CONTINENTAL SHELF NORTHERN UNIT
Internal Report No. 79/6

CRUISE REPORT ON ~~SECOND~~ FIRST LEG OF "WHITETHORN" CRUISE NO. 79/03

7th - 28th ~~JUNE~~ MAY, 1979.

by

R. Owens

CONTENTS

1. Introduction

The second leg of cruise 79/03 initiated the CSNU regional shallow sampling programme in the Halibut Bank 1:250,000 sheet area. (60^{o}-61^{o}N; 0^{o}-2^{o}E) Poor weather, personnel and equipment problems caused diversion of activities to stand-by work areas in the Shetland 1:250,000 sheet area for a significant proportion of the leg. A total of 171 sites were occupied. The survey log forms the appendix to this report.

2. Personnel

R. Owens	IGS, CSNU	Party Chief
J. Chesher	IGS, CSNU	Technical Supervision 7-14.5.79
S. Brown	IGS, CSNU	Night Geologist
C. Graham	IGS, CSNU	Navigation/Day Lab
R. Sutherland	IGS, CSNU	Day Lab
P. Wiggins	IGS, CSNU	Technical Officer 7-11.5.79
H. Robertson	IGS, CSNU	Technical Officer 14-28.5.79
M. Thatcher	IGS, CSNU	Navigation
A. Davies	IGS (A & C)	Night Lab

3. Equipment

a) Ship's

i) 8t hydraulic anchoring winches, bow and stern.

ii) six Danforth anchors

iii) 30t winch and "A" frame (derated to 15t) for vibrocorer handling.

b) IGS

i) 6m vibrocorer, with "penetrometer" system.

ii) gravity corer (rock and sediment) with Sykes winch.

iii) Shipek grab with Lebus winch.

iv) Cone dredge

4. Ship's Performance

i) Anchoring Winches - throughout leg 2 problems and breakdowns were experienced with the 8 ton hydraulic anchoring winches. They appear not to be strong enough to meet the loads imposed when anchoring in anything other than slight swells.

Initially the problems appeared to be confined to leaks in hydraulic piping and general lack of maintenance. However, on 19.5.79, back-pressure in the hydraulic system occasioned by swells resulted in a complete failure of the forward hydraulic winch. Similarly, on 27.5.79 back pressure appears to have been the cause of a rupture in the hydraulic piping on the after winch.

ii) "A" Frame and Winch - this equipment, used primarily for vibrocoring, performed satisfactorily. Although it was not possible to operate the winch and "A" frame simultaneously, this did not detract from the ease of handling the vibrocorer on launch and recovery.

The equipment is tested to 30t capacity, but derated to 15t to comply with the safe working load of the 32mm warp. On several occasions the winch was halted by the required full on extraction of the vibrocorer exceeding 15t. The "A" frame was then "rammed" out to provide the necessary additional full to achieve extraction.

iii) General - "Whitethorn" and her vibrocorer handling system provide a safe and stable sampling platform with the ability to attempt our preferred type of work in fairly extreme conditions. Particular note must be made of the quality and competence of the ship's officers. Their ability and enthusiasm contributed significantly to providing a measure of success during a difficult leg.

5. IGS Equipment Performance

i) Vibrocorer - the "old style" vibrocorer performed well at all times and few problems were encountered.

Some damage to the splice on the main warp was occasioned by interference from the bowsing hook. This will be eliminated on leg 3 by installation of a tri-plate assembly.

A single incident of damage to the main warp was caused by its having fouled the lower stops for the vibrocorer motor pot. The possibility of a recurrence has been partially eliminated by removing the right-angle edges at the base of the stops. However, it remains possible that the pot and the upper edge of the stops may still cause damage to the warp if it falls into the frame.

The "penetrometer" performed well, with most problems encountered traceable to cable damage. One result of having an accurate indication of corer performance on the seabed was that vibrating time was reduced from the standard 30 minutes to a maximum of 12 minutes and commonly, less than 5 minutes. On some occasions it was found that full penetration had been attained without vibration. However, accurate knowledge of seabed performance has also revealed that we often lose 50% of penetration, presumably on extraction from the seabed. Although use of a piston probably served to minimise the loss, urgent attention to catcher design and/or some water flushing system is required.

One side effect of the necessity to alter our power cable runs on the vibrocorer to accommodate the penetrometer is that the use of a "flying lead" to transmit power to the pot has eliminated damage due to the cable being "nipped" between the pot guides and frame. No single

incident of power cable failure due to this type of damage occurred. In fact, the almost total absence of power cable problems was one of the highlights of this leg.

Vibrocoring is the main method of sampling on this cruise. The presence of a three phase 440v supply is therefore essential to the successful operation of the ship. The failure of the no. 1 generator (Dawson-Keith) on 12.5.79 was directly attributable to inundation by heavy spray during the day preceeding.

ii) Gravity Corer - once more we have been plagued with problems caused by inferior or unsuitable wire (see report 78/10). Two of the three gravity corers lost on this leg were lost because of the wire snapping under strain. Precautions taken included removal of lengths of wire whenever kinks started.

Enquiries made at Lerwick established (in the opinion of Messrs. L.H.D. Ltd.) that the type of wire we were using was unsuitable for marine use. An alternative specification was suggested and an immediate order for 1000m placed.

The loss of one of the gravity corers may be attributable to use of an open hook for securing the corer when not in use. This was replaced by a shackle and, as a further precaution, a length of chain was mounted across the trough.

In an effort to reduce the jerk loads on the gravity corer during launching a "flying tail" of rope was secured to the corer shackle. This was used to bowse the corer during launch, by restraining it on a cleat welded to the trough. I recommend this be adopted as standard practice.

Deep cuts in the trough restraining ring were again a problem. The tendency for this to occur has been reduced by a hard weld on the inner face of the ring, made during a port call.

The redesigned "throat" of the trough is very effective in controlling the corer during the last stages of recovery.

An apparent lack of quality control resulted in difficulty again being experienced in mounting 4" sediment barrels on the gravity corer baseplate. This problem was encountered in 1977 and 1978 and has previously been noted (eg. report 78/10).

iii) Shipek Grab - the Lebus winch supplied by RVB was in very poor condition and should not have been installed on a ship in the state encountered. Apart from having to wind on a reasonable length wire before it could be used, the condition of its brake and clutch made operation difficult and, occasionally, hazardous. Stripping the clutch mechanism after it had siezed revealed a total absence of lubricant and confirmed the suspicion that the winch has not been maintained for some considerable time.

The drum speed of the Lebus winch was very slow and resulted in delay on station when repeated drops of the grab had to be made. I would regard this type of winch as inadequate for the job required.

One feature prominent during this leg was the generally poor recovery made with the Shipek grab. Until such time as its seabed performance is seen and analysed we are faced with the problem of continuing to operate with an inadequate and apparently selective seabed sampling device.

6. Geological Results

A total of 171 sites were occupied, as follows.

Area	Total Stations	Shipek Grab	Cone Dredge	Gravity Corer	Vibrocorer
Halibut Bank SW	123	95	10	75	48
Halibut Bank SE	19	13	6	11	8
Shetland	29	10	4	13	13

In the Halibut Bank area the superficial sediments sampled were generally similar to those sampled elsewhere in the North Sea. They are commonly well sorted medium-fine quartzose sands. Carbonate content was generally low (10%) and consisted largely of shell debris in shallow waters (<120m) with foraminifera dominant in the deeper areas.

Cores, particularly the vibrocores, showed a more interesting situation. In Halibut Bank SW, between 60^{o}-$60^{o}15'$N and 0^{o}-$0^{o}30'$E reddish-brown silty clays and tills were encountered beneath the superficial sediment layer. These deposits closely resemble deposits sampled in Shetland NE and SE in earlier years. They were also indistinguishable from deposits sampled in St. Magnus Bay (Shetland NE) during stand-by work. This suggests they are derived from the Devonian rocks on and around the Shetland Isles. In the case of the till-like deposits, they may be true land tills since they show little similarity to glacio-marine tills.

North and east of the area detailed above the reddish brown deposits are represented only by very thin, poorly developed lenses and laminae of silty clay. Here they overlie a compact grey muddy sand, though to represent a glacio-marine till.

In the centre of the Halibut Bank SW sheet several cores, taken in water depths shallower than 130m, revealed a well sorted shelly gravel

overlying the (?) glaciomarine tills. The appearance of this unit is identical to one sampled in the Cormorant sheet during 1978.

East of 1°E, in Halibut Bank SE, a monotonous sequence of grey-green silty clays was sampled in water depths greater than 125m. In the extreme south of the area the shallower waters produced further (?) glacio-marine tills, including one sample of black, very tough mud identical in appearance to deposits encountered in Cormorant. Here, the superficial sediment layer is very thin and it appears that the tough black muds may form a basin in which the soft silty clays were deposited.

The limited results of this cruise suggest the shallow geology of the Halibut Bank sheet to be both complex and interesting. Hopefully the apparent similarities with the Shetland and Cormorant sheets will be an aid to interpretation.

Work in the stand-by area generally confirmed the previous interpretations of the area.

A vibrocore sample of considerable interest was obtained in the Wick of Tresta, Fetlar. This proved over 2m of a shell sand with a lithic fraction containing a high amount of magnetic mineral (? Magnetite). A sample of this sediment will be geochemically analysed. Depending on results, this deposit may warrant further examination.

7. Conclusions

1) Generally the "Whitethorn" is well suited and adapted for sampling.

2) The anchoring system is a weak point. Apart from the question of reliability, the capacity of the winches (8t) is inadequate. This has the effects of both prolonging anchoring operations and restricting sea conditions in which anchoring can be safely undertaken.

3) In the conclusion to report 78/10 I wrote "... it is possible that the pull required to overcome the shear strength of the sediments ..... is in excess of 15t". The experience last year on "Cape Shore" with an 18mm warp and the fact that the vibrocorer winch was halted on several occasions (indicating a pull of 15t) fully vindicates Coe's insistence that a 32mm warp be used.

4) The forepeak location of the 440v, 3 phase generator was predicatably unsound, particularly when previous experience with "Whitethorn" and "Briarthorn" had shown the location to be subject to heavy spray in a sea. One of the empty holds would have provided a more suitable location.

A further questionable point is that IGS provided the 440v, 3 phase power supply. This could have been provided by the ship, had it been stipulated in the contract.

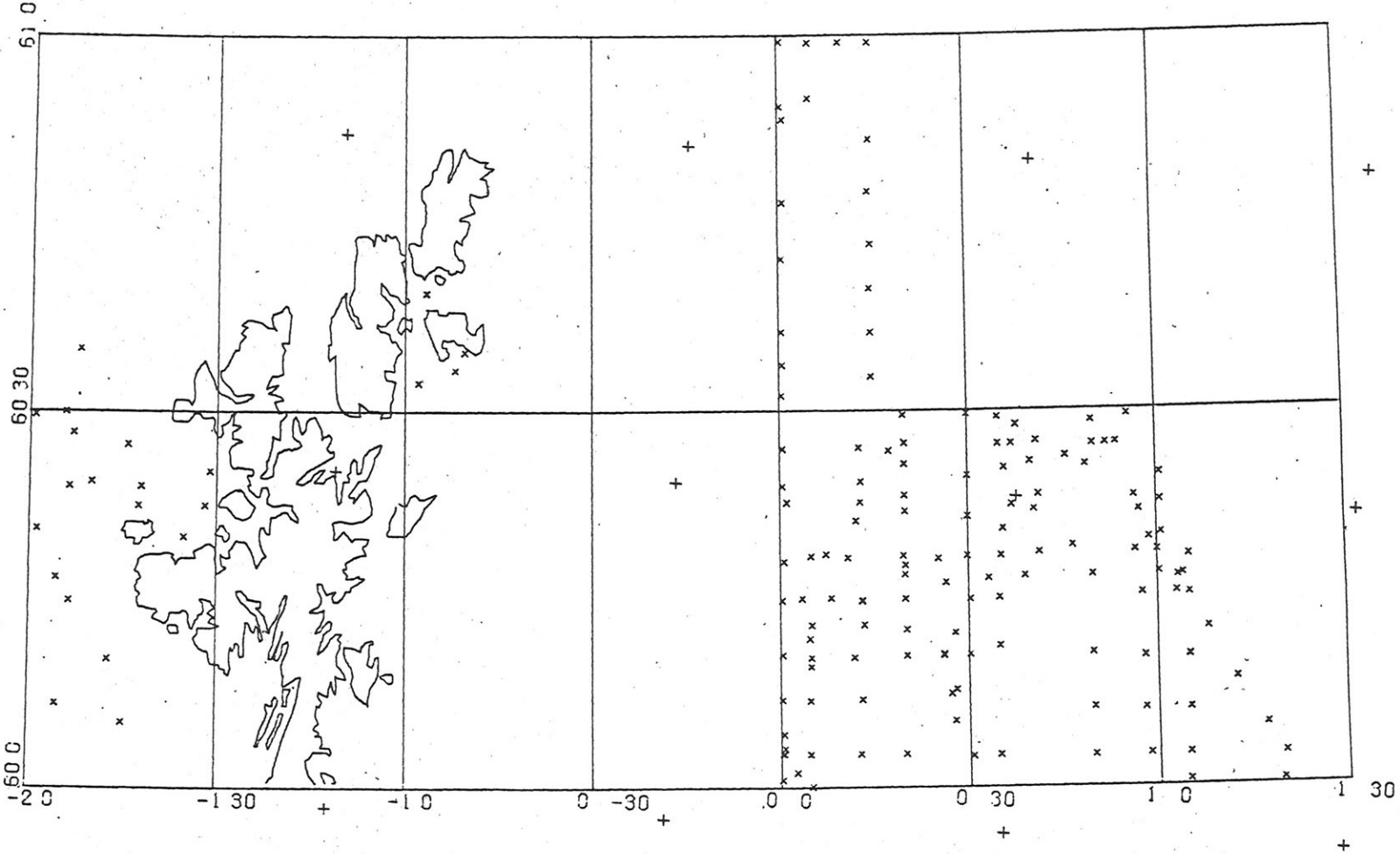
5) The experience with the gravity corer warp should not be repeated.

8. Recommendations

1. At the end of the season, all technical staff and party chiefs should meet to discuss the successes and failures of the season. Otherwise, valuable information on important aspects of ship and equipment performance may not be adequately aired and assessed.

2. On charters where a winch operator is available from the ship's personnel for night routine sampling work, no night navigator is required. The day navigator, night geologist and party chief can, between them, adequately cover the limited amount of work generated at night.

SAMPLE STATIONS - CRUISE 79/03, LEG 2.



Survey Log

Monday 7th May, 1979

0700 Entered Ardrossan for routine port call.

1400 Sailed en route for Halibut Bank. Departure delayed by difficulties experienced taking on potable water. Atlas-Deso echo-sounder still u/s despite attention from Decca engineer; track plotter much improved.

Tuesday 8th May, 1979

En route for Halibut Bank. Checked, adjusted and repaired penetration indication system; constructed core storage pallets; completed lab and workshop installations; arranged navigation and plotting work-area. E.T.A. at $60^{o}N00^{o}$ 1030 hrs. tomorrow. P. Wiggins designed and constructed "stools" to improve vibrocorer recovery and deck storage.

Wednesday 9th May, 1979

1045 Commenced anchoring at first vibrocorer station (60+00/35).

1130 Anchored up, commenced launching vibrocorer.

1200 Vibrocorer on bottom.

1205 Power on; one penetrometer readout defective, changed to spare which appeared O/K, but with "tilt" and "update" flashing. Shipek grab winch only had 50m cable.

1245 Commence recovery.

1440 Forward hydraulic winch (anchor) fails - leaks - vibrocoring suspended; commence gravity coring during repairs.

1935 Testing bow anchor on station 60+00/41

2045 Failed at second attempt to anchor - anchors not holding on hard bottom. Bow winch being modified for free fall. Agreed with J Calder (Wimpey ganger) to commence anchoring at 0700 hrs.

2100 Re-commenced gravity coring and shipek grabbing.

Thursday 10th May, 1979

0600 Cease gravity coring and steam for first vibrocorer station.

0710 Commence anchoring on first station.

2200 Cease vibrocoring and steam for first gravity coring station.

Six VE stations occupied during period 0710 - 2200 hrs.

Friday 11th May, 1979

0700 Steaming for first vibrocore site. Sea state 5, tack welds securing three spare VE pots fail and pots break loose; secured by mate.

0720 Commence anchoring; delayed by problems with forward anchoring winch.

0800 P. Wiggins reports ill.

1145 Approaching second vibrocorer site, weather force 7, sea state 5+, conditions deteriorating; decided on early steam to Lerwick to put of P. Wiggins for medical attention.

1800 Anchoring in Lerwick harbout. IGS personnel (P. Wiggins, J. Chesher, R. Owens) ashore by pilot boat.

2030 Weigh anchor and sail for work area.

Saturday 12th May, 1979

0120 Commence gravity coring.

0400 Night shift reduced to 2 men - C. Graham retired to join day shift; ship's officer assisting with navigation.

0645 Cease gravity coring and sail for first vibrocore station.

0745 Anchored. Delay in launching vibrocorer as No. 1 generator found to be u/s (no voltage); No. 2 generator also u/s ((a) flat starter battery (b) no insulation on wiring (c) water in fuel).

0900 VE launched following repairs to No. 2 generator by ship's engineer and Wimpey fitter. (nb: both generators considered damaged by seawater shipped yesterday).

2145 Vibrocoring completed for the day (six stations); commence gravity coring.

Sunday 13th May, 1979

0600 Cease night operations and steam for first VE site.

0725 On first VE site, dropping stern anchor.

2230 Completed seventh vibrocore site, steaming for first night station. Barrel damaged on recovery owing to ship movement - bow anchor was inadvertantly not dropped; communications problem, J. Chesher to discuss with T. Hart.

Monday 14th May, 1979

0140 Shipek winch fails.

0345 End night work, steam for Lerwick.

0800 Approaching Lerwick, wind force 8.

0900 Ashore at agents arranging for equipment repair/replacement.

1415 J. Chesher leaves ship.

1700 Electricians repair standby (Lister) generator found defective by R. Owens/J. Chesher when testing; report Dawson Keith main generator not repairable - fault appears to lie in voltage regulator, not obtainable in Shetland.

1715 Hay and Company report unable to obtain replacement generator on hire.

1755 Forecast W/SW 7 - 9 decreasing 6 - 8 and veering north. Arrange to sail at 0630 hrs. 15.5.79.

Tuesday 15th May, 1979

0630 Sail from Lerwick heading for work area. Strong SW winds.

1050 On site anchoring; wind WSW 6, sea state 5.

1130 Cable fault - fuses blow on switchboard. Recover vibrocorer for tests/repair. Fault eventually traced to break in power tail and station completed.

1610 Proceeding to next vibrocorer station.

2240 End vibrocoring, steam for first night sampling station.

Wednesday 16th May, 1979

0017 Gravity corer lost - kink in wire snagged in pully.

0200 Corer replaced, continue working.

0720 Commence anchoring for vibrocoring. Problems with stern anchor - had to be lifted and re-positioned as dragging. this delayed completion of first site until 0950.

1405 Bow anchor recovered fouled at third station.

1535 Anchor cleared.

2030 Bow anchor failing to hold on site 6. Site abandoned because of this and electrical problems.

2145 Hove to for repairs to bowsing winch.

2300 Repairs to bowsing winch completed; steam for first vibrocoring site.

Thursday 17th May, 1979

0200 Wind NE6, sea rough with heavy swell; decide to continue coring.

0615 Finished night work.

0630 Vibrocoring impossible; wind N 8 and sea state deteriorating. Steam for sheltered standby work areas.

1500 Commence vibrocoring SW of Fetlar. Wind NE 8.

1900 Link call to Bracknell (Met. office) - advised wind should abate within next day or so. Decided to attempt return to work area for 18.5.79.

2130 Proceeding to Wick of Tresta for the night.

Friday, 18th May, 1979

0400 Weigh anchor and sail to test conditions.

0530 Rolling heavily; course altered to SW to establish viability of course to south of Shetlands.

0630 Decide to head NE towards work area to further test conditions. Heavy swell from N.

0930 Hove to near first vibrocore site, testing seas.

1040 Wind NNW 6, Sea state 5, heavy swell. Anchoring considered impractical owing to possibility of damage to anchor winch.

1100 Commence spooling new wire onto gravity corer (corer and all wire lost during night, possibly around 0530 hrs. thought due to safety hook jumping off corer during heavy roll.); fit safety chain and repack reels of cable which came adrift in heavy seas.

1500 Commence coring. Heavy northerly swell.

2100 Whilst cutting wire to prepare strop for gravity corer spark from grinder ignited hydrogen given off from battery charger and caused minor explosion, sufficient to crack battery casing. Fragments of filler cover struck R. Owens on leg. Battery charging area should be changed or thoroughly ventilated during charging.

Saturday 19th May, 1979

0630 Steaming for first vibrocorer site.

0750 Commenced anchoring.

1020 Second vibrocorer station, winches paying out on hold; heavy swell and wind NW 5-6, snow showers. Unable to hold ship on bow thruster. Vibrocorer recovered with severely bent barrel.

1100 Hydraulic failure on forward anchor winch. Motor removed from aft winch to recover anchor as no spare available.

1400 Forward anchor recovered. Down time logged as 1100-1400 as conditions unsuitable for further vibrocoring.

1505 On site for first gravity corer station.

1530 Gravity corer lost on launching; it had just been started down the chute when it was accelerated by a heavy roll and the strain on braking appears to have been sufficient to sever the wire.

1545 Sampling abandoned - wind NW 7 with heavy swells.

1605 Phoned D. Evans in attempt to obtain instruction from D. Ardus as to how the contract situation should be played with regard to down time.

1915 D. Evans phones - unable to contact D. Ardus; has spoken to T. Hart who accepts ship cannot operate properly in circumstances. He would prefer if we remained on charter and would wish to come to a reasonable arrangement re payment for this period. D.Evans confirms cable and corers will be delivered to Lerwick.

1930 Discussed contract situation with captain - agreed to draw up document showing position of respective parties on equipment and weather down time.

2115 Commenced gravity coring - only two corers remain.

2400 Wind S-SE 7.

Sunday 20th May, 1979

0400 Wind S-SE 7/8.

0510 Gravity coring and shipek grabbing suspended due to severe weather conditions.

0630 Night crew report further problems with gravity corer wire unlaying and kinking. A further length was removed and a new Talurit Eye spliced on. Bowsing the gravity corer down the chute by means of a flying tail appears quite successful, although problems are experienced on recovery due to entanglement in the lifting warp. Ship dodging to weather in SSE gale.

0800 Captain advises phone call received from Wimpey shore rep. at 2330 last night; the spare part required is not on the Briarthorn, as previously considered, but may be available direct from the manufacturers. An attempt will be made today to contact the manufacturers and locate the component, if available.

1120 Statement of "down-time" position drawn up and given to captain - see pages 14-16 of log.

1415 Forecast continuing E/SE 8. Set course for Shetlands and work in sheltered standby area. Will attempt two anchor mooring using two stern anchors and bow thrust to fix position.

1800 Arrive NW of Fetlar, commence transfer of hydraulic pump from bow anchor winch to stern anchor winch and then anchor up; check position keeping then core. Moved on wires and repeated exercise. Two vibrocore stations occupied in shallow water (38m) with satisfactory position keeping.

2110 Tensioning anchor cables.

2300 Commence passage through blue sound to west of Shetland for sheltered night work.

Monday 21st May, 1979

0000 Commence gravity coring/grabbing in Yell Sound. Wind SE 8.

0550 Suspended operations - weather too severe.

0630 Forecast Viking S-SE 7/8, Loc. 9; Fairisle E 6/8 increasing Loc. 9.

0640 Under way to sheltered work locations in St. Magnus Bay.

0915 On first location; unable to anchor owing to siezed spooling gear on after winch. Commence down time.

1400 Forecast Viking SE 7/9; Fairisle E or SE 7/9. Present wind SE 8. Wimpey fitters continue attempting to rectify fault. J. Ball advises spare part (pump) will be at Lerwick 0900 tomorrow.

1600 Port aft anchor dropped to tension wire. Difficult on recovery owing to problems with spooling gear.

1805 On site for vibrocoring. End of down time.

1915 Vibrocorer recovered; lifting warp damaged by being nipped by pot guided against the stopper(s) at the bottom of one of the

runners. There also appears to have been additional damage caused by cable looping under the stopper. The possibility of the second type of damage recurring has been eliminated by removing the straight (horizontal) edge responsible. The damage to the cable is such that, for safety of continuing operations, the damaged section must be removed and a new splice formed. This can be done when alongside uplifting the spare part(s) for the anchoring winch at Lerwick tomorrow. Effort will be made to purchase a tri-plate, or similar device, to eliminate damage to the splice caused by pressure from the bowsing hook. The damaged section of wire was inspected by the captain who considered it safe to occupy a further station.

2140 Vibrocorer recovered from second station.

2225 Anchors up; proceed to first night station.

2325 First gravity coring station. Three large kinks develop in wire when ramming 'A" frame out. Approx. 10m wire removed and new splice made.

Tuesday 22nd May, 1979

0300 Completed gravity coring and steamed for Lerwick.

0945 Moored at Lerwick.

1000 Hay & Company (agents) establish that hydraulic pump still in Aberdeen and not at Sumburgh, as arranged. Best ETA 1700hrs. Phoned D. Evans and advised present situation; office to contact ship tomorrow instead of routine call.

1030 L.H.D. commence cutting and re-splicing vibrocorer wire.

1300 Discover deep grooves in gravity corer outer loop - almost half through tubing. Arrange for hard steel welding to be done.

1730 Welding finished (started 1600 hrs.).

1800 Forecast Viking S-SE 5/6 becoming 7; Fairisle S-SE 5/6 becoming NE 4/5. Decide to work in St. Magnus Bay as continuing southerly winds have built up heavy swell in Halibut Bank area.

1845 Hydraulic pump arrives.

1900 Sail from Lerwick.

Wednesday 23rd May, 1979

0008 Commence gravity coring and grabbing

0645 Cease gravity coring and grabbing.

0720 Commence anchoring at first vibrocore site, St. Magnus Bay.

1340 End of third vibrocore station; sail for Ura Firth (Hills Wick) to uplift Decca technician to repair faulty track plotter. Three hours down time.

1725 Anchoring at fourth vibrocore site.

2100 End of vibrocoring at fifth site.

2135 Commence gravity coring.

2230 Lebus winch (shipek) fails to start - ? water in fuel. Eventually cleared and runs. Forecast for Viking SE 6, occ. 8, becoming S 4. Will break off night work after 1230 forecast and sail for work area.

Thursday 24th May, 1979

0050 Forecast Viking SE 5/6. Sail for Halibut Bank.

1200 On first vibrocorer site.

1840 On site 3, delay while penetrometer wiring replaced. Phone call with J. Chesher today confirmed (a) 1000m wire for gravity corer to be uplifted in Lerwick. (b) hired generator to be installed even if Dawson-Keith is repaired.

2315 Finished vibrocoring, sail for first night site.

Friday 25th May, 1979

0640 Finish gravity coring, sail for first vibrocorer site.

1530 Attempt routing call to office - delays with Shetland/Wick radio traffic did not allow call to be made by 1630 hrs.

2115 Complete vibrocoring, sail for first night site. Eight vibrocore sites sampled.

Saturday 26th May, 1979

0600 End gravity coring, steam for first vibrocorer site.

0705 Commence anchoring at first vibrocoring site.

2330 Anchors up at eighth vibrocorer site; sail for first gravity corer site.

Sunday 27th May, 1979

0650 End gravity coring.

0800 Commence anchoring at first vibrocorer site.

1000 Site completed; wind NE 7. Steamed west awaiting better conditions.

1230 Hove to testing conditions.

1300 Commence second vibrocorer site.

1500 Gale warning Viking S 8 increasing 9 imminent.

1700 Complete third site; sea state confused with swell straining winches to damage point (heavy hydraulic leaks).

1740 Rising confused swell and sudden rise in barometric pressure. Captain advises he considers it unsafe to anchor again. In view of sea state, forecast and possible damage to equipment decided to sail direct for Lerwick and attempt to avoid worst of Force 9.

2250 Alongside at Lerwick.

Monday 28th May, 1979

1630 C. Deegan aboard.