# R.V. FRANKLIN

## NATIONAL FACILITY
## OCEANOGRAPHIC RESEARCH VESSEL

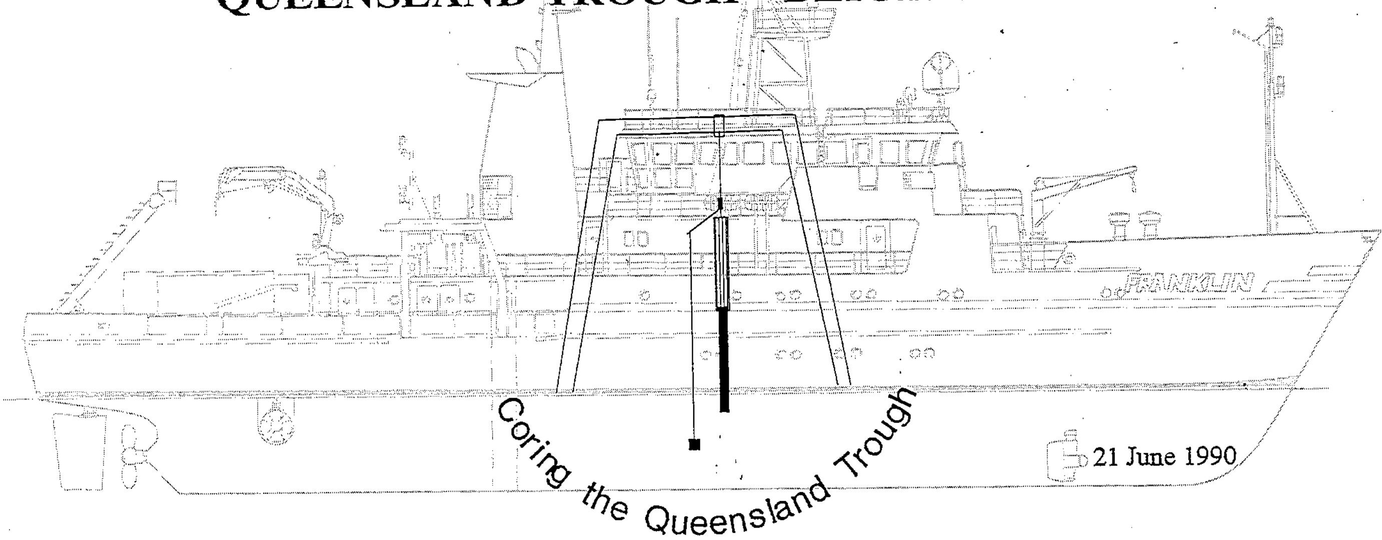
**RESEARCH SUMMARY**

**CRUISE FR 5/90**

Sailed Townsville 1000 Friday 25 May 1990
Arrived Townsville 1330 Tuesday 5 June 1990

**Principal Investigators**
Professor Bob Carter, Drs Craig Fulthorpe and David Johnson
**James Cook University**
&
Dr Lionel Carter
**New Zealand Oceanographic Institute**

# DEEP SEA SEDIMENT TRANSPORT IN THE QUEENSLAND TROUGH - BLIGH CANYON

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AUSTRALIA
R.V. FRANKLIN IS OWNED AND OPERATED BY CSIRO

# O.R.V. FRANKLIN

# REPORT ON CRUISE FR 5/90

# GREAT BARRIER REEF WATERS EX-TOWNSVILLE

May 25 - June 10, 1990

(Julian Days 139-150)

## GENERAL

### TIME

All cruise records were kept in terms of GMT, which was 10 hours behind Australian Eastern Standard Time for the duration of the cruise.

### DEPARTURE AND ARRIVAL

Vessel's departure was delayed for 2 hours to allow completion of loading of scientific gear. Finally departed Port of Townsville at 0000z/JD139 (1000h/May 25). At the end of the cruise, the vessel docked at Townsville at 0335z/JD150 (1335h/June 5).

### CSIRO OPERATIONS

R. Edwards, E. Madsen

### SCIENCE PERSONNEL

R.M. Carter, D.P. Johnson (Co-chief Scientists, JCUNQ), S. Blake, C.S. Fulthorpe, K. Hooper, J. Hughes Clarke, P. Larcombe (JCUNQ), C.C. von der Borch (Flinders University), J. Hunt, J. Mitchell (NZOI).

### WATCH PROCEDURE

The scientific party observed 6 hour watches, as follows:

**Watch A** (0800-1400 h and 2000-0200 h)
Johnson, Hunt, Larcombe, Hughes Clarke, Fulthorpe

**Watch B** (0200-0800 h and 1400-20000 h)
Carter, von der Borch, Mitchell, Hooper, Blake.

## AIMS

To collect seismic information and piston cores from the Great Barrier Reef shelf, and slope adjacent trough in order to:

* provide ground-truth observations for the available GLORIA imagery

* investigate sediment transport from shelf to basin

* investigate the geo-mechanical properties of slope sediment with respect to mass-failures evident on the GLORIA mosaic

* gather data on water quality, including fluorometer and thermo-salinographic measurements for use in the interpretation of reflectance from sateloscience equipment from ORV Franklin.

## CRUISE RECORDS

* Full track on 12 kHz SIMRAD sounder

* 14 rolls of 3.5 kHz profiles

* 1 roll of airgun profiles

* 7 grab samples

* 32 piston cores

* JCU Cruise Log FR 5/90

* CSIRO DELP Cruise Log FR 5/90

* fluorometer and thermo-salinographic records

## SUMMARY

Strong southerly and southeasterly winds produced rough sea conditions at the start of the cruise (JD 140-143) and on the last two days (JD 148-149). Parts of the planned offshore survey were therefore replaced by seismic profiling and coring in inter-reef passages and in the mid-shelf reef lagoon. From JD 144 until JD 148 sea conditions were moderate to excellent, under the influence of 10-15 knot southeasterly winds, and a full offshore coring and profiling programme was implementd. Data collected on the cruise are summarised in the track and core charts (Figs. 1, 2) and Tables 1-4, and comprised:

* a 12 kHz sounder record for the entire cruise

* 1097 nm (2021 km) of 3.5 kHz seismic profiles

ORV Franklin 05/90

TRACK CHART, OPERATIONS FROM GRAFTON PASSAGE NORTHWARDS

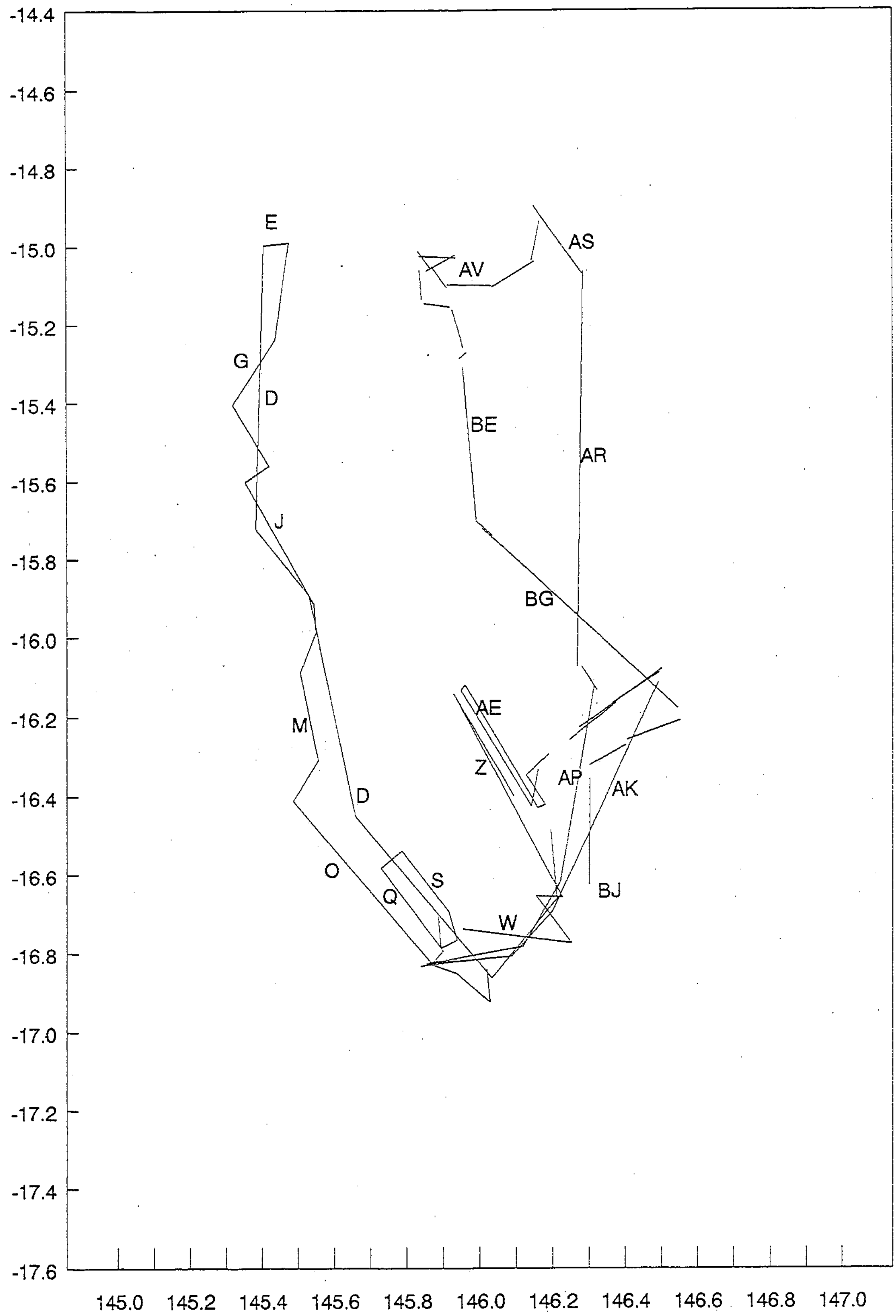



Figure 1. Track chart for 3.5 kHz lines from Grafton Passage northwards. Selected lines lettered in correspondence with Table 1.

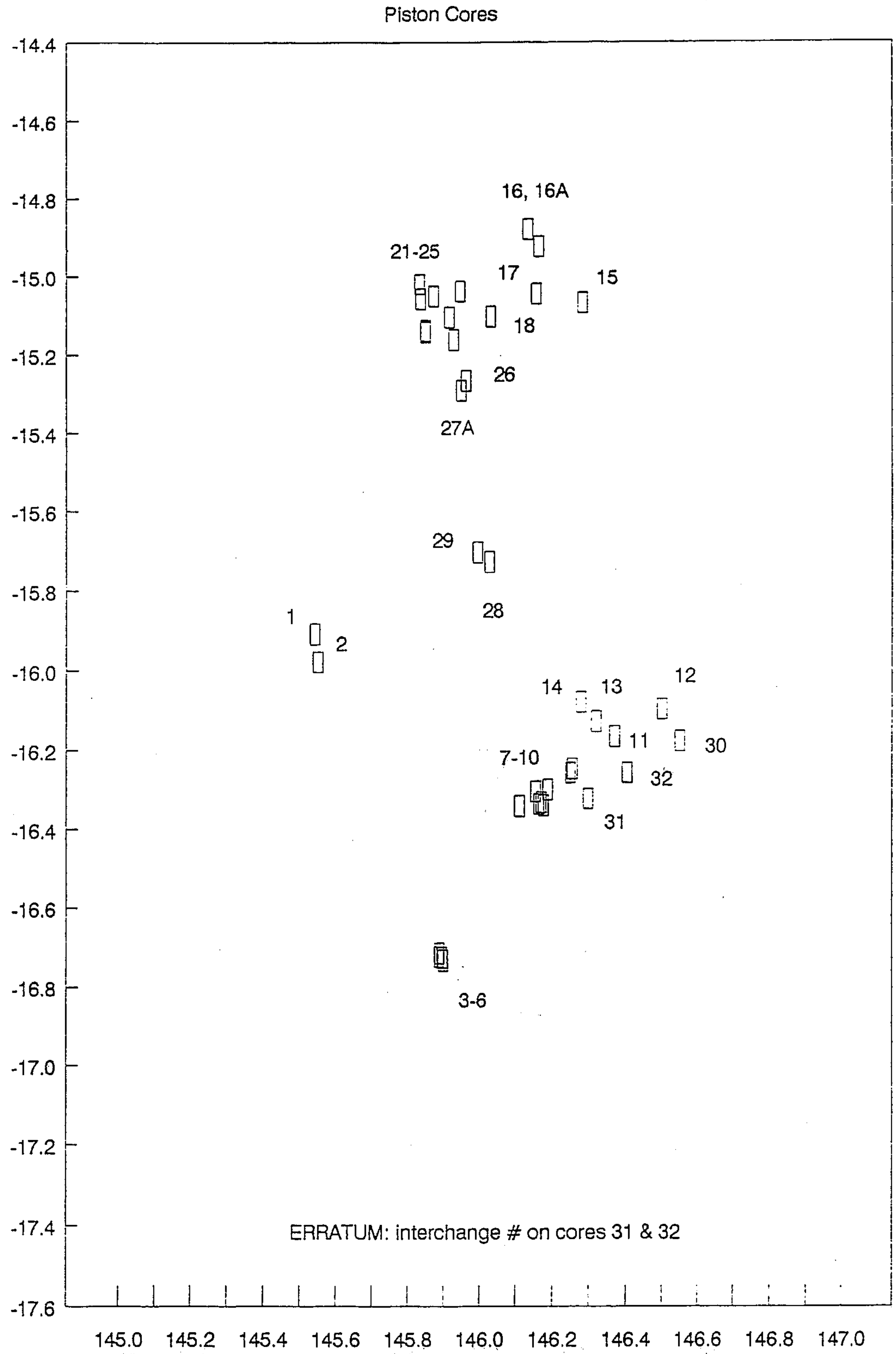



Figure 2. Plot of locations of piston cores collected. Numbers correspond to those in Table 2.

# TABLE 1

# SEISMIC, PDR & SOUNDING LINES

1 = 12 kHz Sounder 2 = 3.5 kHz PDR 3 = Seismic, 20" gun 4 = Seismic 5" gun

| LINE | START | LAT (S) | LONG (E) | END | LAT (S) | LONG (E) | DIR | GEAR | NM | KM |
|---|---|---|---|---|---|---|---|---|---|---|
| A | 1910/139 | 16 13.8 | 146 16.5 | 2300/139 | 16 04.8 | 146 30.1 | ENE | 1,2,3 | 16 | 30 |
| B | 0500/140 | 16 29.1 | 146 11.8 | 0608/140 | 16 39.9 | 146 12.8 | S | 1,2 | 11 | 20 |
| C | 0608/140 | 16 39.9 | 146 12.8 | 0900/140 | 16 51.9 | 146 02.0 | SW | 1,2 | 16 | 30 |
| D | 0900/140 | 16 51.9 | 146 02.0 | 0600/141 | 14 59.8 | 145 24.4 | N | 1,2,3/4 | 125 | 231 |
| E | 0600/141 | 14 59.8 | 145 24.4 | 0704/141 | 14 59.4 | 145 28.5 | E | 1,2 | 5 | 9 |
| F | 0704/141 | 14 59.4 | 145 28.5 | 1042/141 | 15 14.2 | 145 26.3 | SSW | 1,2 | 14 | 26 |
| G | 1042/141 | 15 14.2 | 145 26.3 | 1330/141 | 15 24.3 | 145 19.2 | SSW | 1,2 | 13 | 24 |
| H | 1330/141 | 15 24.3 | 145 19.2 | 1633/141 | 15 33.6 | 145 25.3 | SSE | 1,2 | 11 | 20 |
| I | 1633/141 | 15 33.6 | 145 25.3 | 1728/141 | 15 36.1 | 145 21.3 | SW | 1,2 | 5 | 9 |
| J | 1728/141 | 15 36.2 | 145 21.3 | 2219/141 | 15 54.9 | 145 32.5 | SSE | 1,2 | 21 | 39 |
| K | 2350/141 | 15 54.9 | 145 32.6 | 0040/142 | 15 58.9 | 145 32.9 | S | 1,2 | 4 | 7 |
| L | 0110/142 | 15 59.1 | 145 33.1 | 0225/142 | 16 05.3 | 145 30.3 | SSW | 1,2 | 7 | 13 |
| M | 0225/142 | 16 05.3 | 145 30.3 | 0529/142 | 16 18.7 | 145 33.4 | SSE | 1,2 | 14 | 26 |
| N | 0531/142 | 16 18.7 | 145 33.3 | 0700/142 | 16 24.7 | 145 29.2 | SW | 1,2 | 8 | 15 |
| O | 0700/142 | 16 24.7 | 145 29.2 | 1400/142 | 16 49.7 | 145 52.1 | SE | 1,2 | 34 | 63 |
| P | 1400/142 | 16 49.7 | 145 52.1 | 1432/142 | 16 47.7 | 145 54.0 | NE | 1,2 | 2 | 4 |
| Q | 1432/142 | 16 47.7 | 145 54.0 | 1705/142 | 16 35.1 | 145 43.7 | NW | 1,2 | 16 | 30 |
| R | 1705/142 | 16 35.1 | 145 43.7 | 1756/142 | 16 32.3 | 145 47.2 | NE | 1,2 | 5 | 9 |
| S | 1756/142 | 16 32.3 | 145 47.2 | 2052/142 | 16 41.7 | 145 54.9 | SE | 1,2 | 12 | 22 |
| T | 2052/142 | 16 41.7 | 145 54.9 | 2154/142 | 16 46.0 | 145 56.2 | SSE | 1,2 | 5 | 9 |
| U | 2154/142 | 16 46.0 | 145 56.2 | 2222/142 | 16 47.3 | 145 53.6 | SW | 1,2 | 3 | 6 |
| V | 2222/142 | 16 47.3 | 145 53.6 | 2315/142 | 16 42.5 | 145 53.2 | NNW | 1,2 | 6 | 11 |
| W | 0458/143 | 16 44.3 | 145 57.2 | 0842/143 | 16 46.5 | 146 15.2 | E | 1,2 | 16 | 30 |
| X | 0842/143 | 16 46.5 | 146 15.2 | 1019/143 | 16 39.3 | 146 09.3 | NW | 1,2 | 10 | 18 |
| Y | 1019/143 | 16 39.3 | 146 09.3 | 1203/143 | 16 39.5 | 146 13.7 | SE | 1,2 | 9 | 17 |
| Z | 1203/143 | 16 39.5 | 146 13.7 | 1839/143 | 16 08.7 | 145 55.7 | NNW | 1,2 | 38 | 70 |
| AA | 1839/143 | 16 08.7 | 145 55.7 | 2250/143 | 16 24.0 | 146 05.6 | SSE | 1,2 | 18 | 33 |
| AB | 0900/144 | 16 20.1 | 146 09.7 | 0934/144 | 16 25.6 | 146 08.5 | S | 1,2 | 5 | 9 |
| AC | 0934/144 | 16 25.6 | 146 08.5 | 1153/144 | 16 08.0 | 145 56.9 | NW | 1,2 | 23 | 42 |
| AD | 1153/144 | 16 08.0 | 145 56.9 | 1201/144 | 16 07.3 | 145 57.6 | NE | 1,2 | 2 | 4 |
| AE | 1201/144 | 16 07.3 | 145 57.6 | 1517/144 | 16 25.9 | 146 09.6 | SE | 1,2 | 23 | 42 |
| AF | 1517/144 | 16 25.9 | 146 09.6 | 1527/144 | 16 25.4 | 146 10.8 | NE | 1,2 | 2 | 4 |
| AG | 1527/144 | 16 25.4 | 146 10.8 | 1600/144 | 16 21.0 | 146 07.7 | NW | 1,2 | 5 | 9 |
| AH | 1600/144 | 16 21.0 | 146 07.7 | 1630/144 | 16 17.7 | 146 11.4 | E | 1,2 | 5 | 9 |
| AI | 1938/144 | 16 15.5 | 146 14.9 | 2042/144 | 16 10.0 | 146 22.5 | NE | 1,2 | 5 | 9 |
| AJ | 2158/144 | 16 10.0 | 146 21.9 | 2249/144 | 16 05.4 | 146 29.7 | NE | 1,2 | 9 | 17 |
| AK | 0012/145 | 16 07.0 | 146 29.5 | 0506/145 | 16 49.7 | 145 51.2 | SW | 1 | 10 | 18 |
| AL | 0549/145 | 16 50.0 | 145 50.3 | 0740/145 | 16 48.9 | 146 00.9 | E | 1,2 | 7 | 13 |
| AM | 0800/145 | 16 50.5 | 146 01.2 | 0902/145 | 16 55.5 | 146 01.7 | NW | 1,2 | 7 | 13 |
| AN | 0902/145 | 16 55.5 | 146 01.7 | 1023/145 | 16 51.2 | 145 56.2 | NW | 1,2 | 7 | 13 |
| AO | 1023/145 | 16 51.2 | 145 56.2 | 1243/145 | 16 49.6 | 145 51.5 | W | 1,2 | 6 | 11 |
| AP | 1243/145 | 16 49.6 | 145 51.5 | 1637/145 | 16 07.4 | 146 18.9 | NE,N | 1 | 60 | 111 |

| TOTAL DISTANCE COVERED | 620 | 1,145 |
|---|---|---|

# TABLE 1

# SEISMIC, PDR & SOUNDING LINES

1 = 12 kHz Sounder   2 = 3.5 kHz PDR   3 = Seismic, 20" gun   4 = Seismic 5" gun

| LINE | START | LAT(S) | LONG(E) | END | LAT(S) | LONG(E) | DIR | GEAR | NM | KM |
|---|---|---|---|---|---|---|---|---|---|---|
| AQ | 1758/145 | 16 08.0 | 146 19.4 | 1830/145 | 16 04.5 | 146 16.8 | NW | 1,2 | 4 | 7 |
| AR | 1952/145 | 16 04.5 | 146 16.1 | 0140/146 | 15 03.9 | 146 17.1 | N | 1,2 | 61 | 113 |
| AS | 0711/146 | 15 04.2 | 146 17.0 | 0839/146 | 14 53.8 | 146 09.0 | NW | 1,2 | 12 | 22 |
| AT | 1650/146 | 14 56.1 | 146 09.9 | 1730/146 | 15 02.2 | 146 08.6 | S | 1,2 | 6 | 11 |
| AU | 1939/146 | 15 02.4 | 146 09.0 | 2029/146 | 15 06.3 | 146 02.1 | SW | 1,2 | 8 | 15 |
| AV | 2233/146 | 15 06.1 | 146 01.9 | 2312/146 | 15 05.9 | 145 54.7 | W | 1,2 | 8 | 15 |
| AW | 0109/147 | 15 06.4 | 145 54.6 | 0135/147 | 15 03.1 | 145 52.1 | NW | 1,2 | 4 | 7 |
| AX | 0320/147 | 15 03.4 | 145 52.0 | 0342/147 | 15 00.7 | 145 49.9 | NNW | 1,2 | 3 | 6 |
| AY | 0530/147 | 15 01.6 | 145 50.2 | 0610/147 | 15 01.8 | 145 56.1 | E | 1,2 | 6 | 11 |
| AZ | 0750/147 | 15 01.4 | 145 56.0 | 0836/147 | 15 03.8 | 145 51.3 | SW | 1,2 | 8 | 15 |
| BA | 1016/147 | 15 03.7 | 145 50.2 | 1048/147 | 15 08.0 | 145 50.5 | ESE | 1,2 | 14 | 26 |
| BB | 1347/147 | 15 08.8 | 145 51.0 | 1410/147 | 15 09.3 | 145 55.0 | E | 1,2 | 4 | 7 |
| BC | 1600/147 | 15 09.7 | 145 55.5 | 1640/147 | 15 15.5 | 145 57.3 | SE | 1,2 | 6 | 11 |
| BD | 1829/147 | 15 16.3 | 145 57.9 | 1850/147 | 15 17.2 | 145 56.6 | SSE | 1,2 | 2 | 4 |
| BE | 2253/147 | 15 18.5 | 145 57.2 | 0107/148 | 15 42.1 | 145 59.4 | S | 1,2 | 25 | 46 |
| BF | 0435/148 | 15 44.4 | 146 02.1 | 0503/148 | 15 42.3 | 145 59.4 | NW | 1,2 | 4 | 7 |
| BG | 0640/148 | 15 43.4 | 146 00.4 | 1050/148 | 16 10.7 | 146 32.8 | SE | 1,2 | 41 | 76 |
| BH | 1216/148 | 16 12.7 | 146 33.1 | 1308/148 | 16 15.5 | 146 24.4 | WSW | 1,2 | 9 | 17 |
| BI | 1438/148 | 16 16.4 | 146 24.1 | 1517/148 | 16 19.5 | 146 18.1 | SW | 1,2 | 7 | 13 |
| BJ | 1658/148 | 16 21.5 | 146 18.2 | 1854/148 | 16 37.6 | 146 18.1 | S | 1,2 | 19 | 35 |
| BK | 1854/148 | 16 37.6 | 146 18.1 | 2040/148 | 16 44.1 | 146 23.6 | SE | 1,2 | 8 | 15 |
| BL | 2040/148 | 16 44.1 | 146 23.6 | 2048/148 | 16 44.0 | 146 22.4 | W | 1,2 | 1 | 2 |
| BM | 2048/148 | 16 44.0 | 146 22.4 | 2212/148 | 16 38.6 | 146 17.1 | WNW | 1,2 | 7 | 13 |
| BN | 2212/148 | 16 38.6 | 146 17.1 | 2343/148 | 16 39.9 | 146 09.1 | WSW | 1,2 | 9 | 17 |
| BO | 2343/148 | 16 39.9 | 146 09.1 | 0424/149 | 17 07.4 | 146 05.2 | S | 1,2 | 27 | 50 |
| BP | 0424/149 | 17 07.4 | 146 05.2 | 0810/149 | 17 40.5 | 146 18.6 | SSE | 1,2 | 35 | 65 |
| BQ | 0810/149 | 17 40.5 | 146 18.6 | 1609/149 | 18 19.1 | 146 23.8 | SSE | 1,2 | 39 | 72 |
| BR | 1609/149 | 18 19.1 | 146 23.8 | 1940/149 | 18 44.1 | 146 45.2 | SE | 1,2 | 34 | 63 |
| BS | 1940/149 | 18 44.1 | 146 45.2 | 0021/150 | 19 05.9 | 147 13.6 | SE | 1,2 | 41 | 76 |
| BT | 0021/150 | 19 05.9 | 147 13.6 | 0200/150 | 19 05.0 | 146 54.2 | WNW | 1,2 | 25 | 46 |
| BU | 0335/150 | Port of | Townsville | | | | | | | |
| BV | | | | | | | | | | |
| BW | | | | | | | | | | |
| BX | | | | | | | | | | |
| BY | | | | | | | | | | |
| BZ | | | | | | | | | | |
| CA | | | | | | | | | | |
| CB | | | | | | | | | | |
| CC | | | | | | | | | | |
| CD | | | | | | | | | | |
| CE | | | | | | | | | | |
| CF | | | | | | | | | | |
| CG | | | | | | | | | | |
| CH | | | | | | | | | | |
| CI | | | | | | | | | | |

| | | |
|---|---|---|
| DISTANCE COVERED, LINES A-AP | 620 | 1141 |
| DISTANCE COVERED, LINES AQ-BT | 477 | 881 |
| TOTAL DISTANCE COVERED | 1097 | 2021 |

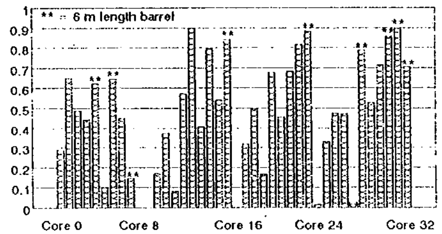
# TABLE 2 CORING STATIONS, CRUISE FR 590

| | |
|---|---|
| TOTAL CORE = | 75.34 metres |
| Average recovery = | 47 % |

**CALENDAR**
May 25 = JD 138-139
June 1 = JD 145-146
June 7 = JD 151-152
0000 h EST = 1400 h GMT

THIS SHEET LAST SAVED
05-Jun-90 03:48 AM EST

PERCENTAGE CORE RECOVERY




**NOTES**
1. Test core taken in sheltered waters
2. Stiff clay in catcher, probably Pleistocene
3 Didn't trigger
4 Bent barrel on retrieval
5 Shear pin failed to operate
6 Triggered in water column
7 Sandy sediment slurried in liner
8 Stuck piston (faulty liner)
9 Core cutter/catcher lost on first try

| STATION | DATE | TIME | LAT(S) | LONG(E) | DEPTH | BARR. | CORE | %REC. | GRAB | NOTE | LOCATION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **590/00** | JD 139 | 0620 | 18 21.8 | 147 00.1 | 70 m | 3 | 0.86 | 29% | Yes | 1 | Palm Passage, north of Slasher Reefs |
| **590/01** | JD 141 | 2327 | 15 54.6 | 145 32.4 | 32 m | 3 | 1.95 | 65% | Yes | 2 | Mid-shelf east of Bloomfield River |
| **590/02** | JD 142 | 0053 | 15 58.8 | 145 32.9 | 31 m | 3 | 1.46 | 49% | Yes | 2 | Mid-shelf, west of Morning Reef |
| **590/03** | JD 142 | 2344 | 16 43.0 | 145 53.3 | 36 m | 3 | 1.33 | 44% | Yes | - | Palaeo-Barron River, N side, channel A |
| **590/04** | JD 143 | 0051 | 16 43.5 | 145 53.2 | 35 m | 6 | 3.75 | 63% | Yes | - | Palaeo-Barron River, centre of channel A |
| **590/05** | JD 143 | 0146 | 16 43.6 | 145 53.7 | 37 m | 3 | 0.3 | 10% | Yes | 2,3 | Reflector A between Channels A and B |
| **590/06** | JD 143 | 0401 | 16 44.0 | 145 53.9 | 36 m | 6 | 3.87 | 65% | Yes | 4 | Palaeo-Barron River Channel B, centre |
| **590/07** | JD 143 | 2346 | 16 20.7 | 146 06.6 | 706 m | 3 | 1.35 | 45% | No | - | Upper slope, above Trinity Slide |
| **590/08** | JD 144 | 0125 | 16 18.4 | 146 09.2 | 1093 m | 6 | 0.87 | 14% | No | 4,5 | Headwall of Trinity Slide |
| **590/8A** | JD 144 | 0305 | 16 20.0 | 146 10.1 | 1080 m | 3 | 0 | 0% | No | 5 | Headwall of Trinity Slide (repeat) |
| **590/8B** | JD 144 | 0427 | 16 20.4 | 146 09.8 | 1047 m | 3 | 0 | 0% | No | 6 | Headwall of Trinity Slide (repeat) |
| **590/8C** | JD 144 | 0543 | 16 20.6 | 146 10.5 | 1053 m | 3 | 0.51 | 17% | No | - | Headwall of Trinity Slide (repeat) |
| **590/09** | JD 144 | 0809 | 16 18.2 | 146 11.2 | 1242 m | 3 | 1.12 | 37% | No | - | Top part of Trinity Slide |
| **590/10** | JD 144 | 1741 | 16 14.9 | 146 15.3 | 1514 m | 3 | 0.25 | 8% | No | 5 | Middle of Trinity Slide |
| **590/10A** | JD 144 | 1900 | 16 15.5 | 146 15.0 | 1489 m | 3 | 1.72 | 57% | No | - | Middle of Trinity Slide (repeat) |
| **590/11** | JD 144 | 2118 | 16 10.0 | 146 22.1 | 1690 m | 3 | 2.69 | 90% | No | - | Toe of Trinity Slide |
| **590/12** | JD 144 | 2327 | 16 05.9 | 146 30.0 | 1798 m | 3 | 1.22 | 41% | No | - | Queensland Trough floor, just outside slide |
| **590/13** | JD 145 | 1714 | 16 07.8 | 146 19.2 | 1701 m | 3 | 2.38 | 79% | No | - | North lateral side, Trinity Slide |
| **590/14** | JD 145 | 1905 | 16 04.8 | 146 16.7 | 1724 m | 3 | 1.62 | 54% | No | - | Slope just north of Trinity Slide |
| **590/15** | JD 146 | 0621 | 15 04.1 | 146 17.0 | 1875 m | 6 | 5.05 | 84% | No | - | Western edge of Queensland Plateau |
| **590/16** | JD 146 | 1331 | 14 52.8 | 146 08.0 | 2496 m | 3 | 0.001 | 0% | No | - | Axis of Townsville Trough |
| **590/16A** | JD 146 | 1547 | 14 55.4 | 146 09.8 | 2490 m | 3 | 0.96 | 32% | No | 6,6,6 | Axis of Queensland Trough (repeat) |
| **590/17** | JD 146 | 1834 | 15 02.7 | 146 09.3 | 2369 m | 3 | 1.5 | 50% | No | - | Axis of Queensland Trough, further upslope |
| **590/18** | JD 146 | 2130 | 15 06.2 | 146 01.8 | 2358 m | 3 | 0.5 | 17% | No | 7 | Mouth of slope valley |
| **590/19** | JD 147 | 0009 | 15 06.4 | 145 54.8 | 2220 m | 3 | 2.03 | 68% | No | - | Distal canyon floor |
| **590/20** | JD 147 | 0225 | 15 03.1 | 145 52.2 | 2110 m | 3 | 1.37 | 46% | No | - | Mid canyon floor |
| **590/21** | JD 147 | 0438 | 15 01.3 | 145 49.8 | 1982 m | 3 | 2.05 | 68% | No | - | Upper canyon floor |
| **590/22** | JD 147 | 0707 | 15 02.3 | 145 56.6 | 1907 m | 6 | 4.9 | 82% | No | - | North side overbank/slope |
| **590/23** | JD 147 | 0925 | 15 03.5 | 145 50.0 | 1670 m | 3 | 2.65 | 88% | No | - | Steep canyon side |
| **590/24** | JD 147 | 1132 | 15 08.3 | 145 50.8 | 1400 m | 3 | 0.05 | 2% | No | - | Eroded interfluve |
| **590/24A** | JD 147 | 1305 | 15 08.6 | 145 50.8 | 1450 m | 3 | 1 | 33% | No | 3 | Eroded interfluve (repeat) |
| **590/25** | JD 147 | 1506 | 15 09.7 | 145 55.5 | 2240 m | 3 | 1.42 | 47% | No | - | Slope channel floor (distal) |
| **590/26** | JD 147 | 1737 | 15 16.0 | 145 57.6 | 2210 m | 3 | 1.41 | 47% | No | - | Mid canyon floor |
| **590/27** | JD 147 | 1952 | 15 17.4 | 145 56.8 | 2163 m | 6 | 0.001 | 0% | No | 8 | Adjacent interfluve |
| **590/27A** | JD 147 | 2159 | 15 17.4 | 145 56.8 | 2163 m | 6 | 4.73 | 79% | No | - | Adjacent interfluve (repeat) |
| **590/28** | JD 148 | 0346 | 15 43.6 | 146 01.6 | 1850 m | 3 | 1.59 | 53% | No | - | South interfluve (dark on GLORIA)(Cruiser Flow) |
| **590/29** | JD 148 | 0545 | 15 42.3 | 145 59.6 | 1834 m | 3 | 2.15 | 72% | No | 9 | Shallow channel/flow (light on GLORIA)(Cruiser Flow) |
| **590/30** | JD 148 | 1138 | 16 10.8 | 146 33.0 | 1798 m | 6 | 5.15 | 86% | No | - | Distal Trinity Slide |
| **590/31** | JD 148 | 1358 | 16 15.6 | 146 24.2 | 1650 m | 6 | 5.35 | 89% | No | - | Middle Trinity Slide |
| **590/32** | JD 148 | 1555 | 16 19.52 | 146 17.9 | 1490 m | 6 | 4.23 | 71% | No | - | Middle Trinity Slide |

# TABLE 3. OPERATIONS DURING CRUISE 5/90

| CALENDAR DATE | JULIAN DAY | GMT/UMT (z) TIME | OPERATIONS | |
|---|---|---|---|---|
| | | | STATIONS | SEISMIC LINES |
| May 25 | 138 | 1400-2000 | | |
| | 138/9 | 2000-0200 | | |
| | 139 | 0200-0800 | Depart Townsville 0000 z | |
| | 139 | 0800-1400 | Station 00 | |
| May 26 | 139 | 1400-2000 | | Line A |
| | 139/40 | 2000-0200 | Render assistance to yacht | Line A |
| | 140 | 0200-0800 | | Line B, C |
| | 140 | 0800-1400 | | Line C, D |
| May 27 | 140 | 1400-2000 | | Line D |
| | 140/1 | 2000-0200 | | Line D |
| | 141 | 0200-0800 | | Line D, E, F |
| | 141 | 0800-1400 | | Line F, G, H |
| May 28 | 141 | 1400-2000 | | Line H, I, J |
| | 141/2 | 2000-0200 | Station 01, 02 | Line J, K, L |
| | 142 | 0200-0800 | | Line L, M, N, O |
| | 142 | 0800-1400 | | Line O |
| May 29 | 142 | 1400-2000 | | Line P, Q, R, S |
| | 142/3 | 2000-0200 | Station 03, 04, 05 | Line S, T, U, V |
| | 143 | 0200-0800 | Station 06 | Line W |
| | 143 | 0800-1400 | | Line W, X, Y, Z |
| May 30 | 143 | 1400-2000 | | Line Z, AA |
| | 143/4 | 2000-0200 | Station 07, 08 | Line AA |
| | 144 | 0200-0800 | Station 08A, 08B, 08C | |
| | 144 | 0800-1400 | Station 09 | Line AB, AC, AD, AE |
| May 31 | 144 | 1400-2000 | Station 10, 10A | Line AE, AF, AG, AH, AI |
| | 144/5 | 2000-0200 | Station 11, 12 | Line AI, AJ, AK |
| | 145 | 0200-0800 | | Line AK, AL |
| | 145 | 0800-1400 | Pick up crew, Cairns | Line AM, AN, AO, AP |
| June 1 | 145 | 1400-2000 | Station 13, 14 | Line AP, AQ, AR |
| | 145/6 | 2000-0200 | | Line AR |
| | 146 | 0200-0800 | Station 15 | Line AS |
| | 146 | 0800-1400 | Station 16 | Line AS |
| June 2 | 146 | 1400-2000 | Station 16A, 17 | Line AT, AU |
| | 146/7 | 2000-0200 | Station 18, 19 | Line AU, AV, AW |
| | 147 | 0200-0800 | Station 20, 21, 22 | Line AX, AY, AZ |
| | 147 | 0800-1400 | Station 23, 24, 24A | Line AZ, BA, BB |
| June 3 | 147 | 1400-2000 | Station 25, 26, 27 | Line BB, BC, BD |
| | 147/8 | 2000-0200 | Station 27A | Line BE |
| | 148 | 0200-0800 | Station 28, 29 | Line BF, BG |
| | 148 | 0800-1400 | Station 30, 31 | Line BG, BH |
| June 4 | 148 | 1400-2000 | Station 32 | Line BI, BJ, BK |
| | 148/9 | 2000-0200 | Station 33, 34 | Line BK, BL, BM, BN, BO |
| | 149 | 0200-0800 | Station 35 | Line BO, BP |
| | 149 | 0800-1400 | | Line BP, BQ |
| June 5 | 149 | 1400-2000 | | Line BQ, BR, BS |
| | 149/50 | 2000-0200 | Station 36 | Line BS, BT |
| | 150 | 0200-0800 | Return to Townsville | Line BT |
| | 150 | 0800-1400 | | |

# TABLE 4

## SEISMIC RECORDS, IN ROLLS

| ROLL | JD-START | TIME | JD-END | TIME | LINES ON ROLL | STATIONS |
|---|---|---|---|---|---|---|
| 01 | 139 | 0350 | 139 | 0500 | Preliminary 3.5 kHz | None |
| 02 | 139 | 0415 | 139 | 2113 | A | FR 590/0 |
| 03 | 140 | 0320 | 140 | 2325 | B, C, D(part) | None |
| 04 | 140 | 2335 | 141 | 2150 | D(part), E-I, J(part) | None |
| 05 | 141 | 2150 | 143 | 0852 | 2nd 3.5 kHz record, | None |
| 06 | 139 | 1910 | 141 | 0230 | AIRGUN, A and D | None |
| 07 | 141 | 2200 | 142 | 0805 | J(part), K-N, O(part) | FR 590/1-2 |
| 08 | 142 | 0813 | 142 | 2330 | O(part), P-V | None |
| 09 | 142 | 2330 | 143 | 0116 | None | FR 590/3-4 |
| 10 | 143 | 0116 | 143 | 1846 | W-Z | FR 590/5-6 |
| 11 | 143 | 1846 | 144 | 0230 | AA-AL | FR 590/7-12 |
| 12 | 144 | 0230 | 145 | 0902 | AL-AM | None |
| 13 | 145 | 0902 | 148 | 1702 | AN-BI | FR 590/13-32 |
| 14 | 148 | 1702 | 149 | 1410 | BJ-BQ (part) | FR 590/33-35 |
| 15 | 149 | 1420 | 150 | 0100 | BQ (part)-BU | FR 590/36 |

* 32 piston cores, cumulative length 75.34 m
* 7 grab samples and 15 water samples
* 17 water samples

## OPERATION OF GEAR

**3.5 kHz Profiler**
The 4-transducer array was mounted in the transducer well midships. The unit operated reliably throughout the cruise, giving excellent results when profiling with or into the prevailing weather at water depths down to about 150 m, though the record was susceptible to drop-outs in cross-seas. A noisy but usable bottom trace was obtained down to depths greater than 2000 m.

The new thermal EPC recorder produced a high-resolution (but slightly low contrast) record whilst operating on the single roll of plastic paper provided. When switched to lower quality paper, this recorder produced grey, fuzzy unusable records.

**Airgun**
The airgun produced disappointing results, despite being tried in various configurations (e.g. 20 and 5 cubic inch chambers) and environments (shelf and slope). The three portable compressors produced a reliable air supply for up to the 20 inch gun, but needed up to 30 minutes to build up and discharge pressure before and after operating the gun. All records were characterised by high background noise, often to the extent that the bottom trace itself could not be observed. The noise could be reduced by (1) operating the vessel at reduced revolutions; and (2) locating the streamer further outboard. In neither case, however, were scientifically useful records obtained. The major cause of the pooor performance could not be pinpointed, but may lie in the relatively short hydrophone streamer used.

**Magellan SATNAV Receiver**
This unit operated reliably and impressively throughout the cruise. It greatly enhances decisions made during coring operations by enabling the operator to measure accurately the direction and rate of drift on station. It also produces rapid, high-quality fixes accurate to 0.04' of latitude. Further, the "distance to go" and "time to go" functions are extremely useful during profiling operations.

**Piston Corer**
Deployment of the corer through the stern A-frame limits the conditions in which it can be used to about 2-3 m swell. At and below this limit the unit operated reliably, recovering cores up to 5.35 m in length. Pull-out loads ranged between 1.5-2.5 tonnes, and the typical winch rate was 60 m/min , reducing to 40 m/min during deployment for depths below that at which the arming device was set. Given the rather short cores collected with the 3 m barrel (generally 1-1.6 m), and the susceptibility of 6 m barrels to bending, future cruises would probably be best served by taking 4 m, 5 m and 6 m barrels for standard operations, together with one or two 8 m barrels for long cores in optimum conditions. The longest barrel that

can be handled on the stern deck of Franklin with the stern doors closed would be 8 m, but such a length could only be deployed in calm seas and with a clear deck.

Problems were encountered with the corer's trigger assembly due to the non-shearing of the safety-pin on the trigger-arming mechanism. In such cases, a much lower strength pin was fitted, resulting in arming in mid-water. Other minor problems included the loss of a core cutter at one station (590/29), and repeated premature triggering at another (590/16). The latter problem was solved by increasing the size of the trigger weight from 40 kg to 140 kg and reducing the winch speed during the later stages of a deployment.

**Vessel**
As a custom-designed oceanographic research vessel, the Franklin has some limitations for geoscience operations. Nonetheless, the vessel proved entirely adequate for the seismic and coring operations undertaken on Cruise 5/90. A small number of modifications would, however, greatly improve the utility of Franklin for such cruises. These modifications, in order of importance, are:

* Provision of a hull-mounted, 16-transducer, ORE 3.5 kHz Sub-bottom Profiler, with two-channel 19" recorder

* Provision of a communications handset in the Geochemistry Laboratory

* Provision of a duplicate DELP terminal in the Geochemistry Laboratory

* Provision of a ship-mounted air compressor for driving airguns up to 40 cu in capacity

The practice of heavy oiling of the main winch wire led to difficulties during the final 3 days of coring. Copious amounts of oil were bled from the wire under the heavy usage, making working conditions on the back deck unpleasant.

## DAILY LOG

**NOTE. Each cruise day comprises parts of two Julian days, 1400-2400 z of the first Julian Day, and 0000-1400 z of the second (cf. Table 3). All times in the log below are referenced to Greenwich Mean Time and Julian Days. During the period of the cruise, 1400 z GMT = 0000 h Australian EST.**

**DAY 1 (May 25, JD 139)**
Underway, from the Port of Townsville at 0000z/JD139 to first station for trial of piston corer. 3.5 kHz system in operation from 0330 z. Core station 590/00 occupied in 70 m water depth in Palm Passage north of the Slasher Reefs between 0458-0640 z. Operation successful, recovering 86 cm core (fine shelly sand at base) from a slightly bent 3 m barrel.

Continued a PDR profile through Palm Passage, thence northwards down the slope towards the start of seismic Line A seawards of Trinity Passage. PDR (with 4-transducer array mounted in internal well) produced excellent results at 12 knots down to about 200 m; thereafter the returns become increasingly faint with the residual bottom echo fading out at 400-500 m depth.

**DAY 2 (May 26, JD 139-140)**
Airgun deployed at 1900z/JD139 at start of Line A across the Erosive Slope area. Severe ship's noise and water noise obliterated all signals, no bottom return detected. Airgun retrieved at 2200 z.

Conditions had worsened during the day to a steady 25 knot SSE wind. After retrieval of airgun, steamed east for 1 hour to assist a yacht from PNG aiming for Trinity Passage, and in some trouble. Rounded on yacht at 0000z/JD140. Offered advice and precise position. Departed towards Trinity Passage. Entrance to passage not safe, diverted south to Grafton Passage at 0330 z. 0500-0608 z PDR Line B up upper slope and into passage. 0608-0900 z Line C through Grafton Passage, terminating short of Fitzroy Island. PDR record with substantial gaps despite calmer seas in passage. Hull-mounted transducer is apparently very sensitive to cross-seas.

Commence Line D at 0900 z towards Low Isles, Hope Island, Boulder Reef and Three Isles (Cape Flattery). Excellent PDR record, showing Reflector A running at or just below the sea-floor, with occasional channels. Airgun deployed 1005-1045 z. Strong bottom return and two multiples now visible above the high background noise, but little if any stratigraphic detail.

**DAY 3 (May 27, JD 140-141)**
2050z/JD140, course adjustment on Line D to 314° to pass Hope Isles/Gubbins Reef. Conditions continued to be unpleasant, with 20-25 knot SSE winds and following seas. Airgun pulled at 2214 z to replace 20 inch chamber with 5 inch. Redeployed and firing at 2328 z. Little improvement was effected, records still inadequate.

Line D continued on course 006°. Airgun retrieved at 0249z/JD141 and removed from fish. Redeployed at 0350 h. Again, little improvement in the record. Airgun retrieved for good at 0434 z and Line D completed using 12 and 3.5 kHz profiles only.

At 0600 z, Line D terminated at Cape Flattery, and vessel turned onto course 084° for Line E around Two Isles reef (0660-0708 z). Lines F (0708-1042 z), G (1042-1330 z) and H (1330-1633 z) started the retrack south.

**DAY 4 (May 28, JD 141-142)**
Continued south on Lines I (1633-1728z/JD141) and J (1728-2219 z) towards coring locations east of Bloomfield River. Line I extremely poor resolution due to beam-on seas.

Coring operations between 2219z/JD141 and 0110z/JD142 were successful.

despite 2-2.5 m seas. Core 590/1 (post-glacial-channel bank sediment, off Bloomfield River) was unsuccessful, probably due to lateral displacement of the trigger weight on deployment. Core 590/1A retrieved 1.95 m with stiff clay at base. Nearby, Core 590/2 (sediment wave above Reflector A, west of Morning Reef) also probably penetrated to Pleistocene, recovering 1.46 m above stiff clay in catcher.

Winds moderated slowly during the morning, from 25-30 knots to 20-25 knots. After coring, resumed 3.5 and 12 kHz profiling south towards Cairns on Lines L (0110-0225z/JD142), M (0225-0529 z), N (0529-0700 z) and O (0700-1400 z).

**DAY 5 (May 29, JD 142-143)**
Profiling continued along a grid offshore in Trinity Bay to delineate the path of the palaeo-Barron and other rivers on lines P (1400-1432z/JD142), Q (1432-1705 z), R (1705-1756 z), S (1756-2052 z), T (2052-2154 z), U (2154-2222 z) and V (2222-2315 z).

From 2344-0408z/JD142 a transect of cores was run across the palaeo-Barron River channels. Cores 590/03 (2344 z, 1.33 m) and 590/04 (0051 z, 3.75 m) were collected from the northern channel visible on 3.5 kHz Line D; core 590/05 (0146 z, 0.30 m) terminated in Pleistocene clay (Reflector A) between Channels A and B; and core 590/06 (0401 z, 3.87 m) was from the southern Channel B. Coring proceeded smoothly despite the 2 m seas.

3.5 kHz profiling was resumed at 0458, Line W (0458-0842 z) passing between Arlington and Green Reefs to cross Grafton Passage. Lines X (0846-1019 z) and Y (1019-1203 z) were further crossings of Grafton Passage.

**DAY 6 (May 30, JD 143-144)**
Line Z (1208-1839z/JD143) was run northwards along the shelf edge across the entrance to Trinity Channel in about 80 m of water, and Line AA (1839-2250 z) back again to just south of the passage.

Coring commenced at site 590/07 (2346 z, 1.35 m) on the upper slope above the head of the Trinity Slide. 3 m swells and a short sea made conditions difficult, but workable. Cores 590/08-8C (0125-0543z/JD144, 0.87, 0, 0, 0.51 m) were taken on the head scarp of the slide. Difficulties were encountered with the operation of vessel/winch (6 m barrel bent), the pressure-actuated arming device (failed to operate twice), and the swell (corer tripped in the water column once). Core 590/9 (0809 z, 1.12 m) was taken from just below the headwall of the Trinity Slide. In all these cores the material was apparently mainly grey pelagic mud, and core lengths were disappointing, perhaps due to overconsolidation of the mud.

Overnight profiling commenced at 0900 z, with Lines AB (0900-0934 z) and AC (0934-1153 z).

**DAY 7 (May 31, JD 144-145)**
Profiling continued with Lines AD, AE (1203-1517z/JD144), AF, AG (1530-1600 z) and AH (1600-1630 z), comprising a grid of 12 kHz sounding lines located parallel to the slope in the region between Trinity Passage opening and the Trinity Slide.

Arrived on coring station at 1630 z. The seas had moderated to only 1-2 m, greatly facilitating the coring operation. Core 590/11 failed to trigger on the first deployment, but a repeat operation was successful (2.69 m core in 1489 m depth at 1900 z). Core 590/12 triggered on the first deployment, but only collected a short core (1.22 m in 1790 m depth at 2327 z).

Scientific operations were suspended immediately after core 590/12 was on board, because of a medical emergency in the engine room. The vessel returned to Cairns via Grafton Passage at full speed. 12 kHz sounding line AK (0012-0506z/JD145) was run on the way.

After transferring Paddy Maclure to the Pilot Vessel, 3.5 kHz profiles AL (0549-0740 z, Cairns beacons - Green Island), AM (0740-0902 z, Green Island - Fitzroy Island), AN (0902-1023 z, Fitzroy Island - Cape Grafton) and AO (1023-1130 z, Cape Grafton - Cairns beacons) were run. Excellent coverage was achieved of the shore-connected mud wedge, Pleistocene channels and the tail of sediment north and in the lee of Fitzroy Island.

A new crewman was taken on board from the Pilot vessel at 1130 z, after which a 12 kHz and 3.5 kHz line was run back out through Grafton Passage to coring station 13 (Line AP, 1140-1637 z).

## DAY 8 (June 1, JD 145-146)

After completing Line AP, the vessel was moved to take Cores 590/13 (2.38 m core at 1714z/JD145, 1701 m depth on the north lateral side of the Trinity Slide) and 590/14 (1.62 m core at 1905 z, 1724 m depth on the slope just north of Trinity Slide), separated by Line AQ (1758-1830 z) between the two sites.

Line AR (1952-0140z/JD146) was completed, ending at Core site 590/15 (5.5 m core at 0621 z, 1875 m depth on the Queensland Plateau), cored on the second attempt after a mid-water trigger. A fire drill was held at 0030 z during Line AR. Line AS (0711-0839 z) was run from core site 15 to 16.

## DAY 9 (June 2, JD 146-147)

Core 590/16 is the easternmost core of those sited to investigate the Eroded Slope of the northern Great Barrier Reef. Deep water, rolling swell and bad luck dogged its collection; of four attempts, two triggered in the water within a few hundred metres of the bottom, one (without piston) failed to collect a core, and the final core was only short (0.96 m at 1547z/JD146, 2490 m in the axis of the Queensland Trough). The core penetrated mixed carbonate-terrigenous sand.

Commencing a profile and coring run westwards across the Eroded Slope, Line AT (1650-1730 z) was run to the site of core 590/17 (1.5 m at 1834 z in 2369 m in the axis of the Queensland Trough, again penetrated sand). Continuing the same transect; Lines AU (1939-2029 z), AV (2233-2312 z), AW (0109-0135z/JD147), AX (0320-0342 z), AY (0530-0610 z), AZ (0730-0856 z) and BA (1016-1048 z); and cores 590/18 (0.50 m at 2130 z and 2358 m at the mouth of a slope valley), 590/19 (2.03 m at 0009 z and 2220 m in a lower canyon floor), 590/20 (1.37 m at 0225 z and 2110 m in a middle canyon floor), 590/21 (2.05 m at 0438 z and 1982 m in an upper canyon floor), 590/22 (4.90 m at 0707 z and 1907 m on the northern overbank slope of the canyon complex), and 590/23 (2.65 m at 0925 z and 1670 m on a steep upper canyon side).

During this transect the piston corer worked exceptionally well, and the seas remained slight with a moderate swell, resulting in the collection of an excellent suite of cores.

**DAY 10 (June 3, JD 147-148)**
The transect across the Eroded Slope was continued, with lines BB (1347-1410z/JD147), BC (1600-1640 z) and BD (1829-1850 z). The corer continued to work well at sites 590/24A (1.0 m at 1305 z and 1450 m on a distal slope channel floor), 590/25 (1.42 m at 1506 z and 2240 m on an eroded interfluve), 590/26 (1.41 m at 1737 z and 2210 m on a distal channel floor) and 590/27A (4.73 m at 2159 z and 2163 m on an adjacent low relief interfluve).

During the deployment of core 590/27, the HIAB lifting arm ruptured a hydraulic hose, spilling hydraulic fluid onto the after deck. Fortunately, the lift-forward of the 6 m coring assembly had already been completed, so no time was lost. On retrieval, however, there was no core because the piston had stuck in a faulty liner only a few cm above the bottom of the corer. The core was repeated successfully (core 27A).

Following the completion of the Eroded Slope transect, Lines BE (2253-0107z/JD148) and BF (0435-0503 z) were run southwards to the site of the Cruiser Debris Flow. Cores 590/28 (1.59 m at 0346 z and 1850 m, and with dark bottom texture on GLORIA) and 590/29 (2.15 m at 0545 z and 1834 m, and with light bottom texture on GLORIA) were collected from without and within the flow respectively. Coring was uneventful apart from the loss of a core catcher on the first try at site 29.

Line BG (0640-1050 z) continued southwards to the Trinity Slide, where the first of three final cores was taken, core 590/30 (5.15 m at 1138 z and 1798 m in the middle of the slide).

**DAY 11 (June 4, JD 148-149)**
Lines BJ (1658-1854z/148), BK (1854-2040) comprised sounding runs down to and in the vicinity of the seaward entrance to Grafton Passage. Weather conditions deteriorated rapidly, starting at core station 32, with winds to 35 knots, a 2-3 m swell and a rough sea. These conditions forced the abandonment of planned seismic lines across the shelf-edge in the Grafton region.

The rough seas precluded further work outside the reef. Instead, Line BL (2040-2048 z) was run back north to the entrance of Grafton Passage. Lines BM (2048-2212 z), BN (2212-2338 z) and BO (2343-0414z/JD149) were run through the passage, stopping at the waypoints between lines to collect water samples at Stations 33-35 for later fluoromeasurement.

The remainder of the cruise was occupied by running a combined 12 kHz and 3.5 kHz sounding profile from Grafton Passage down the mid-shelf to Magnetic Island, on Lines BP (0424-0810 z), BQ (Barnard Island to Hinchinbrook Island, 0810-))))z, run at 5 knots), BR BS, BT and BU.

**DAY 12 (June 5, JD 149-150)**
A final water sample was taken at Station 36 off the northeastern tip of Magnetic Island.

ORV Franklin berthed alongside Townsville Berth 8 at 0335 z on JD 150 (1335 h EST on June 5).

## SCIENTIFIC RESULTS

The results of Cruise 5/90 can be grouped into four general areas:

* Equipment Development
* Shelf studies
* Deep-water studies
* Oceanography

### EQUIPMENT DEVELOPMENT

Cruise 5/90 was particularly useful as a test of deploying several standard items of marine geoscience equipment from ORV Franklin.

**Piston Corer**
Piston corers on specialist geoscience vessels are generally deployed from a midships position, in order to take advantage of the better stability, and to allow the deployment of barrels up to 20 m long. Using a piston corer on Franklin, which lacks a midship A-frame capability, required the development of a safe methodology for deploying the corer through the stern A-frame.

In the event, an efficient and effective method of corer deployment was developed, as summarised in Appendix A. Over 75 m of core, mostly collected from deep water, in only one week speaks for itself, and demonstrates that Franklin is an extremely effective platform for piston-coring in calm to moderate sea states.

**Well-mounted 3.5 kHz Profiler**
The 4-transducer ORE profiler functioned well during the cruise, and demonstrated the feasibility of routine deployment of such a system directly from the ship, i.e. without utilising a towed transducer assembly.

Nonetheless, the low acoustic gathering power of a 4-transducer system limited the collection of sub-bottom information during the cruise to depths above c.150 m (Fig.3, upper). Though a bottom trace was generally visible at depths down to 2300 m, the very noisy record renders it of little value (Fig.3, lower). For comparison, Fig. 4 reproduces portions of 3.5 kHz profiles collected with an identical system but with a 16-transducer hull-mounted acoustic array. Note the excellent delineation of sub-bottom reflectors at depths of more than 4 km, even at cruising speeds of 8 knots.

**Airgun**
Though the airgun results were disappointing, this was not due to any fault of the Franklin as a platform. However, in order to deploy the airgun it was necessary to rig a complex series of small compressors. The capabilities of ORV Franklin as a geoscience platform would be greatly extended by the provision of an onboard compressor system. To drive appropriate small airguns of capacity up to 40 cu in, the compressor would need to deliver 2000 psi at rates up to 50 CFM.

## SHELF STUDIES

Though the prime focus of Cruise 5/90 was deep water studies, the shelf information collected will be of great value in supplementing research already in progress on post-glacial sediment facies development in the Central and Northern Great Barrier Reef.

Prime conclusions to emerge from the data collected will include:

* the delineation of a cross-shelf channel map for all major last glacial drainage systems between Cape Flattery and Cape Cleveland (e.g. Fig. 5)

* the description of the seismic facies associated with the major channel systems

* laboratory studies of grain-size and lithologic variations in cores collected through the channel fills

* description of drowned ("relict") reefs and possible shoreline sediment bodies in mid-outer shelf locations near Grafton Passage, with identification of future coring sites.

* isopach mapping of the shore-connected, post-6.5 ky terrigenous sedimentary wedge (e.g. Fig. 6, upper)

* documentation of 1-2 m thick, several tens of metres wide lensoid sediment bodies (e.g. Fig. 6, lower) which probably represent cross-sections through shelf-parallel, longitudinal bedforms.

These and other results from the shelf part of Cruise 5/90 will be integrated with other available data under the leadership of Drs Carter and Larcombe.

## DEEP-WATER STUDIES

Perhaps the most important result from Cruise 5/90 was to demonstrate the outstanding value of GLORIA and Seabeam type imagery as a basis for later, targeted scientific studies.

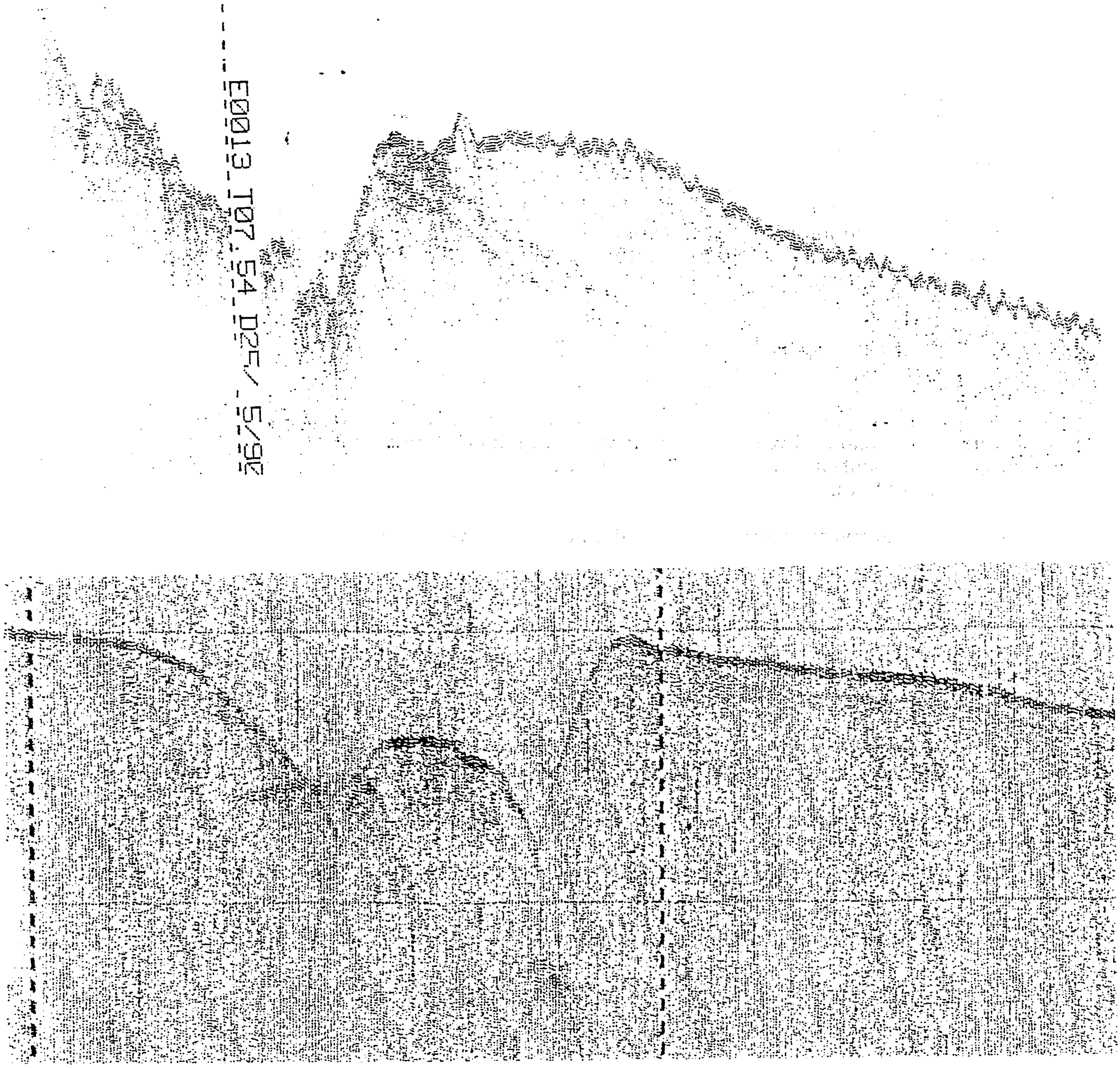
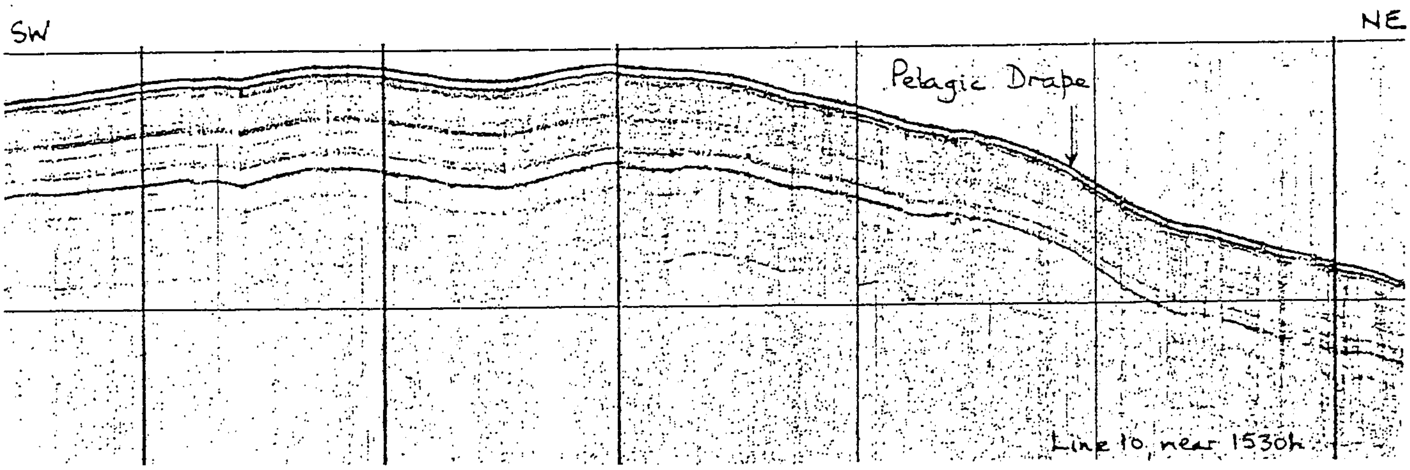
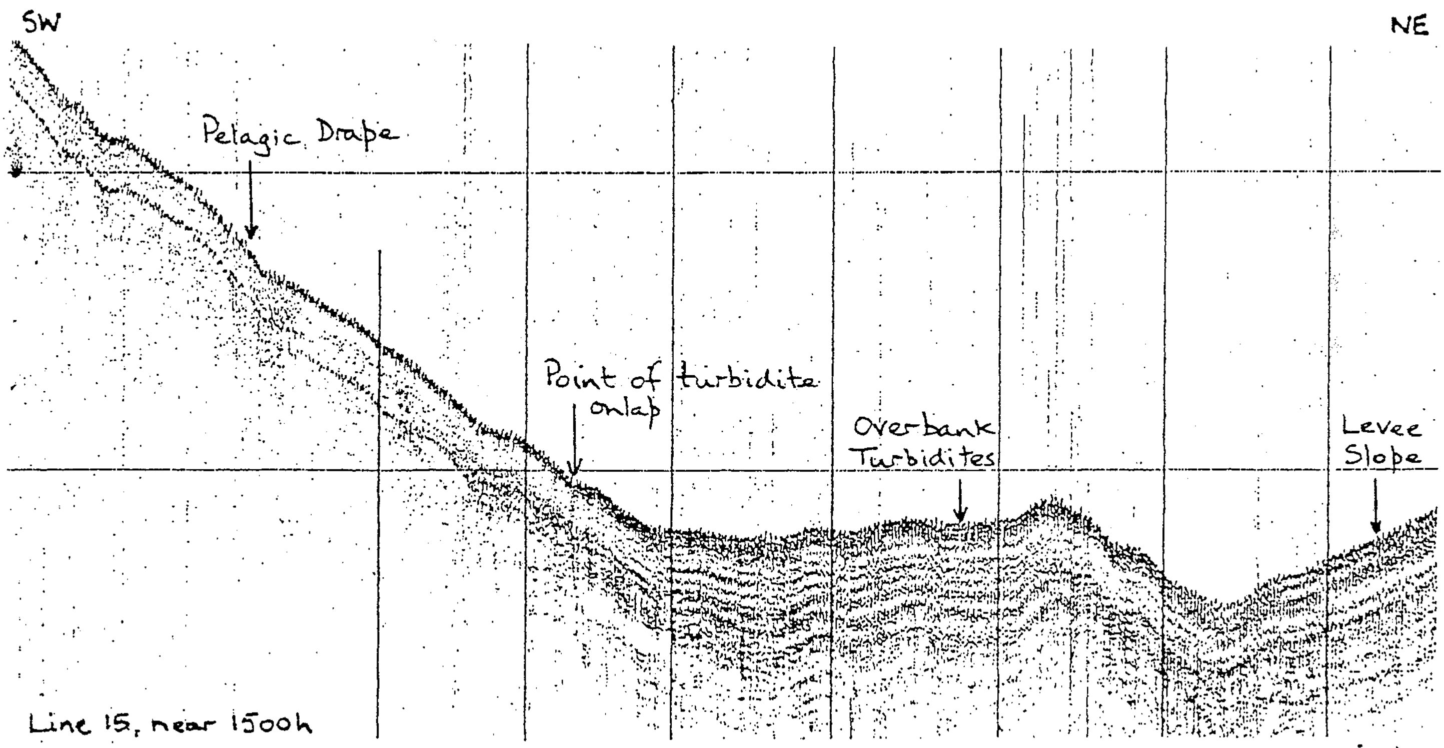


Figure 3. Example records obtained with the ORE 3.5 kHz profiling system, with 4-transducer array mounted in ship's well. Upper: water depths of 120-140 m on the uppermost slope seawards of the Great Barrier Reef (note good sub-bottom penetration); Lower: channel crossing on the upper slope seawards of Trinity Pass in water depths of 600-700 (note noisy record, and no sub-bottom structure).

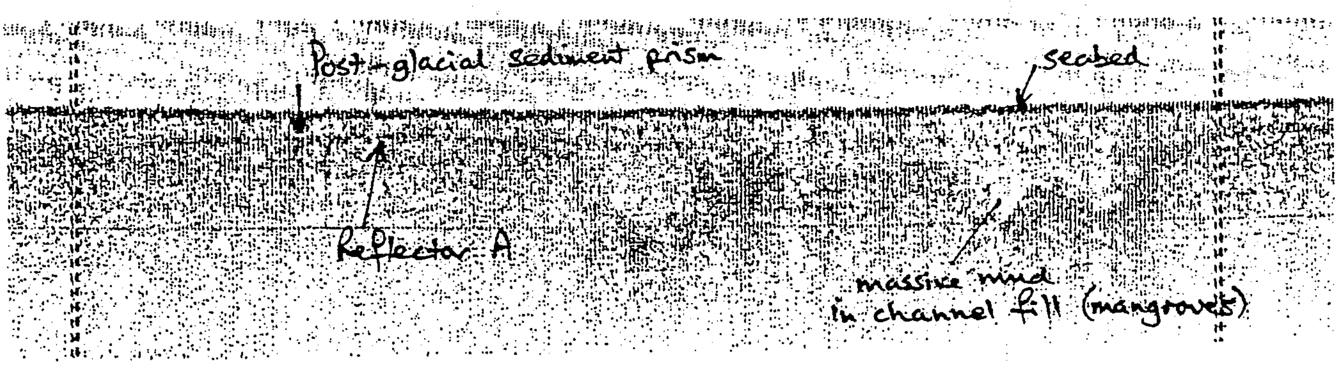



**Pelagic drape beneath the Outer Trough Platform**




**Pelagic drape overlapping the foot of the Campbell Plateau, and grading eastwards into overbank turbidites derived from the Bounty Channel**

Figure 4. Examples of 3.5 kHz profiles collected with an identical system to those c Fig. 3, except that a 16-transducer hull-mounted array was in operation (courtesy New Zealand Oceanographic Institute). Upper: fine structure in the upper 50 m of pelagic sediments draping the outer Bounty Trough in depths of 4200 m (profiling speed 5 knots); Lower: similar structure, but more vertically exaggerated, and less clear, due to ship speed of 10 knots.



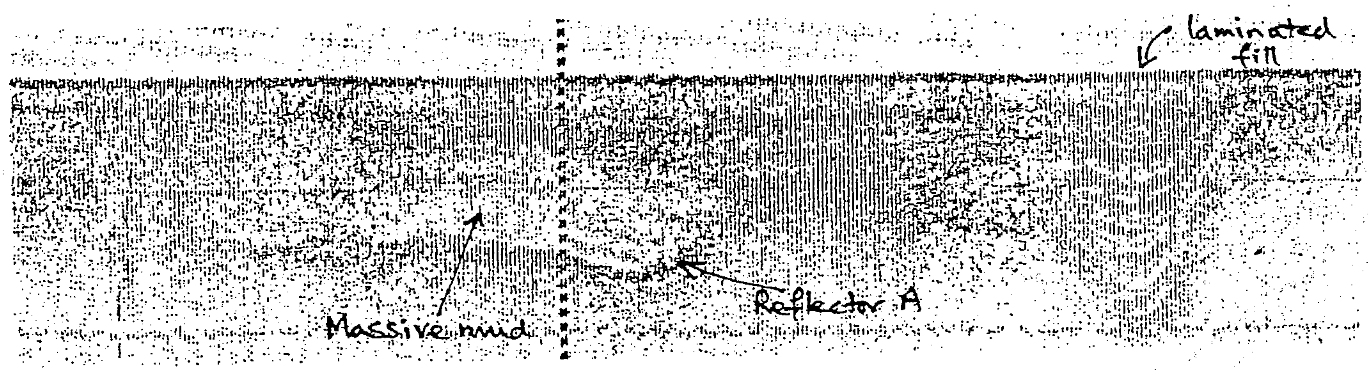




Figure 5. Typical examples of the major post-glacial river channel systems that cross the shelf and were delineated and cored on cruise FR 5/90. Note heavy reflector A (= top Pleistocene), transparent channel fill (= mangrove mud) and draped laminated sediment (probably estuarine silt and mud). Profiles located on Line O, midshelf offshore from the Daintree River.

It was known from the imagery available prior to the cruise that the western (Great Barrier Reef) slopes of the Queensland Trough were characterised by extensive mass-wasting (Fig. 7). The mass-wasting increases in intensity from south to north, in keeping with the steadily deepening of the adjacent trough axis in the same direction. Thus the slope appears largely stable adjacent to the shallower trough regions east of Townsville; isolated debris flows and a large landslide (the Trinity Slide) are present further north as far as Cairns; and north of Cairns the slope seawards of the Ribbon Reefs is dissected by mature submarine canyon systems which feed directly into the head of the Coral Sea.

Cruise 5/90 was the first in Australian waters, and one of the first in the world, to collect an intensive suite of cores from pinpointed targets on individual flows, slides and canyons. The results will be of great scientific interest, as well as making a significant contribution to the knowledge base necessary for sound management of the Great Barrier Reef region.

Initial results evident from the field phase of the study include:

* presence of both terrigenous and carbonate sand in the feeding canyons and axis of the Queensland Trough to depths of 2490 m

* presence of polymict, granular, massive mud (?mass-flow material) from cores in the upper region of the Trinity and Cruiser Slides

* the dominance of pelagic ooze in bottom sediment on the eastern flank of the Queensland Trough, as known also to characterize the adjacent Queensland Plateau.

These results from Cruise 5/90 will be developed for publication in association with GLORIA, Seabeam and other data under the leadership of Drs Johnson, Hughes Clark and von der Borch. The cores collected will be subjected to intensive investigation, including petrographic, geochemical (isotopic), sedimentologic and palaeontologic study.

## OCEANOGRAPHY

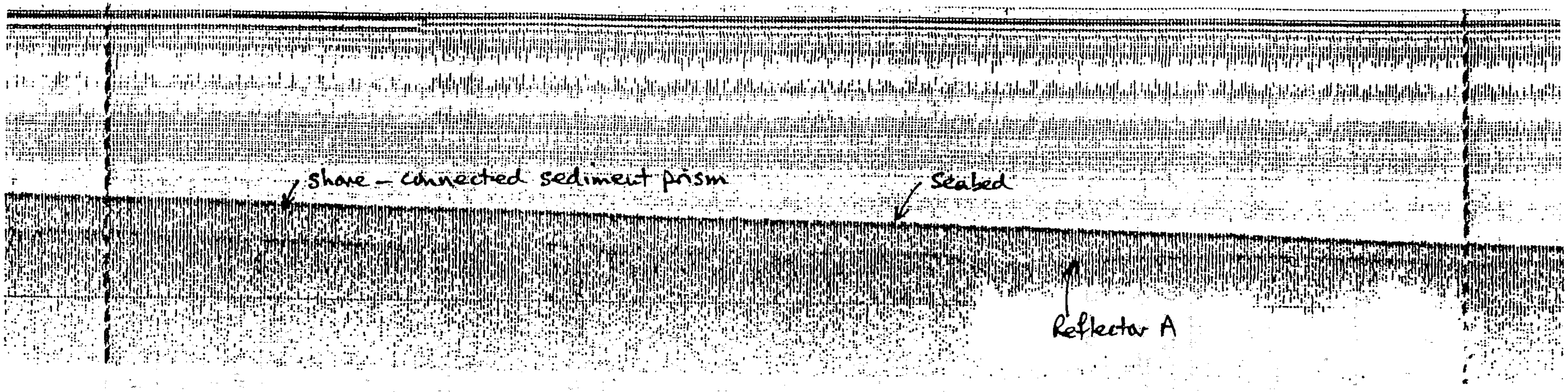
The major results from the oceanographic observations made will include:

* measurement of chlorophyll A concentrations in water samples to develop a calibration curve for the Turner Fluorometer records collected during the cruise

* measurement of nutrient and suspended sediment concentrations from the same samples

* interpretation of 4 thermo-salinograph profiles from the Coral Sea onto the Great Barrier Reef shelf

* use of this data in developing algorithms for the direct measurement of oceanographic parameters from NOAA and LANDSAT imagery



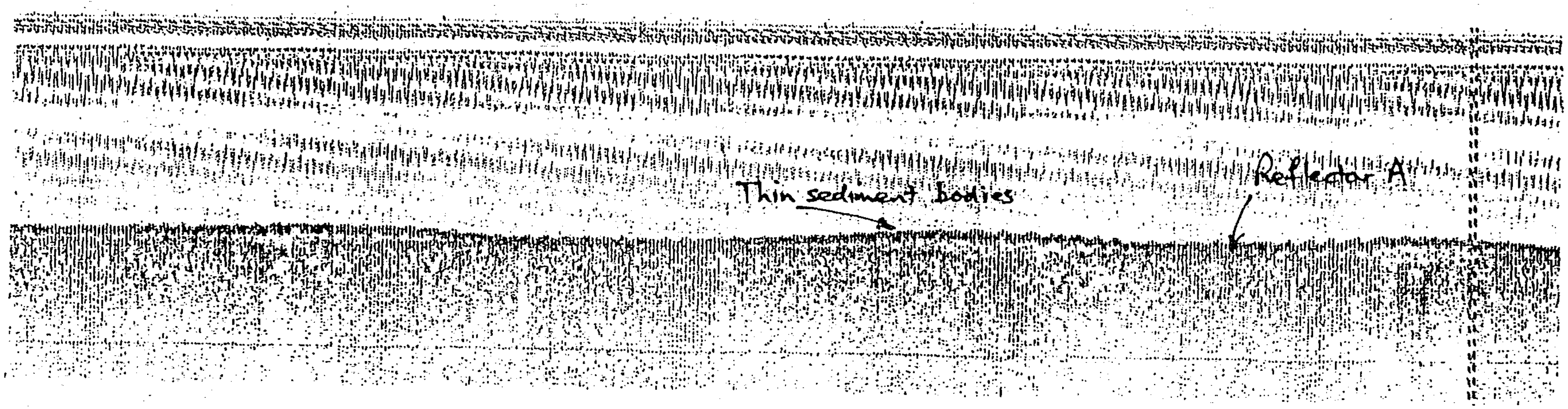




Figure 6. Upper: tapering edge of the shore-connected terrigenous sediment body which fringes the entire north Queensland coastline, pinching out seawards onto reflector A (Line AL, inner shelf offshore from Cairns); Lower: probable longitudinal sand or mud bodies of maximum thickness 2m, resting on the starved current-swep Pleistocene surface (= reflector A). Profile located on mid-shelf, south-east of Cape Flattery.

These results from Cruise 5/90 will be integrated with current research into water quality studies in the Central Great Barrier Reef Shelf under the leadership of Mr S. Blake.

## FINAL COMMENT

The officers, ship's crew and scientists all gave exceptional support under often trying conditions during Cruise 5/90. We thank them for their help and encouragement during all phases of the cruise. In particular, we thank Erik Marsden and Bob Edwards for their patience in explaining the various Franklin operations; and John Mitchell and John Hunt for their great skills and commitment to the cause of operating the airgun and the piston corer.

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(Co-chief Scientists)
(June 5, 1990)

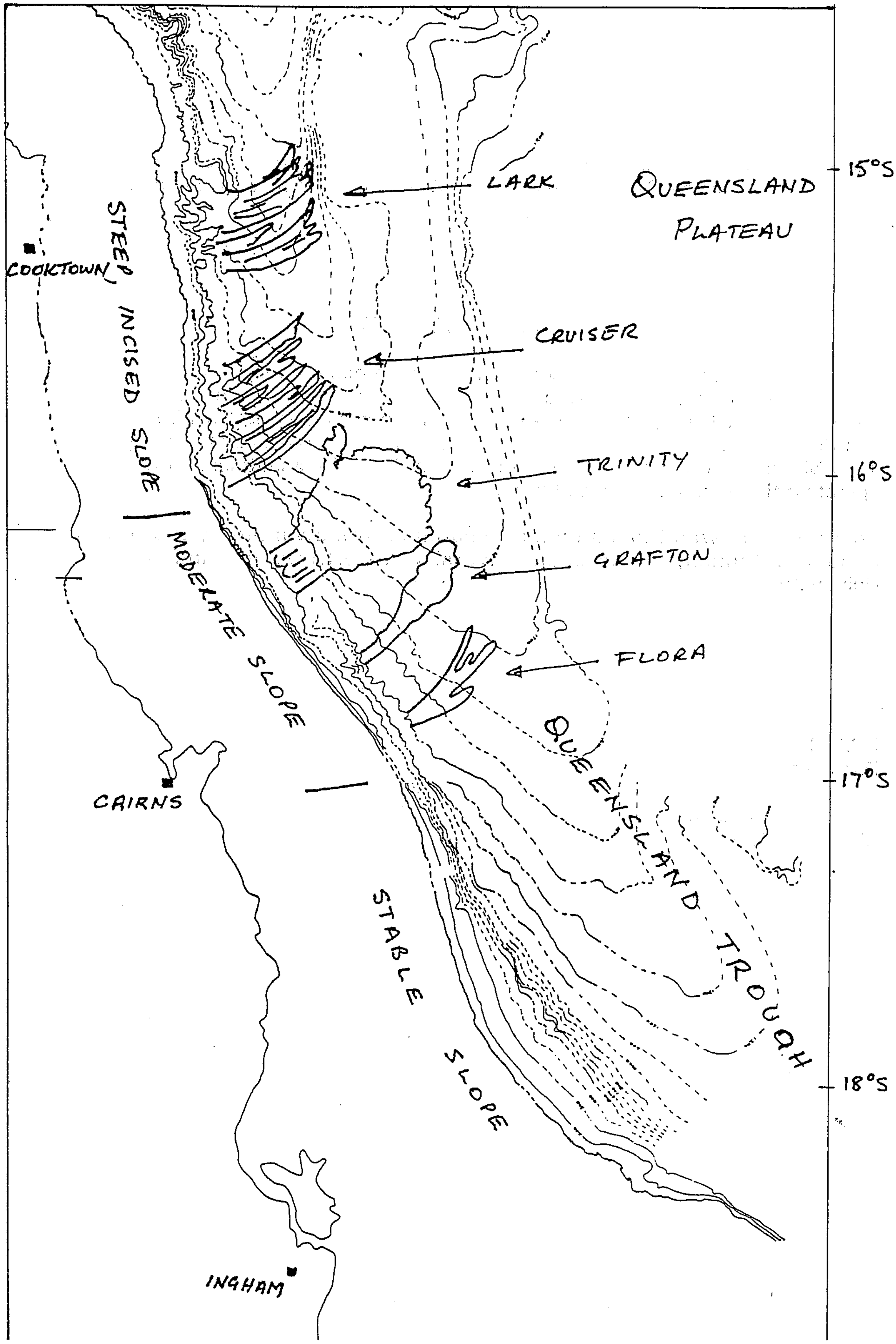


Figure 7. Sketch physiographic diagram of the Queensland continental shelf and adjacent Queensland Trough and Queensland Plateau. Regions of slope instability are added from GLORIA imagery (Johnson, Hughes & von der Borch, unpublished data); named areas of mass movement are indicated by outline and shading.