

CRUISE SUMMARY REPORT

FOR COLLATING CENTRE USE

Centre: BODC Ref. No.:

 Is data exchange restricted Yes In part No

SHIP enter the full name and international radio call sign of the ship from which the data were collected, and indicate the type of ship, for example, research ship; ship of opportunity, naval survey vessel; etc.

Name: RSS James Clark Ross

Call Sign: Z.D.L.P

Type of ship: Research vessel with ice class 1A specification

CRUISE NO. / NAME JR219

enter the unique number, name or acronym assigned to the cruise (or cruise leg, if appropriate).

CRUISE PERIOD start 13/6/10 to 27/8/10 end
(set sail) day/ month/ year day/ month/ year (return to port)

PORT OF DEPARTURE (enter name and country) Immingham, UK

PORT OF RETURN (enter name and country) Peterhead, UK

RESPONSIBLE LABORATORY enter name and address of the laboratory responsible for coordinating the scientific planning of the cruise

Name: Scottish Association for Marine Science

Address: Scottish Marine Institute, Oban, Argyll, PA37 1QA

Country: UK

CHIEF SCIENTIST(S) enter name and laboratory of the person(s) in charge of the scientific work (chief of mission) during the cruise.

Dr Raymond Leakey, Scottish Association for Marine Science

OBJECTIVES AND BRIEF NARRATIVE OF CRUISE enter sufficient information about the purpose and nature of the cruise so as to provide the context in which the report data were collected.

This research cruise was undertaken as part of the UK Natural Environment Research Council Oceans2025 strategic marine strategic research programme. The cruise was organised and led by the Scottish Association for Marine Science (SAMS) as part of the SAMS Oceans2025 research topic "*Arctic and Boreal Seas in a Rapidly Changing Climate*". In addition research scientists participated in the cruise from several UK and international institutions including the Arctic and Antarctic Research Institute (Russia), the Institute of Natural Resources (Greenland), the Leibniz Institute of Marine Sciences (Germany), the Norwegian Polar Institute, the University of Montpellier (France), the University of Vigo (Spain), the UK National Oceanographic Centre (NOC) and the UK Universities of Aberdeen, East Anglia, Glasgow, Oxford, and St Andrews. The research vessel, officers, crew and ships technical support were provided by the British Antarctic Survey (BAS).

The overall scientific objective of research cruise was to improve understanding of how changing sea ice and water column structure influence Arctic ecosystem structure and function, and subsequent biologically derived carbon export. This was achieved by delivering novel and comprehensive observational and experimental data sets on sympagic, pelagic and benthic biogeochemical parameters in the Greenland Sea and Svalbard shelf waters during the Arctic summer. A comparative approach was adopted with multidisciplinary studies focused on stations in open waters, marginal ice zone and full ice covered environments. Physical oceanographic and palaeo-oceanographic observations were also undertaken to examine (i) mixing in the region of the Atlantic Water boundary and (ii) Holocene variability in sea ice, glacial extent and the northward transport of North Atlantic Water around western Svalbard. Additional studies were conducted during transit from the UK to Svalbard.

Summary Itinerary:

- Sailed from Immingham at mid-afternoon on 13 June 2010.
- Commenced science activities in English Channel at 08.00 on the 14 June 2010.
- Arrived Longyearbyen, Svalbard on 19 June 2010.
- Commenced science activities in sea ice north-west of Svalbard on the 22 June 2010.
- Returned to Loneyarbyen for science staff exchange on the 2 July 2010.
- Commenced science activities in open water and sea-ice in Greenland Sea on the 4 July 2010.

- Returned to Loneybyen for science staff exchange on the 13 July 2010.
- Commenced science activities on west and north Svalbard shelf on the 14 July 2010.
- Concluded science activities on west Svalbard shelf at 02.20 on 21 August 2010.
- Returned to Loneybyen for science staff exchange on the 21 August 2010
- Docked and demobilised at Peterhead on morning of 27 August 2010.

PROJECT (IF APPLICABLE) if the cruise is designated as part of a larger scale cooperative project (or expedition), then enter the name of the project, and of organisation responsible for co-ordinating the project.

Project name:

Coordinating body:

PRINCIPAL INVESTIGATORS: Enter the name and address of the Principal Investigators responsible for the data collected on the cruise and who may be contacted for further information about the data. (The letter assigned below against each Principal Investigator is used on pages 2 and 3, under the column heading 'PI', to identify the data sets for which he/she is responsible)

- A. Ray Leakey, Scottish Association for Marine Science (ray.leakey@sams.ac.uk)
- B. Colin Griffiths, Scottish Association for Marine Science (colin.griffiths@sams.ac.uk)
- C. Estelle DuMont, Scottish Association for Marine Science (estelle.dumont@sams.ac.uk)
- D. Ronnie Glud, Scottish Association for Marine Science (ronnie.glud@sams.ac.uk)
- E. Henrik Stahl, Scottish Association for Marine Science (henrik.stahl@sams.ac.uk)
- F. Tim Brand, Scottish Association for Marine Science (tim.brand@sams.ac.uk)
- G. Tim Boyd, Scottish Association for Marine Science (tim.boyd@sams.ac.uk)
- H. Mark Inall, Scottish Association for Marine Science (mark.inall@sams.ac.uk)
- I. John Howe, Scottish Association for Marine Science (john.howe@sams.ac.uk)
- J. Jenny Riley, National Oceanography Centre (jennifer.riley@noc.soton.ac.uk)
- K. Eithne Tynan, National Oceanography Centre (e.tynan@soton.ac.uk)
- L. Mike Zubkov, National Oceanography Centre (mvz@noc.soton.ac.uk)
- M. Dan Mayer, University of Aberdeen (dan.mayor@abdn.ac.uk)
- N. Helen Atkinson, University of East Anglia (helkin@bas.ac.uk)
- O. Heiko Moossen, University of Glasgow (heiko.moossen@ges.gla.ac.uk)
- P. Heather Bouman, University of Oxford (heather.bouman@earth.ox.ac.uk)
- Q. Katherine Woollard, University of St Andrews (khw@st-andrews.ac.uk)
- R. Alexey Pavlov, Arctic and Antarctic Institute, Russia (pavlov.alexey.k@gmail.com)
- S. Daniel Vogedes, Norwegian Polar Institute (daniel.vogedes@gmx.de)
- T. Emilie le Floch, University of Montpellier, France (emilie.lefloch@univ.montp2.fr)
- U. Elena Garcia, University of Vigo (egarcia@uvigo.es)

MOORINGS, BOTTOM MOUNTED GEAR AND DRIFTING SYSTEMS

This section should be used for reporting moorings, bottom mounted gear and drifting systems (both surface and deep) deployed and/or recovered during the cruise. Separate entries should be made for each location (only deployment positions need be given for drifting systems). This section may also be used to report data collected at fixed locations which are returned to routinely in order to construct 'long time series'.

PI See top of page.	APPROXIMATE POSITION						DATA TYPE enter code(s) from list on last page.	DESCRIPTION Identify, as appropriate, the nature of the instrumentation the parameters (to be measured), the number of instruments and their depths, whether deployed and/or recovered, dates of deployments and/or recovery, and any identifiers given to the site.
	LATITUDE			LONGITUDE				
	deg	min	N/S	deg	min	E/W		
D	80	55	N	05	01	E	H10 H21 H74	Sea-ice/water gas exchange instrumentation. This instrument package included: 3 eddy correlation instruments, a CTD, Oxygen optode and PAR-meter.
B	80	55	N	05	01	E	H10 H72 D01 D71 B73	SAMS sea-ice physics instrumentation deployment and recovery This mooring included: Mooring (? CTDs, ? temperature miniloggers, an ADCP, ? S4 current meter and ? sediment trap), APEX, GPS etc (Colin Griffiths to complete)
B	79	49	N	10	01	E	H10 H72 D01 D71 B73	SAMS mooring deployment and recovery. This mooring included: three ? CTDs, ? temperature miniloggers, ? ADCP, ? S4 current meter and ? sediment trap. (Colin Griffiths to complete)
G								AUV deployment and recovery on Legs 3 and 4 (Tim Boyd to complete)
G								AUV deployment and recovery on Legs 3 and 4 (Tim Boyd to complete)
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Please continue on separate sheet if necessary

SUMMARY OF MEASUREMENTS AND SAMPLES TAKEN

Except for the data already described on page 2 under 'Moorings, Bottom Mounted Gear and Drifting Systems', this section should include a summary of all data collected on the cruise, whether they be measurements (e.g. temperature, salinity values) or samples (e.g. cores, net hauls).

Separate entries should be made for each distinct and coherent set of measurements or samples. Different modes of data collection (e.g. vertical profiles as opposed to underway measurements) should be clearly distinguished, as should measurements/sampling techniques that imply distinctly different accuracy's or spatial/temporal resolutions. Thus, for example, separate entries would be created for i) BT drops, ii) water bottle stations, iii) CTD casts, iv) towed CTD, v) towed undulating CTD profiler, vi) surface water intake measurements, etc.

Each data set entry should start on a new line – it's description may extend over several lines if necessary.

NO, UNITS : for each data set, enter the estimated amount of data collected expressed in terms of the number of 'stations'; miles' of track; 'days' of recording; 'cores' taken; net 'hauls'; balloon 'ascents'; or whatever unit is most appropriate to the data. The amount should be entered under 'NO' and the counting unit should be identified in plain text under 'UNITS'.

PI	NO	UNITS	DATA TYPE	DESCRIPTION
see page 2	see above	see above	Enter code(s) from list on last page	Identify, as appropriate, the nature of the data and of the instrumentation/sampling gear and list the parameters measured. Include any supplementary information that may be appropriate, e. g. vertical or horizontal profiles, depth horizons, continuous recording or discrete samples, etc. For samples taken for later analysis on shore, an indication should be given of the type of analysis planned, i.e. the purpose for which the samples were taken.
				METEOROLOGY
C	~3000	Naut.miles	M06	Incident radiation
C	~3000	Naut.miles	M06	Routine standard measurements
N	?	Stations	M71	Atmospheric Chemistry
				PHYSICAL OCEANOGRAPHY
C	20+	Stations	H09	Water bottle stations
C	?	Stations	H10	CTD Stations
C	~3000	Naut.miles	H71	Sub-surface measurements underway (T,S)
R/T	?	Stations	H17	Optics
C	?		D71	Current Profiler
G/H	?	Stations	D90	Other physical oceanographic measurements (Microscale structure and mixing)
				CHEMICAL OCEANOGRAPHY
D/F/U	1+	Stations	H21	Oxygen
D/U	1+	Stations	H74	Carbon dioxide
F	?	Stations	H22	Phosphate
F	?	Stations	H23	Total - P
F	?	Stations	H24	Nitrate
F	?	Stations	H25	Nitrite
F	?	Stations	H75	Total - N
F	?	Stations	H76	Ammonia
F	?	Stations	H26	Silicate
D/K	1+	Stations	H27	Alkalinity
D/K	1+	Stations	H28	PH
F	?	Stations	H31	Radioactivity
Q	~3000	Naut.Miles	H32	Isotopes (underway δ^{18} oxygen)
I/R	?	Stations	H32	Isotopes (δ^{18} oxygen)
N	?	Stations	H90	Other chemical oceanographic measurements (halocarbon compounds)
				MARINE BIOLOGY/FISHERIES
K/P	6	Stations	B01	Primary productivity
A/P	6	Stations	B02	Phytoplankton pigments (eg chlorophyll, fluorescence)
A/J/K	20	Stations	B71	Particulate organic matter (inc POC, PON)
A	6	Stations	B06	Dissolved organic matter (inc DOC)
O	1+	Stations	B72	Biochemical measurements (eg geochemical biomarkers)
J	11	Stations	B73	Sediment Traps (Snowcatchers)
A/P	6	Stations	B08	Phytoplankton
S	?	Stations	B09	Zooplankton
A/L/Q	13	Stations	B07	Pelagic bacteria/micro-organisms

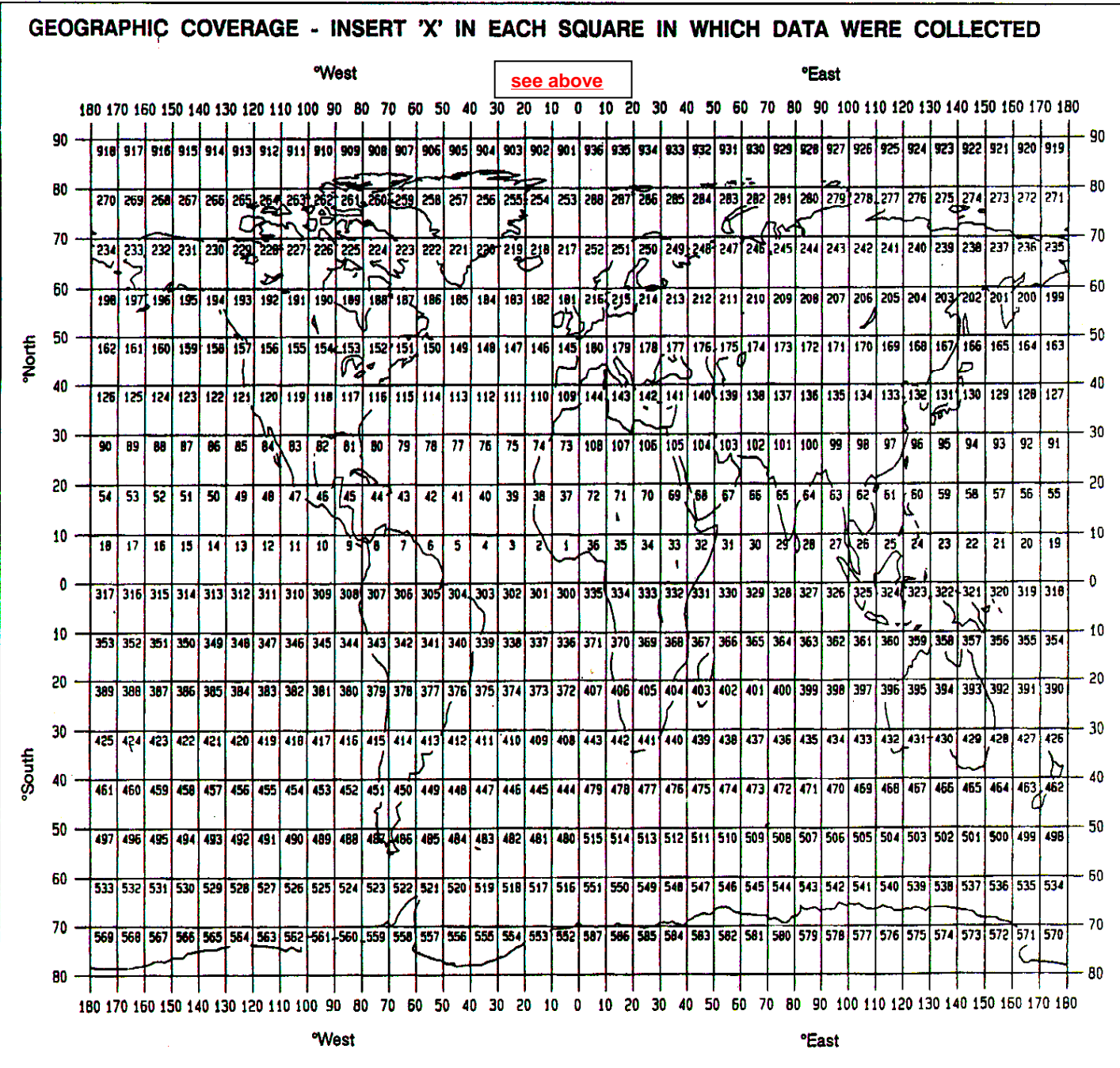
M	1	Stations	B18	Zoobenthos
MARINE GEOLOGY/GEOPHYSICS				
I/M	8+	Stations	G04	Core - soft bottom (megacores)
E	7	Cores	G04	Core - soft bottom (Piston cores)
I/M	1+	Stations	G71	In-situ seafloor measurement/sampling
E	5	Stations	G74	Multi-beam echosounding

TRACK CHART: You are strongly encouraged to submit, with the completed report, an annotated track chart illustrating the route followed and the points where measurements were taken.	Insert a tick (✓) in this box if a track chart is supplied	<div style="border: 1px solid black; width: 40px; height: 40px; margin: 0 auto; display: flex; align-items: center; justify-content: center;"> X </div>
GENERAL OCEAN AREA(S): Enter the names of the oceans and/or seas in which data were collected during the cruise – please use commonly recognised names (see, for example, International Hydrographic Bureau Special Publication No. 23, 'Limits of Oceans and Seas'). North Atlantic (North Sea and Norwegian Sea) Arctic Oceans (Greenland Sea and Svalbard Shelf Seas)		

SPECIFIC AREAS: If the cruise activities were concentrated in a specific area(s) of an ocean or sea, then enter a description of the area(s). Such descriptions may include references to local geographic areas, to sea floor features, or to geographic coordinates.

Please insert here the number of each square in which data were collected from the below given chart

North Sea and eastern Norwegian Sea (216, 252, 251)
 Greenland sea Svalbard Shelf Seas (253, 287, 288, 901, 935, 936)



THANK YOU FOR YOUR COOPERATION
 Please send your completed report without delay to the collating centre indicated on the cover page

PARAMETER CODES**METEOROLOGY**

M01	Upper air observations
M02	Incident radiation
M05	Occasional standard measurements
M06	Routine standard measurements
M71	Atmospheric chemistry
M90	Other meteorological measurements

PHYSICAL OCEANOGRAPHY

H71	Surface measurements underway (T,S)
H13	Bathythermograph
H09	Water bottle stations
H10	CTD stations
H11	Subsurface measurements underway (T,S)
H72	Thermistor chain
H16	Transparency (eg transmissometer)
H17	Optics (eg underwater light levels)
H73	Geochemical tracers (eg freons)
D01	Current meters
D71	Current profiler (eg ADCP)
D03	Currents measured from ship drift
D04	GEK
D05	Surface drifters/drifted buoys
D06	Neutrally buoyant floats
D09	Sea level (incl. Bottom pressure & inverted echosounder)
D72	Instrumented wave measurements
D90	Other physical oceanographic measurements

CHEMICAL OCEANOGRAPHY

H21	Oxygen
H74	Carbon dioxide
H33	Other dissolved gases
H22	Phosphate
H23	Total - P
H24	Nitrate
H25	Nitrite
H75	Total - N
H76	Ammonia
H26	Silicate
H27	Alkalinity
H28	PH
H30	Trace elements
H31	Radioactivity
H32	Isotopes
H90	Other chemical oceanographic measurements

MARINE CONTAMINANTS/POLLUTION

P01	Suspended matter
P02	Trace metals
P03	Petroleum residues
P04	Chlorinated hydrocarbons
P05	Other dissolved substances
P12	Bottom deposits
P13	Contaminants in organisms
P90	Other contaminant measurements

MARINE BIOLOGY/FISHERIES

B01	Primary productivity
B02	Phytoplankton pigments (eg chlorophyll, fluorescence)
B71	Particulate organic matter (inc POC, PON)
B06	Dissolved organic matter (inc DOC)
B72	Biochemical measurements (eg lipids, amino acids)
B73	Sediment traps
B08	Phytoplankton
B09	Zooplankton
B03	Seston
B10	Neuston
B11	Nekton
B13	Eggs & larvae
B07	Pelagic bacteria/micro-organisms
B16	Benthic bacteria/micro-organisms
B17	Phytobenthos
B18	Zoobenthos
B25	Birds
B26	Mammals & reptiles
B14	Pelagic fish
B19	Demersal fish
B20	Molluscs
B21	Crustaceans
B28	Acoustic reflection on marine organisms
B37	Taggings
B64	Gear research
B65	Exploratory fishing
B90	Other biological/fisheries measurements

MARINE GEOLOGY/GEOPHYSICS

G01	Dredge
G02	Grab
G03	Core - rock
G04	Core - soft bottom
G08	Bottom photography
G71	In-situ seafloor measurement/sampling
G72	Geophysical measurements made at depth
G73	Single-beam echosounding
G74	Multi-beam echosounding
G24	Long/short range side scan sonar
G75	Single channel seismic reflection
G76	Multichannel seismic reflection
G26	Seismic refraction
G27	Gravity measurements
G28	Magnetic measurements
G90	Other geological/geophysical measurements

