From March 1998

Fisheries Research Services have a new ship: FRV Scotia

Their old ship is referred to as Scotia II

R1/12

Not to be cited without prior reference to the Marine Laboratory, Aberdeen

FRV *Scotia*

Cruise 2098S

REPORT

2-21 December 1998

Personnel

M Heath	C2 (in charge)
W Turrell	C1
S Hay	B3
J Dunn	B2
J Hunter	B2
R Payne	B2
F Brown	B1
C Wilson	A4
M Sand	Visitor (University of Åahus, Denmark) (2-16 December)

Project

AE11n - 5 days; GBF1 - 15 days

Sampling gear

Hydrographic CTD; Plankton nets (ARIES and OCEAN samplers)

Area

Northwestern North Sea - Faroe Shetland Channel, and Norwegian Sea to maximum 70°N

Objectives

1. To conduct routine hydrographic sampling at stations along the standard JONSIS, Fair Isle-Munken and Nolso-Flugga survey lines.
2. To conduct plankton sampling with the OCEAN sampler at selected stations along the Fair Isle-Munken and Nolso-Flugga lines.
3. To conduct comparative tows with the OCEAN sampler and ARIES in the Faroe Shetland Channel.
4. To conduct plankton and hydrographic sampling with ARIES at stations in the Norwegian Sea.
5. To collect water samples for radio-caesium analysis at Fair Isle and off Aberdeen.

Narrative

Scotia sailed from Aberdeen at midday on 2 December and proceeded to conduct trial deployments of all sampling equipment in Aberdeen Bay. These were completed by midnight, and the vessel then set course for the first station on the Fair Isle-Munken survey line. Sampling

for radio-caesium analysis was carried out *en route*. CTD sampling at station FIM-1 commenced on the evening of 3 December and after some initial problems with the ship's DP system, sampling continued smoothly. Towed plankton samplers were deployed at stations in the deepest part of the Faroe-Shetland Channel according to plan until 2200 hours on 4 December when a problem with the plankton winch causing the winch to jamb in the brake. The gear was recovered, and the vessel proceeded to complete the CTD sampling along the survey line.

CTD sampling at stations on the Nolso-Flugga survey line was abandoned due to failure of the cable termination on the CTD winch. The tangled wire on the plankton winch was streamed on the evening of 5 December and inspected for damage, and the vessel then proceeded to work with the towed ARIES system at the four central stations on the Nolso-Flugga line. These were completed by 1400 hours on 6 December, and the ship then set to work the Norwegian Sea station grid with the ARIES system.

Four stations in the Norwegian Sea were completed by the morning of 8 December when bad weather forced the vessel to lie hove to for 24 hours. By 0400 hours the next day, conditions had improved and sampling was resumed at Station 10. Station 14 was also completed and the vessel was on passage to Station 15 when at 0015 hours on 10 December water entered the engine control room and the vessel lost all power and propulsion. Under the prevailing weather conditions the vessel began to roll heavily and equipment began to break loose inside the ship. The scientists and crew worked to secure and make safe equipment and close all watertight doors. It soon became clear that there was extensive damage to electronic components in the control room and that it would not be possible to restart the engines for some while.

The ship lay disabled for 12 hours before one of the engines was restarted and the vessel made slow headway to the nearest landfall 220 miles away on the west coast of Norway. A tug met the ship some 100 miles offshore and escorted it to the harbour at Sandnessjøen, arriving at 2000 hours on 11 December.

Engineering staff worked through 12 and 13 December to strip down the engine control systems and isolate the damage. Shipbuilding and technical personnel arrived on 14 December to assess the situation and supervise temporary repairs, which were completed by 15 December. However, the vessel was not considered to be in a fit state to resume the sampling programme and was instructed to make a direct passage back to Aberdeen. Due to bad weather, sailing from Sandnessjøen was delayed until 0800 hours on 16 December, and the ship arrived back in Aberdeen at 2000 hours on 19 December, 1½ days earlier than planned, after an extremely rough passage.

Results

The survey track is shown in Figure 1. The programme was clearly very much impaired by the disablement of the ship on 10 December and the subsequent loss of 11 days of survey time. This period was used productively by the scientific staff to process data and work up samples collected on the early part of the cruise.

Equipment performance

The handling system for the CTD requires further development before it can be used to best effect. The CTD was also beset with faults in the cable termination almost from the beginning of the cruise which culminated in a dead short due to water ingress. The priority sampling along the Fair Isle-Munken survey line was completed before this occurred.

The ARIES system was newly built and had not been sea tested prior to the cruise. After initial problems with the plankton sampling component of the system, the equipment performed extremely well (251 samples recovered out of a potential total of 533 from 11 deployments during the cruise as a whole, but 100% return from the last four hauls). 100% data and sample return was achieved from the water sampling rosette (513 samples from 11 deployments) and the Optical Plankton Counter, and good quality CTD data were recovered.

Engineering trials with the OCEAN sampler indicated that its towing performance was less satisfactory than for ARIES. However, the sampling nets operated well and material was collected at three stations.

Faroe-Shetland channel monitoring

The hydrographic sampling along the Fair Isle-Munken line showed that all the usual water masses were present, but lower than normal salinities (<34.90) were measured in the 600-800 m depth layers. *Calanus finmarchicus* were concentrated below 600 m along both the survey lines, in concentrations of up to 170 m^{-3}. The 1,002.8 $kg.m^{-3}$ specific density surface marks the interface between southerly flowing Arctic water masses and northerly flowing Atlantic waters in the Channel. Long term monitoring data indicate that this surface has deepened over the last three decades. The data from this survey, together with others collected since 1993, indicate that below the 1,002.8 $kg.m^{-3}$ specific density surface, the concentration (number m^{-3}) of *Calanus* during the winter has remained approximately constant. Hence, the results indicate a declining trend in overall abundance, although there are not yet sufficient years of data to confirm this as statistically significant.

Norwegian Sea survey

The sampling strategy in the Norwegian Sea had been to work northwards along the Norwegian continental shelf slope as far as 70°N, then west towards Jan Meyen and south towards the Faroe Islands. Due to the vessel breakdown, only a few stations were completed in the east of the area as far as 66°48'N. Nevertheless, this was an area which had been least well surveyed in previous cruises, and the sampling revealed high concentrations of *Calanus* along the slope, equivalent to those encountered in the Faroe-Shetland Channel. Even these few data add considerably to knowledge of the winter distribution of *Calanus* and will make a significant difference to the computer models of *Calanus* population dynamics that are being developed at the Marine Laboratory.

M R Heath
7 January 1999

Seen in draft: P Ramsay, Master

Table 1. Fair Isle-Munken line stations completed

Name	Latitude	Longitude	Depth	Sampling
FIM-01	60°10.00'N	03°44.00'W	150 m	CTD
SEFOS-1	60°13.00'N	03°51.50'W	170 m	CTD
FIM-02	60°16.00'N	03°59.00'W	200 m	CTD
SEFOS-2	60°18.00'N	04°04.50'W	330 m	CTD
FIM-03	60°20.25'N	04°09.00'W	390 m	CTD
FIM-04	60°25.00'N	04°19.00'W	655 m	CTD
FIM-05	60°29.00'N	04°26.00'W	995 m	CTD, OCEAN
FIM-06	60°35.00'N	04°45.00'W	1,090 m	CTD, OCEAN, ARIES
FIM-6a	60°38.00'N	04°54.00'W	1,030 m	CTD
FIM-07	60°43.00'N	05°06.00'W	915 m	CTD, OCEAN
FIM-08	60°47.00'N	05°16.00'W	830 m	CTD
FIM-09	60°51.00'N	05°29.00'W	600 m	CTD
FIM-10	61°02.00'N	05°57.00'W	280 m	CTD
FIM-11	61°12.00'N	06°22.00'W	240 m	CTD

Table 2. Nolso-Flugga line stations completed (out of a planned total of 16)

Name	Latitude	Longitude	Depth	Sampling
NOL-04	61°14.00'N	02°40.00'W	1,080 m	ARIES
NOL-05	61°21.00'N	03°10.00'W	1,370 m	ARIES
NOL-06	61°28.00'N	03°42.00'W	1,235 m	ARIES
NOL-07	61°35.00'N	04°15.00'W	990 m	ARIES

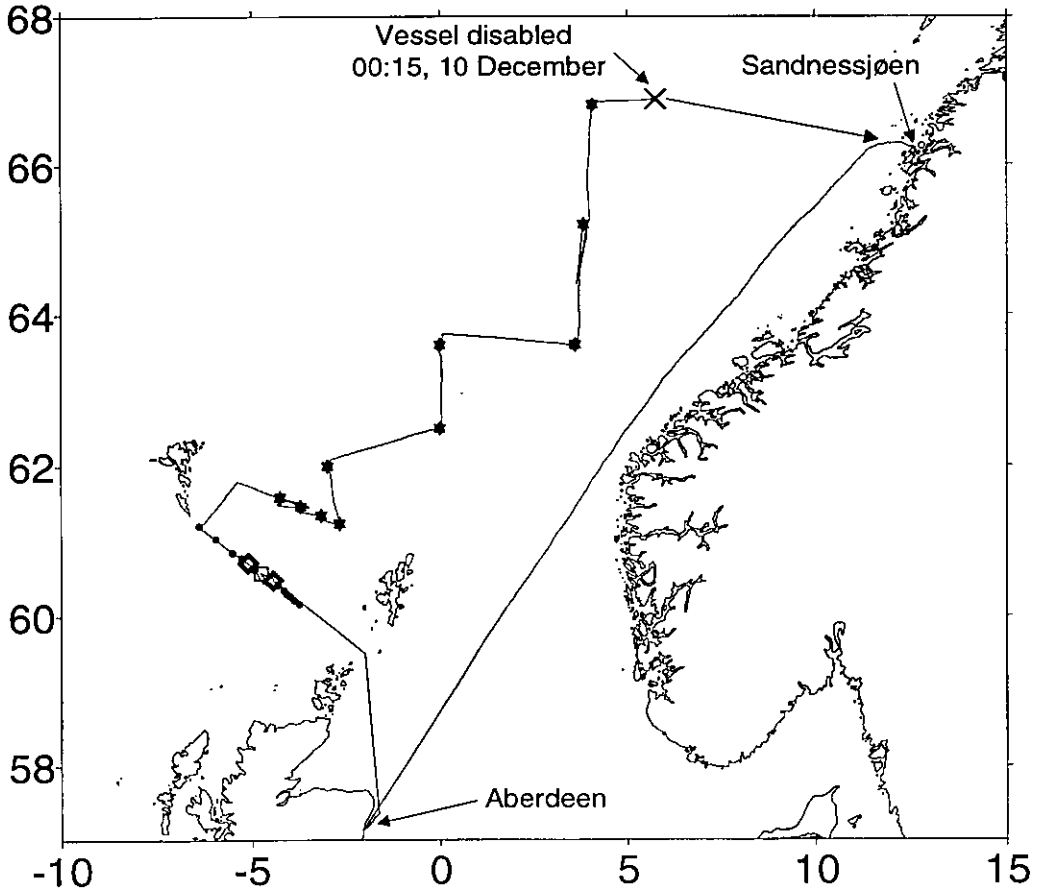
Table 3. Norwegian Sea stations completed (out of a planned total of 27)

Number	Latitude	Longitude	Depth	Sampling
1	62°00.00'N	3°00.00'W	1,384 m	ARIES
2	62°30.00'N	0°00.00'E	1,101 m	ARIES
5	63°36.00'N	0°00.00'E	2,207 m	ARIES
6	63°36.00'N	3°35.91'E	1,480 m	ARIES
10	65°12.00'N	3°48.87'E	1,137 m	ARIES
14	66°48.00'N	4°03.69'E	1,245 m	ARIES

Figure 1

Scotia cruise 20/98

Cruise track and sampling locations
2 - 19 December 1998



- CTD sampling
- ARIES sampling
- ◇ CTD and OCEAN sampling
- □ CTD, OCEAN and ARIES sampling