

RRS Sir David Attenborough

November 2020 Science Users' Workshop Report



Compiled from an online workshop held on Wednesday 25 – Friday 27 November 2020

Acknowledgements

The workshop organisers, Linda Capper, Dr Ray Leakey (co-Chair), Dr Sophie Fielding, Dr Rob Larter and Emily Neville, would like to thank: Guest speakers Professor Susan Waldron (co-chair), Professor Dame Jane Francis and Professor Sir Duncan Wingham; Presenters: Randy Sliester, Professor Brian King, Jeremy Robst, Professor Colm Ó Cofaigh, Dr Malcolm Woodward, Professor Ian Brooks, Dr Anna Jones, Dr Natalie Powney and Simon Garrod; Breakout session leads, Professor Karen Heywood, Dr Alex Burton-Johnson, Professor Finlo Cottier, Dr Kelly Hogan, Dr Alex Brearley, Dr Sian Henley and Dr Huw Griffiths; Pete Bucktrout, Jamie Oliver, Rich Turner and Simon Wright for their work developing the virtual ship tour; and Amanda Wynne for administrative support.

Executive Summary

In November 2020, 198 delegates attended a three-day science-users' workshop to discuss the science and operation of the new polar research ship RRS *Sir David Attenborough* (SDA). Held online via Zoom, a series of plenary presentations and breakout sessions focussed on the ship's science capability, 'into service' planning, future opportunities and challenges.

The key aims were to introduce delegates to the scientific capabilities of the new polar research ship, highlight the differences from the RRS *James Clark Ross* and stimulate and capture big science ideas. Participants were challenged to think about what needs to be done differently to optimise the ship's multidisciplinary capability and operational role, and to consider how to bring about culture change to promote and enhance equality, diversity and inclusion.

Plenary session video recordings are available to view on the British Antarctic Survey (BAS) web site: <https://www.BritishAntarcticSurvey.ac.uk/attenborough-workshop> (password: penguins2020). To enable free discussion breakout sessions were not recorded on video. Key outcomes and notes from rapporteurs, chairs and workshop organisers are summarised in this report.

Post workshop note: the into-service timeline was changed because of COVID-19 disruption.

Making waves breakout sessions – key outcomes

The challenge to think differently about future research cruises was embraced positively. Delegates expressed an appetite for larger and longer cruises, but noted that effective management of these cruises requires a critical review of the role of Chief Scientist. There was concern that longer cruises may deter some communities, including some under-represented groups. However, the idea that by making use of new technologies, such as autonomous vehicles, researchers could be involved in a cruise without being on-board was viewed as a potential benefit. This approach could improve inclusivity, for example disabled scientists and others who do not find it easy to travel or be away from home for extended periods.

Funding and planning-horizon policies and processes are poorly understood by science users (particularly Early Career Researchers (ECRs)). The need for longer planning horizons, at least for primary-use projects (as opposed to secondary add-on projects), was raised repeatedly.

Participant feedback was extremely positive, with several commenting on how encouraging it is to see Natural Environment Research Council (NERC) Head Office, Higher Education Institutions (HEIs), and NERC Centres working together. There is a strong desire for improved two-way communication between UK Research and Innovation (UKRI)-NERC and the science community, a need for greater visibility of planning and funding processes and clarity about linkages with international programmes – both existing and future.

Doing things differently: science opportunities and challenges

During breakout sessions delegates recognised that the commissioning of the new ship offers a unique opportunity to instigate transformative change to enhance the way cruises are planned and run, for example new training programmes for Chief Scientists and options to involve Early Career Scientists. However, there is a risk that without positive action now a new "normal" way of working could evolve within a year or two, which would be difficult to change.

It was recognised that multi- and interdisciplinary cruises using the full capability of the SDA was likely to be the most efficient model to operate the ship – like that of the Polarstern. There was

interest in how to identify the appropriate national and international mechanisms to drive them forward. The ambition to embed positive culture on the ship from the start is hugely important.

In addition to existing globally important research activities, delegates discussed a range of 'big science ideas' and new initiatives such as:

- **Winter cruises** to address key scientific gaps in understanding of polar systems stemming from a lack of winter data. There was recognition that winter cruises could conflict with BAS' logistical delivery requirements and that this should be highlighted as a key challenge moving forward.
- **Arctic** - access to new areas such as Russian waters, Baffin Bay, Central Arctic Ocean and newly ice-free regions
- **Coastal and land-ocean studies** using new capabilities (e.g. helicopters)
- **Novel ideas** to use the ship as a more sophisticated (Hi-Tech) monitoring platform
- **Enabling ECRs** to act as co-Chief scientists on cruises to grow the next generation of Chief Scientists, and to promote good management of SDA cruises that are likely to be more sophisticated, complex, large and long.

Recommendations

- **Embracing change:** in developing NERC's science commissioning for SDA and BAS' new operating model, positive action should be taken ensure that a new "normal" meets science user community needs.
- **New science:** identify a horizon scanning mechanism to capture science community ideas to optimise the capabilities of the SDA and to engage science users in longer planning horizon discussions.
- **Planning and funding:** UKRI-NERC and BAS teams to work together to improve online visibility of funding and planning processes.
- **Cruise management:** UKRI-NERC to review the role, responsibilities, training and selection process for Chief Scientists who lead research cruises. Nurture the next generation by involving ECRs as 'co-Chief Scientists'. *(NB this initiative is already being discussed through the NERC Cruise Programme Review Group).*
- **Communication and engagement:** identify and implement e-communication networks/channels to keep users and future users involved and up to date with activities and opportunities
- **Equality, Diversity and Inclusion (EDI):** develop new policies and procedures to enable under-represented groups to access the ship (perhaps virtually). Review existing codes of conduct and any cultural barriers to EDI and link with efforts by NERC Cruise Planning Review Group. Ensure that pre-deployment training covers the importance and benefits of EDI.

Introduction

The RRS *Sir David Attenborough* (SDA) is the UK's most advanced research vessel and is set to transform how the UK delivers and supports polar science. The new ship is owned by UKRI-NERC, operated by BAS, and will enter service in support of the UK science community research cruises from 2023.

In November 2020, 198 delegates attended a three-day science-users' workshop to discuss the science and operation of the SDA. Held online via Zoom, a series of plenary presentations and breakout sessions focussed on the ship's science capability, 'into service' planning, future opportunities and challenges. The workshop builds on previous science-user engagement activities, including an SDA cruise planning and operations workshop held in 2017.

The workshop comprised two parts:

Days 1 and 2 plenary sessions. *Making waves: Britain's new polar ship* introduced delegates to the new polar research ship and the timetable for bringing the ship into service. Presentations focused on the ship's new scientific capabilities, highlighting the differences from the RRS *James Clark Ross*, and encompassing all science disciplines (physics, geosciences, biology, chemistry and atmospheric science).

Day 3 breakout sessions. *Doing things differently: science opportunities and challenges* explored, via presentations and facilitated discussions ambitious new science on the SDA in the Antarctic and Arctic; how we should plan, fund and schedule such science, and how we can build diverse polar communities of the future.

The full programme can be read in Appendix 1. Recordings of the plenary sessions are available to view on the BAS website: <https://www.BritishAntarcticSurvey.ac.uk/attenborough-workshop> (password: penguins2020).

To allow free dialogue, breakout sessions were not recorded, however a written summary is below. See Appendix 2 for Chair and Rapporteur notes. See Appendix 3 for full workshop participant list; and Appendix 4 for written Questions and Answers. Sessions were:

1. **Ambitious science -What is our vision for ambitious science on the RRS *Sir David Attenborough* in the Antarctic?** Chair: Professor Karen Heywood. Rapporteur: Dr Alex Burton-Johnson
2. **What is our vision for ambitious science on the RRS *Sir David Attenborough* in the Arctic?** Chair: Professor Finlo Cottier. Rapporteur: Dr Kelly Hogan
3. **Ambitious science -Making it happen. How should we plan, fund and schedule science on the RRS *Sir David Attenborough*?** Chair: Professor Susan Waldron. Rapporteur: Dr Alex Brearley
4. **Building inter-disciplinary, diverse and inclusive polar science communities of the future** Chair: Dr Sian Henley. Rapporteur: Dr Huw Griffiths

Summary of key issues, outcomes and recommendations

Embracing change:

The challenge to think differently about future research cruises was embraced positively. During breakout sessions delegates recognised that the commissioning of the new ship offers a unique opportunity to instigate transformative change. However, there is a risk that without positive action now a new “normal” way of working could evolve within a year or two, which would be difficult to change.

Recommendation: *The development of BAS’ change management programme and new operating model should build in mechanisms for engagement and consultation with science users.*

New science:

In addition to existing globally important research activities there are areas where the community is proactively wanting to do things differently. Delegates discussed a range of ‘big science ideas’ and new initiatives such as:

- Winter cruises to address key scientific gaps in understanding of polar systems stemming from a lack of winter data. There was recognition that winter cruises could conflict with BAS’ logistical delivery requirements and that this should be highlighted as a key challenge moving forward. To take the concept of winter cruises forward researchers will need to identify the geographical regions of highest scientific benefit and understand what can be achieved with platforms deployed from the SDA.
- Arctic - access to new areas such as Russian waters, Baffin Bay, Central Arctic Ocean and newly ice-free regions. The challenge of matching the best timing of Arctic cruises with the SDA’s logistical commitments was also recognised.
- Coastal and land-ocean studies using new capabilities (e.g. helicopters).
- Novel ideas to use the ship as a more sophisticated (Hi-Tech) monitoring platform.
- Developing methodologies to enhance biological oceanography and understanding of ecosystems. For example, extracting environmental DNA from standard water sampling using CTD rosettes to estimate dynamics of changes in abundance of biological entities.

Recommendation: *identify a horizon-scanning mechanism to capture science community ideas to optimise the capabilities of the SDA and to engage science users in longer planning horizon discussions.*

Planning and funding:

Workshop participants considered the implications of undertaking more complex and longer cruises, with more scientists, and noted that whilst some see this as a real opportunity, there are challenges.

- The drive and interest for multidisciplinary cruises using the full capability of the SDA was high, including how to identify the appropriate national and international mechanisms to drive them forward.
- There was a desire to understand how to plan, coordinate and utilise helicopter capability provided by a third party.
- The need for longer planning horizons, at least for primary-use projects (as opposed to secondary add-on projects), was raised repeatedly.
- Participants recognised that large science endeavours are likely to be led by mid-late career scientists and expressed a desire for mechanisms to identify opportunities for ECRs who are

likely to drive or influence the future use of the SDA. There was a demand from ECRs for a more coordinated approach to accessing funding or ship time

- Participants want greater clarity on what the logistical and station resupply constraints and commitments are, and how these will impact where and when the ship can conduct science cruises.
- Researchers want to know what the maximum duration in a normal year of summer Arctic cruise that can be accommodated; and implications for the ship venturing into the Central Arctic Ocean.
- Scientists want to be part of the solution in terms of making planning structures work, and share new ideas and opportunities to link with international programs to fill the ship.

Recommendation: *UKRI-NERC and BAS teams to work together to improve online visibility of funding and planning processes; and to involve science users in the early planning process. Identify a horizon scanning mechanism to capture science community ideas to optimise the capabilities of the SDA.*

Cruise management:

A critical review of the role of Chief Scientist is required, particularly for effective management of larger and longer multidisciplinary cruises.

- The increased responsibility associated with coordinating and looking after the welfare of more projects and people could be addressed by the appointment of a Co-Chief.
- There could be benefits gained from future Chief Scientists co-working with more experienced individuals – for example, ECRs acting as co-Chief scientists
- A new Chief Scientists' training programme could be developed, involving input from other national programmes who typically run longer, multi-project cruises. For example, Germany and USA.

Recommendation: *UKRI-NERC to review the role, responsibilities and selection process for Chief Scientists who lead research cruises. Nurture the next generation by involving Early Career Researchers as 'co-Chief Scientists' (NB this initiative is already being discussed through the NERC Cruise Programme Review Group).*

Communication and engagement:

Participants commented positively about observing NERC Head Office, HEIs, NERC Centres working together.

- There is a strong desire for improved two-way communication between UKRI-NERC and the science community.
- Funding and planning-horizon policies and processes are poorly understood by ECRs and/or potential science users. This could be addressed by greater online visibility of planning and funding processes, and clarity about linkages with international programmes.
- Proactively using the ship to promote ECRs and under-represented groups would demonstrate UKRI-NERC-BAS commitment to greater inclusivity.
- There may also be an ongoing role for the UK Arctic and Antarctic Partnership group

Recommendation: *Identify and implement e-communication networks/channels to keep users and future users involved and up to date with activities and opportunities*

Equality, Diversity and Inclusion (EDI):

The ambition to embed positive culture on the ship from the start is recognised as hugely important.

- There was strong support for proactively using the ship to bring about culture change and promote involvement of under-represented groups. However, there was some concern that longer, more complex cruises may deter under-represented groups.
- The idea that by making use of new technologies, researchers could be involved in a cruise without being on-board – was viewed as a potential benefit to disabled scientists, or those who do not find it easy to travel or be away from home for extended periods.
- There was discussion around behaviours, conduct and policies for working onboard, and whether these adequately reflected UKRI-NERC and BAS ambitions for Equality, Diversity and Inclusion.
- Pre-deployment induction on EDI and refreshed codes of conduct were perceived to be a positive step forward.

Recommendation: *develop new policies and procedures to enable under-represented groups to access the ship (perhaps virtually). Review existing codes of conduct, and any cultural barriers to EDI, and link with efforts by NERC Cruise Planning Review Group. Ensure that pre-deployment training covers the importance and benefits of EDI.*

Appendix 1

Workshop programme

RRS *Sir David Attenborough* science users' workshop

Wednesday 25 – Friday 27 November 2020

The RRS *Sir David Attenborough* is set to transform how the UK delivers and supports polar science. This workshop is for anyone who has been involved with the planning and commissioning of the RRS *Sir David Attenborough* so far, or who is likely to use the new polar vessel to carry out research in the future.

Day one – Making waves: Britain's new polar ship

Format: zoom webinar

Opened by Director of British Antarctic Survey Professor Dame Jane Francis, and featuring a guest address by Professor Duncan Wingham, Executive Chair of NERC, this two-hour session focusses on the ship's new features and key differences from the RRS *James Clark Ross*.

DAY 1 – Wednesday 25 November 2020		
9.50 am to 10am	Arrival	
10am to 10.05am	Welcome and introduction	Professor Dame Jane Francis, BAS
10.05am to 10.20am	'Tour' of the RRS <i>Sir David Attenborough</i>	Dr Ray Leakey, SAMS
10.20am to 10.45am	Introduction to ship capability	Dr Sophie Fielding, BAS
10.45am to 10.55am	Break	
10.55am to 11.10am	Making waves: Britain's new polar ship	Professor Sir Duncan Wingham, NERC
11.10am to 11.20am	Ship into service timetable	Randy Sliester, BAS
11.20am to 11.35am	Introduction to next two days	Dr Ray Leakey, SAMS
11.35am to 12pm	Questions	
12pm	End	

Day two – RRS *Sir David Attenborough* science capability

Format: zoom webinar

This session takes a closer look at the layout of the ship, its science equipment and special features. We will explore science capability in the following disciplines: physics, biology, geology and geophysics, chemistry, atmospheric science and meteorology. This session sets the scene for day three breakout discussions to explore how the science community can make the most of its new science capabilities.

DAY 2 – Thursday 26 November 2020		
9.50am to 10am	Arrival	
10am to 10.05am	Welcome and introduction	Dr Ray Leakey, SAMS
10.05am to 10.25am	Introduction to physics and IT capability	Dr Brian King, NOC, and Jeremy Robst, BAS
10.25am to 10.45am	Introduction to geology and geophysics capability, equipment and spaces	Dr Rob Larter, BAS and Professor Colm Ó Cofaigh, Durham University

10.45am to 11.05am	Introduction to biology capability, equipment and spaces	Dr Sophie Fielding, <i>BAS</i>
11.05am to 11.15am	Break	
11.15am to 11.35am	Introduction to chemistry capability, equipment and spaces	Dr Malcolm Woodward, <i>PML</i>
11.35am to 11.55am	Introduction to atmospheric science and meteorology capability, equipment and space	Professor Ian Brooks, <i>University of Leeds</i> and Dr Anna Jones, <i>BAS</i>
11.55am to 12.15pm	Questions	Dr Ray Leakey, <i>SAMS</i>
12.15pm	End	

Day three – Doing things differently: science opportunities and challenges

Format: zoom interactive session with facilitated breakout session

Professor Susan Waldron, Director of Research and Skills at NERC will chair this session, aimed mostly at Principal Investigators, and early career researchers who will submit future grant proposals. We will focus on horizon scanning, and discuss what the optimal models might be for funding and planning ambitious new science on the SDA. Outcomes from breakout sessions will help shape future science and operation of the ship.

DAY 3 – Friday 27 November 2020		
9.50am to 10am	Arrival	
10am to 10.15am	Welcome. Realising our science ambitions. Long-term horizon scanning	Professor Susan Waldron, <i>NERC</i>
10.15am to 10.20am	Ambitious science – a vision for the future.	Professor Dame Jane Francis, <i>BAS</i>
10.20am to 10.40am	Challenges and opportunities. Review of key issues from the first science user workshop held in 2017.	Dr Ray Leakey, <i>SAMS</i>
10.40am to 11.00am	Marine Planning. Current mechanisms for research cruise planning and funding	Dr Natalie Powney, <i>NERC</i>
11am to 11.20am	Science and Operations. The dual role of RRS <i>Sir David Attenborough</i>	Simon Garrod, <i>BAS</i>
11.20am to 11.30am	Questions	Professor Susan Waldron, <i>NERC</i>
11.30am to 11.35am	Break	
11.35am to 12.20pm	Breakout 1: What is our vision for ambitious science on the SDA in the Antarctic?	Chair: Professor Karen Heywood, <i>UEA</i> Rapporteur: Dr Alex Burton Johnson, <i>BAS</i>
12.20pm to 1.30pm	Lunch	
1.30pm to 2.15pm	Breakout 2: What is our vision for ambitious science on the SDA in the Arctic?	Chair: Prof Finlo Cottier, <i>Scottish Association for Marine Science</i> Rapporteur: Dr Kelly Hogan, <i>BAS</i>
2.15pm to 2.30pm	Break	
2.30pm to 3.15pm	Breakout 3: Making it happen. How should we plan, fund and schedule science on the RRS <i>Sir David Attenborough</i> ?	Chair: Prof Susan Waldron, <i>NERC</i> Rapporteur: Dr Alex Brearley, <i>BAS</i>
3.15pm to 3.30pm	Break	
3.30pm to 4.15pm	Breakout 4: Building inter-disciplinary, diverse and inclusive polar science communities of the future	Chair: Dr Sian Henley, <i>University of Edinburgh</i> Rapporteur: Dr Huw Griffiths, <i>BAS</i>
4.15pm to 4.30pm	Break	
4.30pm to 5.15pm	Plenary: breakout session reports and close	Professor Susan Waldron, <i>NERC</i>
5.15pm	Close	

Appendix 2. Breakout sessions – Chair and Rapporteur notes

Session 1

Ambitious science -What is our vision for ambitious science on the RRS Sir David Attenborough in the Antarctic?

Chair: Professor Karen Heywood. Rapporteur: Dr Alex Burton-Johnson

Challenges or opportunities	Ideas for the future
Enhanced opportunities for large multi- and interdisciplinary projects (expanding on success of MOSAiC and the International Thwaites Glacier Collaboration (ITGC))	The Antarctic Winter (e.g. “MOSAiC Antarctica”) (interdisciplinary research)
Bigger and better: longer duration seasons with more advanced equipment (e.g. novel sonar tools, deeper trawls, giant piston corer)	Methane seeps (interdisciplinary research)
Helicopters: new opportunities (simultaneous terrestrial and marine science) and challenges (cost)	Choice areas of interdisciplinary , marine and terrestrial science (e.g. The South Sandwich Islands and Bellingshausen Sea)
Challenge: balancing station-based science and logistical role with marine science support	Suggest implementing new analyses as routine. For example, developing methodologies to enhance biological oceanography and understanding of ecosystems. For example extracting environmental DNA from standard water sampling using CTD rosettes to estimate dynamics of changes in abundance of biological entities.

Session 2

What is our vision for ambitious science on the RRS Sir David Attenborough in the Arctic?

Chair: Professor Finlo Cottier. Rapporteur: Dr Kelly Hogan

Challenges or opportunities	Ideas for the future
Future science questions in the Arctic for multidisciplinary SDA cruises	Vertical Carbon export (atmosphere to deep sea); winter processes; new questions arising from CAO programme; top-predator studies in SDA-accessible areas
New working areas like “deglaciating” zones (as Arctic sea ice shrinks)	Arctic observations in N Greenland/Lincoln Sea, Central Arctic Ocean, Russian shelves/slopes
Can we fill berths with ECRs and/or researchers from nations without infrastructure; how do we fund this?	Set aside a few berths on every cruise (UK funded); every 3 years have ECR-led cruise. This could link to APECS/UKPN
What are the possible funding mechanism for large Arctic multidisciplinary & multinational cruises?	International partnerships (e.g. UK-Canada) in Baffin Bay
Will SDA contribute to existing large international programmes (IODP, Synoptic Arctic Survey)?	Can SDA do IODP site survey cruises? Can SDA be committed to science at sea in next decade?

Balancing science demand for winter cruises with ship operational demands such as refits

Session 3

Ambitious science -Making it happen. How should we plan, fund and schedule science on the RRS Sir David Attenborough?

Chair: Professor Susan Waldron. Rapporteur: Dr Alex Brearley

Challenges or opportunities	Ideas for the future
Knowing what is happening and when with big strategic programmes so that other smaller pieces of science can be fitted alongside those (something akin to the German model).	Should know 3 years in advance – which geographical area (e.g. Weddell Sea). Then smaller bits of science added on later. Along the lines of the German model (Polarstern) – include international collaboration too. Important to understand the details of that system, since it has evolved over recent years.
Better transparency over what measurements are already being taken, to enable more multidisciplinary	Making sure it's clear what equipment is on which cruise, so that opportunistic science can be fulfilled easily. This maximizes scope of project.
How do we exert influence on NERC? What are the pathways to do that, especially from within a university?	For the International Thwaites Glacier Collaboration, there was a joint NERC/NSF Partnerships and Opportunities bid. Meetings happening between NERC and others. Best done through an individual email to NERC Marine Planning about potential international interest. NERC needs early intelligence of these opportunities.
How do you feed ideas/funding in as an early career researcher? How do you connect small ideas to bigger ideas?	Head Office can provide ideas about different funding schemes. Workshop/town hall meetings can be critical – that often comes well before the call itself. Association of Polar Early Career Scientists – ECR excellent support. UK Arctic and Antarctic Partnership – designed to bring together the UK community and excellent networking for interdisciplinary groups. Also UK National Committee on Antarctic Research
How do we bring together these big strategic ideas with the smaller ones without them looking unfocused at review stage?	More of a systems approach might be required when assessing these types of grants
There can be opportunities that come up after the event – having clarity about when that is occurring is crucial. May be about changing horizons	
Standard (small) grants limited the possible inter-disciplinarity on such a large vessel	Some work within NERC going on about better communication around when, e.g. free berths are available on cruises with other nations.
Programming ship time vs. logistics - with early and late season station resupply to enable the SDA to conduct a 60-day cruise spanning the sea ice minimum to a more	Chartering other vessels to take some of the logistic or resupply load – how can scientists who want to conduct such winter cruises push for this to be arranged?

remote area, such as the Amundsen Sea or Riiser-Larsen Sea.

Session 4

Building inter-disciplinary, diverse and inclusive polar science communities of the future

Chair: Dr Sian Henley. Rapporteur: Dr Huw Griffiths

This Session 4 focussed on culture change, and opportunity the new ship presents to instigate transformative change (as happened when JCR came into service in 1992 and totally revolutionised the conditions and culture for scientists working on the ship).

Challenges or opportunities	Ideas for the future
Virtual participation & cruise leadership	Increased bandwidth & emerging technologies
Encouraging ECR/under-represented groups involvement in cruise planning and management	Co-Chief Scientists
Can many under-represented groups (e.g. people with caring responsibilities) afford the time to go to sea for extended periods.	How would this be done given the plans for new model of longer expeditions?
Opportunity to ensure that PPE fits smaller frames/women and works for all genders	Better understanding of potential users
Neurodiversity considerations given the unknowns and cultural implications of working at sea	Increased information, videos, manuals etc. to give a clear picture of the experience in advance.
Should all scientists have to do Unconscious Bias training? And more ambitious training?	Before they board the ship US National Science Foundation has an explicit seminar and discussion on their Community Norms and Values
Opportunities for underrepresented groups to join expeditions at a very early career stage (undergraduate, Masters and PhD)	Using transit north or south for training expeditions, underway measurements or equipment testing expeditions.
How do we keep ECRs in Polar Research given the broken career path?	
How do ECRs, underrepresented groups and minority/new science groups stay connected to big, high level themes?	More transparency, more equal opportunity for participation. It shouldn't be about who you know.
Enabling ECRs to be co-Chief scientists on cruises. This is obviously important for ECR careers. However, it is also crucial for the good management of SDA cruises.	Being a Chief Scientist will now be a much bigger and more important job than before so a focus on this is really important. And not just for ECRs but also for older experienced scientists.

Appendix 3

Workshop participants

Surname	First Name	Company	Job Title
Abrahamsen	Povl	British Antarctic Survey	Physical Oceanographer
Ager	Jon	British Antarctic Survey	Director UK AIMP
Airs	Ruth	Plymouth Marine Laboratory	Marine biogeochemist
Aleynik	Dmitry	Scottish Association for Marine Science	PI
Anderson	Phil	Scottish Association for Marine Science	Polar Atmospheric Physics
Annett	Amber	University of Southampton	Senior Research Fellow
Apeland	Bjorg	British Antarctic Survey	Mechanical Engineer
Armsden	Suzy	University of Brighton	Principal Lecturer
Baker	Alex	University of East Anglia	Professor of Marine and Atmospheric Chemistry
Barham	Mark	British Antarctic Survey	Oceanographer
Barnes	David	British Antarctic Survey	Marine Ecologist
Beard	Paul	British Antarctic Survey	CIO
Bell	Tom	Plymouth Marine Laboratory	Senior Scientist
Bentley	Michael	Durham University	Professor (and Chair, UKNCAR)
Bird	Kimberley	Marine Biological Association UK	Research Assistant
Bohaty	Steve	University of Southampton	Associate Professor
Bosì&Ekoval	Kateri&Eina	University of Portsmouth	graduate student
Bouman	Heather	University of Oxford	Marine Biogeochemist
Boyle	Claire	British Antarctic Survey	Assistant Environmental Manager
Brearely	Alex	British Antarctic Survey	Physical Oceanographer
Brierley	Andrew	University of St Andrews	Professor in Marine Biology
Briscoe	Marjolaine	University of Oxford	Master's student
Bristow	Martina	British Antarctic Survey	PhD Research Student
Brown	Peter	National Oceanography Centre	Marine Biogeochemist
Brown	Ian	Plymouth Marine Laboratory	Marine Chemist
Bryan	Allison	NERC	Programme Manager
Burgess	Henry	NERC	Head, NERC Arctic Office
Butler	Paul	University of Exeter	Research Lecturer
Carvalho	Filipa	National Oceanography Centre	Research Scientist
Ce	Elena	University of Southampton	PhD candidate
Clarke	Charlotte	NERC	Programme Manager - Digital Environment
Clarkson	George	FCDO	Polar Regions Department
Collier	Jenny	Imperial college London	Research scientist

Commins	Morgan	Ordnance Survey	Data Management Specialist
Cook	Kathryn	National Oceanography Centre	Pelagic Biogeochemist
Coppock	Rachel	Plymouth Marine Laboratory	Marine ecologist
Cunliffe	Michael	Marine Biological Association	Senior Research Fellow/Associate Professor
Czerski	Helen	University College London	Lecturer
Cziferszky	Andreas	British Antarctic Survey	Geospatial Systems Architect
Dahlberg	Linda	British Embassy, Oslo	Science and Innovation Policy Adviser
Dall'Olmo	Giorgio	Plymouth Marine Laboratory	senior scientist
Damerell	Gillian	UEA	PDRA
Darlington	Eleanor	National Oceanography Centre	Programme Manager
Davis	Clare	Springer Nature	associate editor
Degerman	Rosa	FCDO	Science officer
Dornan	Tracey	British Antarctic Survey	Fisheries Acoustician
Downie	Rod	WWF	WWF Chief Advisor, Polar
Dunkley	Ria	University of Glasgow	Lecturer in Geography, Environment & Sustainability
Dutrieux	Pierre	British Antarctic Survey	Principal Ocean and Ice Scientist
Ellison	Elizabeth	Imperial College London	PhD Student
Enderlein	Peter	British Antarctic Survey	Head of Mechanical Services and Ship Support
Enzor	Natalie	British Antarctic Survey	SDA lab manager
Evans	Mark	British Antarctic Survey	Geological Laboratories and Collections Manager
Evans	D. Gwyn	National Oceanography Centre	Research Scientist
Ewence	Annette	NERC	SPM
Fedak	Mike	University of St Andrews	prof emeritus
Firing	Yvonne	National Oceanography Centre	Scientist
Fisher	Ben	University of Edinburgh	PhD Student
Fitzcharles	Elaine	British Antarctic Survey	Senior Laboratory Manager
Fleming	Andrew	British Antarctic Survey	Remote Sensing Lead
Ford	Elaina	British Antarctic Survey	Senior Science Programme Manager
Fox	Nina	British Antarctic Survey	Project Administrator
Fox	Alan	Scottish Association for Marine Science	Postdoctoral researcher
Freer	Jennifer	British Antarctic Survey	post doc
Fremand	Alice	British Antarctic Survey	Scientific data manager
Frey	Markus	British Antarctic Survey	Principal Investigator
Garfield	Claire	Scottish Association for Marine Science	Student
Garnett	Jack	Lancaster university	Research scientist

Garratt	Lizzie	UKRI-NERC	Head of Atmospheric and Polar
Georgiopoulou	Aggeliki	University of Brighton	Senior Lecturer
Goodger	David	British Antarctic Survey	Head of Electronic Services
Graham	Susan	None	Student
Grange	Laura	Bangor University	Lecturer in Marine Biology
Grant	Susie	British Antarctic Survey	Marine Biogeographer
Grant	Sheona	British Antarctic Survey	Head of Supply Chain Logistics
Hall	Rob	University of East Anglia	Senior Lecturer in Physical Oceanography
Hamaza	Salua	Imperial College London	PostDoc in Aerial Robotics
Harding	Ian	University of Southampton	Associate Professor
Havranek	Claudia	British Antarctic Survey	Scientific Data Manager
Hendry	Katharine	School of Earth Sciences, University of Bristol	Associate Professor
Hernandez-Molina	Javier	Royal Holloway University of London	Professor in Sedimentary Geology
Hillenbrand	Claus-Dieter	British Antarctic Survey	Marine geologist
Hobbs	Laura	Scottish Association for Marine Science + University of Strathclyde	Zooplankton ecologist
Hochmuth	Katharina	University of Leicester/ ECORD Science Operator	IODP Research Associate
Hodgson	Dominic	British Antarctic Survey	Science Leader
Hulbert	Alysa	British Antarctic Survey	Assistant Information Officer
Huthnance	John	National Oceanography Centre	Emeritus Fellow
huuse	mads	University of Manchester	Professor of Geophysics
Iakovleva	Tatiana	UK Science and Innovation Network in Russia (SIN Russia)	Head - UK Science & Innovation Network in Russia
Ingwall King	Oliver	West Suffolk Council	Energy Advisor
Jackson	Amie	British Antarctic Survey	BCM Future Atarctic capability
Jackson	Michelle	University of Oxford	Associate Prof
Johnson	Joanne	British Antarctic Survey	Geologist
Johnson	Helen	University of Oxford	Professor of Ocean and Climate Science
Jungblut	Anne D.	Natural History Museum	Research Scientist
Kaiser	Jan	University of East Anglia	Professor of Biogeochemistry
Kiernan	Summer	BBC	Junior Researcher
King	Amy	British Antarctic Survey	Postdoctoral Researcher
Kingsland	Matthew	National Oceanography Centre	Senior Robotics Systems Engineer
Kitidis	Vassilis	Plymouth Marine Laboratory	Senior Scientist
Kuech	Anton	University of Aberdeen	PhD Student

Kyrimis	Stylianos	University of Southampton	PhD in chemical engineering
Lachlan-Cope	Tom	British Antarctic Survey	Head Climate Processes Group
Lea	James	University of Liverpool	Senior Lecturer
Leadbitter	Philip	University of East Anglia	PhD Candidate
Lee	Gareth	University of East Anglia	Marine services facility manager
Lemaire	Cecilia	British Antarctic Survey	HR Officer
Lens	Peter	British Antarctic Survey	IT Engineer
Linse	Katrin	British Antarctic Survey	Senior biodiversity Scientist
Liszka	Cecilia	British Antarctic Survey	Biological oceanographer
Liu	Emma	University College London	Lecturer
Mahaffey	Claire	University of Liverpool	Professor of Ocean Sciences
Malcz	Christian	University of Leeds	Associate Professor in Biogeochemistry
Manning	Cara	Plymouth Marine Laboratory	Earth Observation Scientist
Manno	Clara	British Antarctic Survey	Biological Oceanographer
Martin	Adrian	National Oceanography Centre	Researcher
Marzocchi	Alice	National Oceanography Centre	Research Scientist
Mawji	Edward	National Oceanography Centre	Observational biogeochemist
Mayor	Daniel	National Oceanography Centre	Marine Biogeochemist
McAfee	Carson	British Antarctic Survey	Antarctic Marine Engineer
McClymont	Erin	Durham University	Professor
McGillivray	Phil	US Coast Guard PACAREA	Icebreaker Science Liaison
McGowan-Yallop	Chelsey	Scottish Association for Marine Science	PhD Student
McKay	Bryana	University of Montana	Student - Geoscience
Meijers	Andrew	British Antarctic Survey	Deputy Science Leader, British Antarctic Survey Polar Oceans
Mitra	Aditee	Cardiff University	Research Fellow
Moat	Ben	National Oceanography Centre	Senior Scientist
Monier	Adam	University of Exeter	Royal Society University Research Fellow
Mora- Soto	Alejandra	St Peter's College, University of Oxford	DPhil student
Murray	Georgia Rose	DJCAD, Dundee University	Artist/ Lecturer/ PhD Researcher
Naveira Garabato	Alberto	University of Southampton	Professor of Physical Oceanography
Nicholson	Uisdean	Heriot-Watt University	Assistant Professor
Nissen-Meyer	Tarje	University of Oxford	Associate Professor of Geophysics
Oldridge	Helen	National Oceanography Centre	Head of Scientific Engineering
Oussou	Francis	Personal	GIS Expert

Peacock	Caroline	University of Leeds	Professor of Biogeochemistry
Peat	Helen	British Antarctic Survey	Head of the Polar Data Centre
Peñerez	Lara	British Antarctic Survey	Marie Curie Research Fellow
Peppe	Oliver	British Geological Survey	Head of Marine Operations
Pereira-O'Callaghan	Ana	British Antarctic Survey	Head of Research Development and Support
Pheasant	Iain	British Geological Survey	Marine operations Manager
Polfrey	Scott	British Antarctic Survey	Mechanical Engineer
Quinn	Ruth	Swanmorr College	Science teacher
Radionovskaya	Svetlana	University of Cambridge, dept of Earth Sciences	PhD student
Reed	Saz	Scottish Association for Marine Science	Ships ops manager and technician
Rees	Andy	Plymouth Marine Laboratory	Senior Scientist
Reid	William	Newcastle University	Lecturer
Reynard	Nick	Imperial College London	PhD Candidate
Robinson	Thomas	NERC	Senior Programme Manager - Capital
Robinson	Carol	University of East Anglia	Professor of Marine Sciences
Robst	Jeremy	British Antarctic Survey	Head of Linux Systems
Roman-Gonzalez	Alejandro	University of Exeter	Unknown
Rose	Mike	British Antarctic Survey	Head of Engineering Technology
Sahy	Diana	British Geological Survey	Isotope geochemist
Sands	Chester	British Antarctic Survey	Molecular Ecologist
Schuster	Ute	University of Exeter, UK	Senior Lecturer
Scott	Kat	NERC	Senior Programme Manager
Sharples	Jonathan	University of Liverpool	Professor in Oceanography
Shervington	A	BLAST Fest Ltd	Founder
SHI	Zongbo	University of Birmingham	Professor
Silvano	Alessandro	University of Southampton	Research Fellow
Smith	Aisling	British Antarctic Survey	SDA Laboratory Manager
SOUSTER	TERRI	Ulster University	Marine Biologist
Spingys	Carl	University of Southampton	Research Fellow
Squires	Freya	British Antarctic Survey	Instrument Scientist
Stowasser	Gabriele	British Antarctic Survey	Marine Ecologist
Surma	Jessica	NERC	Senior Programme Manager
Tagliabue	Alessandro	University of Liverpool	Professor
Tarling	Geraint	British Antarctic Survey	Senior Biological Oceanographer
Tarran	Glen	Plymouth Marine Laboratory	Marine ecologist

Tate	Alex	British Antarctic Survey	Senior Data & Systems Architect
Taylor	Michelle	University of Essex	Director of Marine Biology
ten Hoopen	Petra	UK PDC, British Antarctic Survey	Scientific Data Manager
Thomas	Liz	British Antarctic Survey	Paleoclimatologist
Thorpe	Sally	British Antarctic Survey	Ecosystem Modeller
Tidau	Svenja	University of Plymouth	Postdoctoral researcher
Tsamados	Michel	University College London	Lecturer
Tyler	Paul	University of Southampton	Emeritus Professor
Usher	Simon	uoP	Associate Professor
van de Flierdt	Tina	Imperial College London	Professor of Isotope Geochemistry
van den Heuvel	Floortje	British Antarctic Survey	Cloud Physicist
Wattam	Dave	British Antarctic Survey	Operations Programme Manager
Waugh	lisa	FCDO	HM diplomat
Webb	Michael	NERC	Head of Marine Research
Williams	Thomas	University of Southampton	PhD student
Wimmer	Werenfrid	University of Southampton	Research Fellow
Witherstone	Jonathan	British Antarctic Survey	Electronic engineer
Wood	Andy	British Antarctic Survey	Marine Predator Ecologist
Woodall	Lucy	University of Oxford	Senior Research Fellow
Woods	Fiona	University of Portsmouth	Student
Wynn-Jones	Blanche	NERC-UKRI	Head of NC Services
Yang	Mingxi	Plymouth Marine Laboratory	Senior scientist
Yelland	Margaret	National Oceanography Centre, UK.	Scientist
Yesson	Chris	Zoological Society of London	Research Fellow
Zanacchi	Marcus	Plymouth University	Early career researcher
Zein	Beate	University of St Andrews	PhD student
Zhai	Xiaoming	University of East Anglia	Associate Professor

Appendix 4

Question and Answers

Day one

Is the forward sonar sticking out below the hull? If yes, is this safe in ice?

It is on a lowered pole, so can be retracted. There are a lot of acoustic systems on the bottom of the ship - some of these have ice windows which means they are fitted to the hull and carry on being used in the ice. The forward sonar does not have an ice window so isn't protected in ice. The systems without ice protection can be retracted when the ship heads into icy areas.

Is the Scanning Electron Microscope complemented by a sputter coater (vacuum coater) and argon gas cylinder?

It's an environmental SEM and does not have a sputter coater (or argon gas). We will shortly identify the model and I can send you the details. Currently putting together a very detailed list of the science capabilities of the SDA so people can go there for first point of call, then come back to BAS with more specific questions.

How good will the comms be so that people onboard can have video conference meetings with their group back on land, and keep dealing with things by email and webpages? Important on long cruises.

Email and webpages should be okay. Audio conferencing should work well. We can't guarantee VC, depending on area. This vessel has much better comms than the JCR

When would be the earlier opportunity to transfer science equipment currently on the JCR to the SDA? before Jul 2021 science trials?

The SDA is fully fitted out with science equipment, where any equipment moved over from the JCR should be spare if it is standard. A list of the full capability (and sensors) will be published in the near future. Is there something specific you are referring to? In Spring 2021 we'll be removing all the remaining science capability off the JCR and start to integrate those systems that are compatible on to the new vessel.

What are the onboard facilities for DNA analysis?

We don't have any specific Polymerase Chain Reaction machines or specific bits of lab equipment dedicated to DNA or genetic research. We have a clean lab and clean lab container which can be used for taking samples and processing them. These are located close to CTDs and front hangar. Also have -80 freezers to preserve samples at very low temperatures. Will need to bring your basic lab kits, PCs and test tubes etc. also have a liquid nitrogen generator on board.

Seen the specifications of the new ship, specifically the higher draft of the ship. I am concerned about the work that could be carried out in coastal environments which the smaller vessel could potentially not undertake, such as deployments of multicorer, grabs, etc. We have seen during recent projects that carrying work in fjord systems can be very complex and time consuming using the JCR which may be not possible to do them at using a smaller vessel. I just wanted to hear your thoughts about this. Many thanks

This ship will do everything the JCR does and more. The difference in draft between the JCR and the SDA is less than a metre so it can access shallow areas and ports in Antarctica. We also have a small workboat which will be used to reach coastal areas. The underwater imaging system can also be

used to give the vessel more confidence in shallow waters, especially those areas which are poorly mapped. The thruster capability on the SDA means it will be more manoeuvrable than the JCR.

Thank you for session - very helpful. Working in partnership with international team - and funders - will be very important. Are there going to be early opportunities for international colleagues to get onto the vessel during trials and rehearsals to see the ship in action? So they then have the confidence to seek/fund collaborations. NERC Arctic Office will be happy to help if we can.

International collaborations are already important, but this ship gives opportunity for new international collaborations and thinking more internationally. The really big, visionary science questions we will address with this ship are generally international. Building partnerships takes time. Important remember the trials are trials - focusing on creating safe operating procedures and testing systems. In the future will have opportunities for open days on the ship to see the facilities.

When will those of us not associated with BAS be able to apply for ship time? I am especially interested in 'opportunistic sea time' to hitchhike to terrestrial/freshwater sites in the Arctic and Antarctic.

Everything is arranged through NERC ship planning group. 'Hitchhiking' unlikely to be possible because the ship will have a programme of science to do. And a lot of the programmes on the ship are funded by grants.

Will there be any opportunity for the community to be involved in the trials? They may be opportunistic for data-gathering

See above

Will initial ship time be restricted to people associated with BAS and/or NERC funded projects? Or will it be possible for scientists funded on an EU project to apply for ship time straightaway?

Again, ship time managed by NERC planning office. So whoever you're funded by, you make your application through the Ship and Marine Equipment form.

The green credentials of the new ship seem to have been thought of in detail, and seem to be pretty good. I assume this means that all current requirements of the IMO's Polar Code will be adhered to. To what extent have enhanced regulations/restrictions in the Arctic and Antarctic, as the Polar Code is augmented in the future, been taken into account to ensure that the ship is compliant in the longer-term?

Ship is PC5 - fully compliant with polar code, carry all group and personal survival kits.

Day two

Will the SDA ever deploy crewed mini subs?

The SDA is a versatile platform. Assuming the crewed mini sub was deployable from the ship, it could be done. We would encourage anyone writing a grant to fund this science to get in contact with the details of the mini sub to investigate whether the ship has the right capability

Sorry if I missed it but will there be screens in cabins?

There are TV screens in the cabins which we may be able to integrate with the display system. It should also be possible to access the display system feeds from a laptop or mobile device over the ship's network. In addition you will also be able to use the screen in your cabin as an additional monitor for your laptop.

Does BAS have plans to enhance the VSAT link (to bring it closer to what we have at home or in UK port)?

We continually look to increase the VSAT link, which depends to a large extent on budget. You may also be aware of new satellite companies such as OneWeb and SpaceX which are planning to offer very high bandwidth connections (up to 1Gbps) in the next 5 years. Once those come online that opens up the options dramatically.

Can you get the watercolumn echo from the EM2040?

Yes

Would be the One-Web &/or the Starlink options considered for internet connection on board in open sea and high latitudes? The pilot tests show speed >150Mbps, dynamic sat. dish positioning, low \$ monthly subscription etc benefits

Yes, absolutely. They look very promising and we are in a good position for those, since we will have very few other users contending for bandwidth in the area the ship operates, so we should get high bandwidth connections.

Do you use marine mammal observers when operating the air guns?

All cruises on the SDA (and indeed on the NERC ocean going fleet) now undertake an environmental impact assessment. These identify where marine mammal observers are required following the NERC marine environment interaction policy The SDA is fully fitted out with science equipment, where any equipment moved over from the SDA should be spare.

<https://nerc.ukri.org/research/sites/facilities/marine/guidance/marine-environment-policy/>. Yes, that is now required by NERC marine environmental policy. This includes an active acoustics component

Hi Rob - will there be space on the back deck to hold/deploy the 6km long CSIC hydrophone streamer?

The aft deck is very large, so I don't think that would be a problem.

Has BAS procured compressors for seismic ops?

Sorry, my omission. Yes, a single container housing two small compressors has been procured for use with the 2 GI guns on SDA, so the compact seismic profiling system can be operated completely independently of any loaned or hired equipment.

Can you multiplex the EK80s, ADCPs, MS70, EM2040 to avoid cross-talk?

The EM2040 is fitted to the Erebus workboat. There isn't a ksync on there currently.

There is a sound synchronisation unit (ksync) on the SDA that will control the EK80, EA640, EM, MS etc

Thanks Colm. Will SDA be able to deploy MeBo 200? I think its "footprint" is larger than that of RD2. My understanding is yes (but clearly not via the moonpool).

What will be available to support working with marine mammals on the ice or near shore, eg easy launching of small rubber boats to get a small team ashore or a small team quickly down onto the ice for animal capture etc.?

Rigid Inflatable Boats will be available, as they were on JCR.

Hi Colm, will there be colour scanning capability in the containerised multi-sensor core logging system. Sorry if I missed this.

Hi Tina. No. It will have P-wave velocity, gamma density and mag sus. but it will be possible to upgrade to include other sensors such as colour down-track. Hi Tina. At the moment the MSCL in the container only has p-wave, magnetic susceptibility and density sensors. We will aim to add others, subject to availability of funding, when successful operation of the facility has been proved.

Sorry if I missed that (dodgy connection) but did you say the shelves in the CT lab are removeable? I'm just thinking about extra desk space needed for animal and genomics processing (it all happens in a cold lab, 4C usually). Is the CT lab the only one accessible or are there others too please?

There are two CT labs, both accessed from the Deck Lab. One is primarily intended for storage of sediment cores, but can be used as a CT lab space when required. yes - they should be removable in the CT lab.

Question for Colm: has there been thought on how to arrange the working deck for handling a 40-m piston core? Is there space

The corer is modular with 5.8 m barrels so the full length does not have to be deployed but yes this yes this has been thought through and there is space. A key aspect of the GPC trials cruise will be to assess the layout and optimised working arrangements.

Did I get it right that there will be visual underwater systems on board that could be used opportunistically?

Any acoustic system will need to be requested in the SME, as it will need to be included in the environmental impact assessment. It will then depend on this instrument and whether the required support level is onboard (some instruments will require more support than others) as to whether it can be used.

Is there the ability to trawl/collect samples of phytoplankton etc during icy conditions?

The user will have to supply the net for this. It would then be a decision by the owner of that net and the ship regarding how and where it could be deployed safely. There is a 6mm wire that can be used from the starboard gantry, but this could be heavy for that?

Do the rubber bands on the TMC "Niskin-style" bottles work in the cold? My experience of elastic bands in polar conditions is that they very quickly fail!

Hi Anonymous, these 114 bottles were the bottles requested by the trace metal community. It was after a lot of discussions with the US Geotraces group and these are the bottles they use.

Where will lab containers be stored? Cambridge, Falklands or permanently onboard?

This is still under consideration as BAS is updating its operating model.

Is the FRRF going to be dedicated to underway measurement, or will it be available for Lab use too?

The operating model for this system is yet to be finalised. I believe the instrument is capable of either.

Hi Malcolm, is the pCO2 system the PML/Dartcom system? or another?

Hi Helen, Its a new Dartcom

I took ~300L of 100% ethanol last time I went to sea. It was stored on the deck for H&S reasons. Where would that be stored on the SDA please?

Like the JCR, the SDA is equipped to transport all the chemicals from the UK for a season south and volumes that you describe have been identified as required to be carried. There are bespoke areas for the transport of chemicals, as well as bespoke areas in the labs for chemicals in use

What's the latest with regard to trace metal clean sampling on autonomous vehicles? (Sorry if I missed this)

If someone brings along an autonomous vehicle with trace metal clean sampling capability, then, like any item of user equipment, we see no reason why it shouldn't be deployed from SDA. SDA won't host such vehicles as part of its standard fitout

Question for Colm and Malcolm: Is there enough space in the main lab to say build a clean bubble for chemistry work and handle cores simultaneously? Just thinking about cruises which do water chemistry and coring as part of the same project.

I think the advantage of the current labs is that there is plenty of space for handling cores in general. I envisage the wet lab and deck lab being used for the majority of coring related work so it would be possible I think to use the main lab for what you describe.

Are there plans to conduct CFD modelling and/or make measurements of the air flow distortion around the met platform (to inform eddy covariance flux observations)?

Been done in part. The safety modelling that was done on behalf of Rolls Royce in the design stage, they provided us with the outputs of the model at whole range. I think one metre vertical intervals above the Met platform, up to much higher than we would actually end up storing instruments. Used to feed into the need to add this foremast extension for putting the instrumentation above the platform itself. We have the digital model of the ship so CFD modelling for specific types of flux applications could be done,

2nd to Tom, is there plans to get RPAS atmospheric physics / air-sea interaction as standard to avoid ship contamination?

What is the thinking on radio sonde/weather balloon launches – eg where they would be safely and efficiently done, adjacent to gases needed etc?

Could enriched isotope experiments be conducted in the main labs or would that type of work need its own container?

All radioisotope work will have to be done in the radioactive container. We need to keep isotopes away from rest of ship to prevent contaminating other samples.

Day three

What is at stake here? Are we defining a thematic call or similar? Is there likely to be new money for using the ship (bearing in mind that the present NERC cruise schedule is severely hit by covid)?

This will be explored this afternoon – it's about exploring what science we think is really important and for us to understand if these ideas are so big they can't be met by existing funding streams for e.g. by Discovery Science individual awards

If planning horizons are lengthened, what will the implications be for engaging early career scientists, and allowing them to use the vessel for their projects? If a grant or fellowship application won't be able to obtain ship time until 3-4 years into the future, will we be losing these researchers, either to other science areas or to nations with smaller/more flexible polar vessels?

Our advice is to work with marine planning who will seek to ensure the logistics are in place in a timely manner, and this can include barter activity, which is collaboration and not losing researchers.

How will the extra net scientist time at sea be funded.? The current planning system always seems to deliver all funded science that requests ship time, suggesting that there is (normally) no backlog of funded science that isn't happening due to lack of ship time. If we have more ship time (or berth time) to fill, where will the funding for this come from?

This is a challenge across all disciplines. Need to try and act strategically and draw on strategic funding/partnership and opportunity funding.

What scope will there be for the SDA to go to the “wrong” hemisphere in winter? i.e. Arctic in December-January or Antarctic in July-August? What is the capability for SDA's science time in the Arctic to be moved around in time? The schedule Simon showed had the SDA only really operating in the Arctic in June-July, this is way before the best ice conditions in Greenland but after the main spring blooms too, for example. @Simon - for a lot of key Antarctic marine science the critical period spans the sea ice minimum, from mid-Jan to mid-March. To what extent are logistic commitments going to impinge on how much science can be done and where it can be done during that stage of the season?

We have to try and think creatively – science will drive the activity. Degree of presence and whether foreign office want to see the ship in the Arctic. Hard to say if feasible but if this is a request we can look at solutions – need to be a strong driver. Think big about future plans and we try and work collectively to serve the research community, while meeting logistics needs.

What arrangements are proposed for direct face to face discussion with Captain and appropriate crew before cruises?

Information will come out of Chief Scientist workshop that might help answer this. But if you have specific questions for the Captains/specific crew member then ops can help that happen in advance,

How constrained will the SDA's science activities be by logistical commitments? Will those logistical commitments be made (clearly) available to the community in advance? Will plans for logistics be made available to the community, so science might be able to be added to logistics trips to places like Halley or the Amundsen Sea?

There are logistical constraints but some flexibilities we've tried to bring in to support science eg collaborative approaches. NERC Marine Planning and BAS need to continue to work together. Some things are fixed – need to get to stations around December, for example. But dialogue and early planning are key. This is already done with the JCR – but with SDA we will be looking four/five years ahead that there will be a Halley call in X year, and what blocks of time that leaves open. Need to look ahead and communicate with community about future grant proposals.

If Brexit gets sorted in a way that preserves the UK's access to EU science funds (!)...will the SDA rejoin ARICE - the EU's transnational access scheme for research icebreaker time?

Not sure yet - still negotiating exactly for that activity - watch this space!

I think my question may have been poorly worded. The current bottleneck in getting scientists to sea is rarely actually ship time, instead it is winning funding for that time. Without allocating extra funds or having more targeted grants there simply won't be extra scientists to fill the new berths.

Part of the reason for this workshop is to stimulate the thinking and create the networks that support the development of strategic research proposals (taking advantage of community-led options such as [Highlight Topic](#) submissions) and thus secure a larger funding base (excellence prevailing).

