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Charter Vessel *Cirolana*

Cruise 2302H

**REPORT**

15-28 May 2002

**Loading:** Aberdeen

**Unloading:** Aberdeen

**Personnel**

W R Turrell

G Slesser

S Hughes

J Beaton

M Burns

C Wilson

A Watson

M Robjant

FRS PhD Student

R Swift

Aberdeen University

G Hastie

Aberdeen University

**Gear**

CTD, ADCP Moorings, Pop Up Acoustic Moorings, Towed hydrophone, Thermosalinograph, Profiling light meter.

**Objectives**

1. To perform hydrographic surveys along the JONSIS standard section in the northern North Sea.
2. To perform hydrographic surveys along the standard Faroe Shetland Channel sections.
3. To service two ADCP moorings, and deploy a deep water mooring.
4. To perform eddy surveys in the Faroe Shetland Channel
5. To perform *ad-hoc* sonar buoy, pop-up mooring deployments and towed array acoustic recordings for cetaceans.

**Narrative**

After loading and setting up all scientific gear, *FRV Cirolana* sailed from Aberdeen at 2030 (all time BST) on Wednesday 15 May 2002. She proceeded directly to a station in Aberdeen Bay, where trial CTD casts were performed. These were completed successfully by 2230, when *Cirolana* proceeded to the eastern end of the JONSIS standard section. Survey work along this section commenced at approximately 1020 Thursday 16 May, and was completed

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G Slesser	
S Hughes	
J Beaton	
M Burns	
C Wilson	
A Watson	
M Robjant	FRS PhD Student
R Swift	Aberdeen University
G Hastie	Aberdeen University

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by 2300 later that day. *Cirolana* then proceeded directly to the location of the NWSE ADCP mooring. Although this instrument had been found adrift on the Norwegian coast before the cruise commenced, it was hoped that the acoustic release might still be in place. This was found to be the case on arrival at the location at approximately 0700 Friday 17 May, and the release, with its own buoyancy unit, was recovered by 1000. *Cirolana* then proceeded to the location of ADCP mooring NWSD. This unit was recovered by 1300, and survey work along the Fair Isle Munken standard section commenced at 1500 Friday 17 May. This section was completed by 1500 Saturday 18 May, and *Cirolana* proceeded to the start of the Nolso Flugga section, commencing the survey there at 1930 on the 18<sup>th</sup>, and completing it by 0730 Monday 20 May.

*Cirolana* then proceeded to the location of the three pop-up moorings, where an acoustic search for these commenced at 1900 Monday 20 May, although the weather was too poor to attempt to raise these moorings. Two out of the three moorings had been located by 2200, when *Cirolana* proceeded to the start of the first eddy survey. This commenced at 0345 on Tuesday 21 May, and continued until 1200 Wednesday 22 May. During this survey weather conditions deteriorated resulting in CTD casts being abandoned, although the surface sampling continued throughout. On completion of the survey, *Cirolana* entered Torshavn, where scientific equipment was collected, and servicing work on the ADCPs was carried out.

*Cirolana* departed Torshavn at 0930 Thursday 23 May and proceeded directly to the location of the first mooring site, which was deployed at 60°24.656'N 005°19.344'W (depth - 1,132 m) by 0120 on Friday 24 May. *Cirolana* then proceeded to the location of the acoustic pop-up mooring which had previously failed to be located. An acoustic search commenced for this mooring at approximately 0500 and was completed by 0700 without success, when *Cirolana* proceeded to the location of the more southerly of the two acoustic moorings which had been located earlier. Although this was acoustically confirmed to be at 60°22.491'N 004°27.317'W (depth - 240 m), it did not release from the seabed after receiving and executing the release command. *Cirolana* then proceeded to the last of the three pop-up moorings, and this was successfully recovered by 1045 that day. The ADCP mooring NWSD was then deployed at 60°27.000'N 004°22.593'W (depth - 814 m), a replacement acoustic pop-up mooring at 60°27.515'N 004°22.825'W (depth - 842 m) and the NWSE ADCP mooring at 60°16.505'N 004°20.018'W (depth - 452 m). The ADCP moorings were partly lowered to the sea bed, and released from the lowering line acoustically. NWSD was lowered to approximately 430 m, and NWSE to 400 m below the vessel. All mooring work was completed by 1750 on Friday 24 May.

*Cirolana* then proceeded to commence two days of eddy/front surveys using a combination of shallow (250 m) CTD casts and 50 m profiling light meter casts. Fortunately poor weather did not materialise, and clear skies were encountered on both days. These surveys commenced at 0600 on Saturday 25 May, and were concluded at 2100 Sunday 26 May. Passage was then made towards the North Sea.

A low-nutrient sample was collected at JONSIS station 7, during passage to Aberdeen, at 1338 Monday 27 May 2002. This concluded the scientific program, and work commenced in packing all equipment. *Cirolana* entered Aberdeen at 0630 Tuesday 28 May.

## Results

The cruise can be characterised as one that was extremely productive, with no down time either due to weather or mechanical/equipment problems. Although the weather at times threatened to deteriorate, it never did and even clear skies were encountered when needed. All objectives were met, and sampling for the PhD study targeting primary production at eddy/frontal features went much better than expected. All salinity and nutrient samples were

worked up on board, thanks to the hard work of all the analysts involved, and the chemist (Carrie Shaw) in particular.

1. **JONSIS Standard Section:** These were surveyed successfully. Conditions were typical for May.
2. **Faroe Shetland Channel Sections:** These were surveyed successfully. Surface waters were generally highly saline compared to normal. Modified East Icelandic Water (MEIW) also demonstrated higher than normal salinities, while Norwegian Sea Arctic Intermediate Water (NSAIW) fell well within more typical ranges. Bottom water (below 800 m) had salinities of ~34.907.

The Nolso Flugga section exhibited North Atlantic Water (NAW) out to mid-Channel, with a sharp northerly frontal feature, possibly associated with a mid-Channel eddy structure. This was not the case in the more southerly section. Fluorescence along the Fair Isle Munken line showed a distinct sub-surface maximum, with a peak above the 800 m depth contour on the Scottish side, again possibly associated with a frontal/eddy feature

**CTD Conductivity Calibrations:**

Instrument	M	C	RMS (salinity)
SBE 25	0.999239	0.035327	0.0036
SBE 911+	1.000169	-0.00297	0.0018

3. **Moorings:** All planned moorings were deployed successfully (see summary below). A new technique was tried, of lowering the ADCP moorings to close to the sea bed, in order to avoid large impact speeds on release. This proved successful and should be tried in the future.

In October 2002, the pop-up moorings which failed to surface should again be acoustically located, and creeping/net recovery attempted.

**Summary of Buoy Positions remaining on sea bed after CZ200202:**

<b>Deployed</b>			
Deep Mooring	60°24.656'N	005°19.344'W	1,132 m
Acoustic Pop-up	60°27.515'N	004°22.825'W	842 m
NWSD	60°27.000'N	004°22.593'W	814 m
NWSE	60°16.505'N	004°20.018'W	452 m
<b>Remaining On Sea Bed</b>			
Acoustic Pop-up Mooring Last known position October 2001 – not acoustically located during CZ200202	60°22.670'N	004°17.460'W	
Acoustic Pop-up Mooring Located acoustically – failed to surface after release code executed	60°22.491'N	004°27.317'W	729 m

4. **Eddy Surveys:** Despite over cast conditions during much of the survey, good satellite images were obtained (by email from the Plymouth Marine Laboratory), using mosaicing techniques. A total of 24 CTD casts targeted at describing eddy/frontal features were performed, along with 20 light profiles using the PRR2500 Biospherical profiling radiometer (kindly on loan from Biospherical Instruments, San Diego). This instrument

performed exceedingly well, and produced a large quantity of new data which awaits detailed analysis. Preliminary analysis of underway temperature, salinity and fluorescence data, as well as CTD casts, confirm that the survey bisected several interesting features that await full interpretation. Detailed sampling was performed for chlorophyll, yellow substance and phytoplankton species analysis, as well as surface and sub-surface nutrients.

- 5. Cetacean Monitoring:** Passive acoustic surveys for cetaceans were carried out in the Faroe Shetland Channel from the RV *Cirolana* between 15 and 28 May 2002. Surveys were conducted using a towed hydrophone array between standard hydrographic stations along Fair Isle Munken and Nolso Flugga lines, where ever passage times exceeded one hour, during transit between lines, and during the return steam back into the North Sea. Towed array surveys were also carried out during passage between mooring deployment and recovery sites. Towing the hydrophone in no way effects ship speed or performance, and provides an excellent additional use of the resource of the survey vessel during periods which would otherwise be unproductive.

A total of 121 hours of acoustic data were collected, along 1,712 kilometres of survey line. Sperm whales and dolphin species were acoustically detected during the surveys (Fig. 1). Visual sightings of sperm whales, pilot whales and common dolphins were also made.

A single "pop-up" (bottom mounted whale recording units) was deployed in the Foinaven Schiehallion development area as part of long-term project to detect and then monitor the fine-scale movements of fin whales within the Faroe Shetland Channel. This unit was deployed on the 23rd May and will be in place until October 2002. In addition, a single unit that was deployed from the RV *Scotia* in October 2001 was recovered for analysis.

- 6. Low Nutrient Sample:** This was collected at 59°16.88'N 000°59.62'W, 1238 GMT 27/05/2002. Salinity: Start = 35.280. End = 35.267. Temperature: Start = 9.62°C. End = 9.61°C. Fluorescence = 1552.

### Acknowledgements

We would like to thank the Captain, officers and crew of the FRV *Cirolana* for an extremely productive and enjoyable scientific survey. We would like to thank Biospherical Instruments of San Diego for the loan of the PRR2500 profiling light meter, and to Derek Noble for setting up this loan. We would also like to thank the Plymouth Marine Laboratory for the regular supply of satellite imagery by e-mail.

W R Turrell  
10 June 2002

*Seen in draft: Captain R McCurry, OIC Cirolana*