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

FRV *Clupea*

Cruise 1000C

REPORT

7-22 July 2000

Personnel

G Grewar	7-15 July	(In charge)		
P Hayes	7-22 July			
W Austin	7-11 July	St Andrews Univ		
S Davies	7-11 July	St Andrews Univ		
G Slesser	11-15 July			
I Davies 15-19 July	(In charge)			
J Barnes	15-19 July	Newcastle Univ	}	
S Harries	15-19 July	Leeds Univ	}	Living Ashore
P Anchutz	15-19 July	Bordeaux Univ	}	
T Freitag	15-19 July	Aberdeen Univ		
M Krom 16-19 July	Leeds Univ			
R Mortimer	16-19 July	Leeds Univ		
P Gillibrand	19-22 July	(In charge)		
M Robertson	19-22 July			

Out turn costs per project: 16 day AE1158

Objectives

1. To recover hydrographic moorings from Loch Torridon, Rona and Loch Duich.
2. To undertake hydrochemical surveys in the Minch off Loch Snizort.
3. To undertake small scale hydrochemical surveys at fish farms, including Loch Duich.
4. To collect sediment cores for historical analysis of microplankton remains.
5. To collect sediment samples for studies of nitrogen cycling in sea loch sediments.
6. To collect sediment samples for studies of ammonia-oxidising bacteria at fish farms.

Narrative

After loading on the morning of the 7th, passage was made to Loch Sunart, arriving in the evening of the 8th. Due to sampling equipment difficulties, a series of Sholkavich cores rather than Craib cores were taken. *Clupea* left Sunart earlier than programmed due to bad weather and made passage to an anchorage in Loch Nevis, where processing of cores continued until late in the evening. Processing of the cores was completed during the morning of the 10th, followed by a grab survey of Loch Nevis for chemical analysis. After completion of the survey in the late afternoon, passage was made to Kyle of Lochalsh where on the morning of the 11th W Austin and S Davies disembarked and G Slesser boarded. Passage was made to Loch Torridon, where a grab survey of Lochs Torridon, Diabaig and Sheildaig was undertaken. *Clupea* then made passage to Gairloch. On 12 July a hydrochemical survey was partially carried out along a transect in the Little Minch, before anchoring in Loch Snizort. The survey was completed on 13 July, before passage

was made to Loch Duich. An intensive hydrochemical survey near a fish farm in Loch Duich was carried out on the 14th, and *Clupea* anchored in Loch Duich overnight. G Slesser left the boat on the morning of the 15th at Kyle of Lochalsh, before *Clupea* continued to Loch Kishorn to complete a grab survey for chemical analysis. Passage was then made to Kyle of Lochalsh for a staff changeover with G Grewar disembarking and returning to Aberdeen with samples for analysis.

I Davies, T Freitag (Aberdeen Univ), P Anschutz (Bordeaux Univ), S Harris (Leeds Univ) and J Barnes (Newcastle Univ) joined *Clupea* at Kyle on 15 July. M Krom (Leeds Univ) and R Mortimer (Leeds Univ) joined on 16 July. The period from 16-19 July was devoted to nitrogen cycling studies in sediment in Loch Duich. The Leeds University staff undertook high resolution sampling of sediment pore waters for subsequent analysis for iron, manganese, ammonia, alkalinity, nitrate, chloride, sulphate and sulphide. This was complemented by electrochemical measurements on a similar millimetre resolution by P Anschutz of dissolved oxygen, iron, manganese, sulphide, nitrate and iodide. J Barnes prepared samples for measurement of microbial nitrogen cycling rates using 15N spikes (as ammonia or nitrate) and subsequent incubations and assays of the nitrous oxide generated. J Barnes also took water samples for measurement of nitrous oxide and methane as indicators of microbial activity which might be enhanced by the activities of the fish farm.

T Freitag collected sediment samples for the extraction of bacterial DNA and subsequent amplification of the DNA from ammonia oxidisers in particular. This will give material suitable for sequencing, and possibly for estimates of microbial activity. Direct measurements of the activity of ammonia oxidisers were made using incubations in the presence of labelled carbon. Some experiments were carried out using enrichment culture techniques (with added manganese dioxide), and further work with enrichment cultures is planned in Aberdeen, to aid the interpretation of the DNA data.

P Hayes extracted pore waters samples under anaerobic conditions using classical glove box and centrifugation procedures. These were sub-sampled and suitably preserved for subsequent analyses. Sulphide analyses were carried on the ship.

All staff except P Hayes left the ship at Kyle on 19 July, and P Gillibrand and M Robertson joined the ship. *Clupea* returned to Loch Duich on 19 July to recover a current metre mooring, collect sediment samples for macrofaunal analysis, while other staff completed the processing of samples collected on the previous day.

On 19 and 20 July, current metre moorings were recovered from Loch Duich, Loch Torridon and close to Rona Island before *Clupea* made passage back to Fraserburgh. Scientific staff left the vessel on 22 July. Equipment was fully unloaded on 24 July.

Results

All objectives were successfully completed. Collected data will undergo further processing and analysis at relevant institutions.

G Grewar
I M Davies
P A Gillibrand

25 July 2000

Seen in draft: A Simpson, OIC