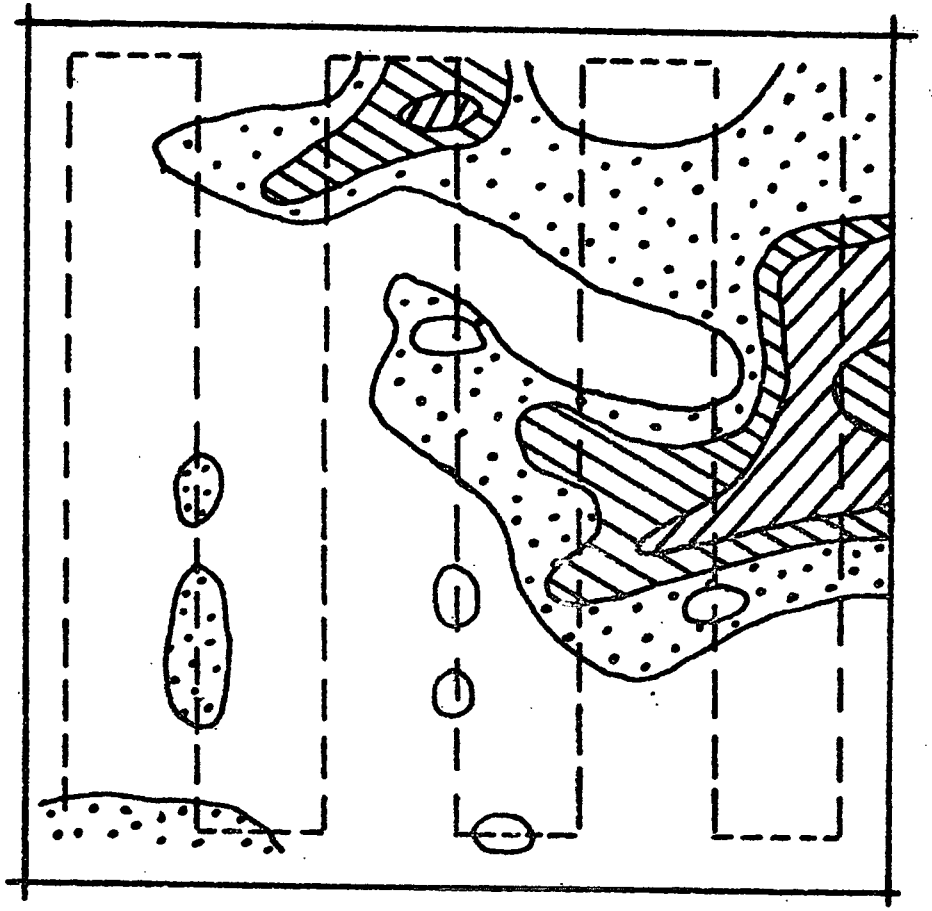




(a) PHYTOPLANKTON

5-9 MAY

<5 ; 5-10 ; 10-20 ; >20



(b) ZOOPLANKTON

5-9 MAY

<5 ; 5-10 ; 10-15 ; >15

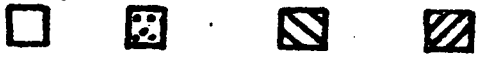


FIG. 3. FLEX BOX SURVEY, 5-9 MAY.

Units in both Figs. based on volumetric analysis of phytoplankton and zooplankton samples divided by the flowmeter readings