

ASSEMBLE



ASSOCIATION OF EUROPEAN MARINE BIOLOGICAL LABORATORIES EXPANDED

JRA1 (WP7) Genomics Observatories

Georgios Kotoulas
Melanthia Stavroulaki (OSD)
Matthias Obst (ARMS)

GA2 – Galway, 10/10/2018



GOs is a Network

of Ecosystems and/or Sites subject to long-term scientific research, including and not limited to the sustained study of genomic biodiversity from single-celled microbes to multicellular organisms

Davies et al. GigaScience

Operation of GOs

- Genomic data are taken together with high quality contextual data (e.g. spatial, temporal, environmental)
- Use and encourage development of standards for all processes: Sampling, Sample processing, Experimentation, Data & Metadata Capture, Data Management, Data Analysis

General Principles

Reconcile realism & ambitions

Technology and expertise alone does not suffice

This is an exercise for improving collaborative intelligence

Ambition to get to:

- Bring Systems Biology outside the lab into the (Eco)systems
- Get from Genomes and Phenomes to Ecosystem Functioning
- Offer FAIR Data for knowledge production



Objectives

- 1. Initiate a distributed Marine Genomic Observatory (GO) community** in European marine biological stations with time-series ecosystem monitoring programs and molecular expertise
- 2. Harmonize a consortium strategy and guidelines for DNA barcoding** and populate a **reference DNA barcoding database** for local communities
- 3. Produce a common virtual-access portal for GO data and information on protocols, tools and best practices; Communication & Outreach Forum**
- 4. Perform pilot coordinated sampling and sample processing events** via a «**GO Ocean Sampling Day**» as an end-to-end exercise in order to identify steps in need of improvement and produce a baseline harmonized dataset for virtual access and analysis through the web services provided

Tasks

Task JRA1.1. GO standards-literate community building – M12 (HCMR)

Questionnaire & Workshop = > strategy document for GO implementation

Task JRA1.2. GO-Sampling Day M18 (HCMR)

Operation of Pilot cross-consortium: 'GO-Ocean Sampling day'

Doing the real thing in a well prepared manner, adding new elements

Task JRA1.3. DNA barcoding & metagenomics (UPMC) M24 & M45

DNA barcoding and metabarcoding water column & benthic diversity & **ARMS deployment**

Bring all Institutes to level for DNA barcoding and metabarcoding

Populating Reference DNA barcoding data bases

Task JRA1.4. GO virtual-access portal (MPIMM)

A multipurpose tool communication Forum,

Access to ASSEMBLE Plus and publically available relevant services,

Outreach tool - window of GOs to the community and the world

ASSEMBLE's Plus GOs

18 marine stations

- 15 along Europe
- 1 at Red Sea
- 1 at Antarctic
- 1 at Arctic ocean



Community building

Meetings: GA1, Faro March2018, GA2

Questionnaire & Portal

Dynamic document for a mid-term roadmap of GOs

Community of Practice – Concrete actions:

- OSD2018 gaining experience
- ARMS 2018
- Sub-groups formed:
 - DNA barcoding/Metabarcoding
 - Zooplankton diversity
 - eDNA
 - MetaTranscriptomics



Impacts of achieved visibility

- AtlanECO (proposal H2020): using OSD
INFRASTRUCTURE & EMBRC ERIC brand name outreach also
- EMBL – proposed collaboration
- BGI – asked to sequence everything
- Discussions with GENOSCOPE



Broadening the scope: Sub-groups of stations

Please subscribe to groups of your interest (Institutions)	metaT	ARMS group	zooplakton	DNA barcoding	eDNA
Please highlight if you would accept to be coordinator					
Matthias Obst, University of Gothenburg, Sweden		coordinator	+	+	+
Joanan Norkko, University of Helsinki, Finland		+			
Rafal Lasota, University of Gdansk, Poland		+	+		+
Panagiotis Kasapidis, HCMR			coordinator	+	+
Roman Wenne, Piotr Kuklinski, Piotr Balazy		+	+		
Michael Cunliffe, Marine Biological Association (MBA), Plymouth		+	+	+	coordinator
Andreja Ramšak; David Stanković, Borut Mavri		+	+	+	+
Melody Clark (NERC-BAS)	maybe	+		+	maybe
Flanders Marine Institute (VLIZ), Klaas Deneudt, Pascal Hablutzel	+	+	+	+	maybe
Adriana Zingone, Raffaella Casotti, Roberta Piredda (Stazione Zoologica Anton Dohrn)	+		+	+	+
Lionel Guidi (Laboratoire d'océanographie de Villefranche sur mer)			+	+	

Being Global

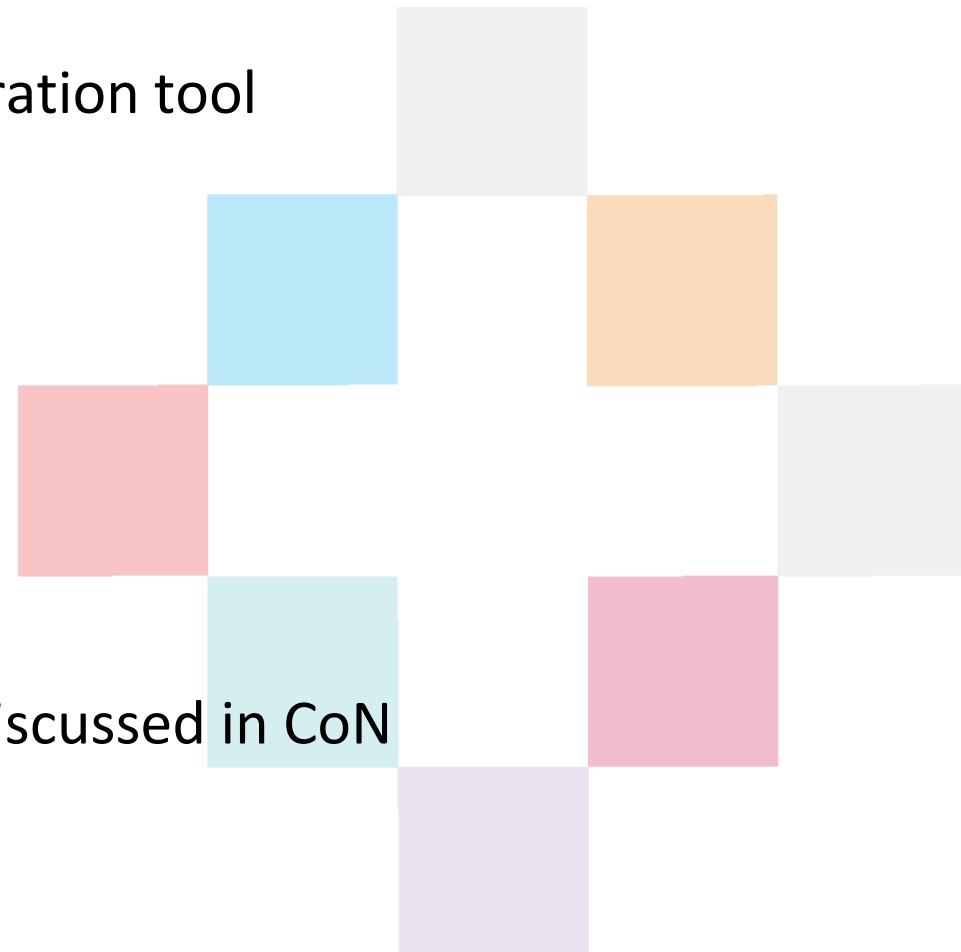
Collaboration – Interaction:

- GOs of GSC
- TARA OCEANS
- GLOMICON – ATLANTOS H2020
- ENA – EBI/ELIXIR
- gfbio



DATA

- FAIR DATA principle: adopted, NOT materialized
- Reinstated the OSD sampling and metadata registration tool
- Needs testing before use for 2019 event
- Discussions to be organised with EBI on:
 - Metadata standards
 - Data infrastructure
 - Data brokering
- Suggested workshop dedicated to DATA & GOs, discussed in CoN meeting (Galway 8/10) for 2019



Ocean Sampling Day

coordinated by



OSD 2018

21st June

200+ Registered Sites

Analysis of the
Gene content
of All
microorganisms

Sampling on
All Continents

Free
access to
all Data

www.oceansamplingday.org

Coordination tasks

1. Send e-mails to all previous participants asking whether they would be interested in participating this year and with which sampling sites
2. Register new participants and give OSD-IDs to the new sampling sites
3. Keep record of all sampling sites, sampling teams etc.
4. Prepare instructions on:
5.
 - Metadata sheet
 - Sampling protocols
 - Storing details
 - Shipping directions
5. Talk to legal advisors and prepare documents resolving legal issues, for all participants to sign before sending their samples to HCMR
6. Make sure all participants have signed and sent these documents, along with their samples, in order IMBBC-HCMR to be able to proceed with the samples' DNA analysis legitimately.

Coordination tasks

7. Deal with samples shipment issues (courier companies , release parcels from customs, letters for customs use, to describe the nature of the samples delivered etc.)
8. Send reminder e-mails describing the right procedures to sample or to ship the filters and answer to questions from participants (***more than 500 e-mails have been exchanged since May, the vast majority between June and August***)
9. Prepare, update and maintain social media accounts of OSD event (<https://fb.me/OCEANSAMPLINGDAY>, https://twitter.com/OSD18_19)
10. Get consent (GDPR) from all participants to keep communicating electronically with them. Last replies from old participants were received in the nick of time (on the deadline of 25th May).

OSD2018 IN NUMBERS

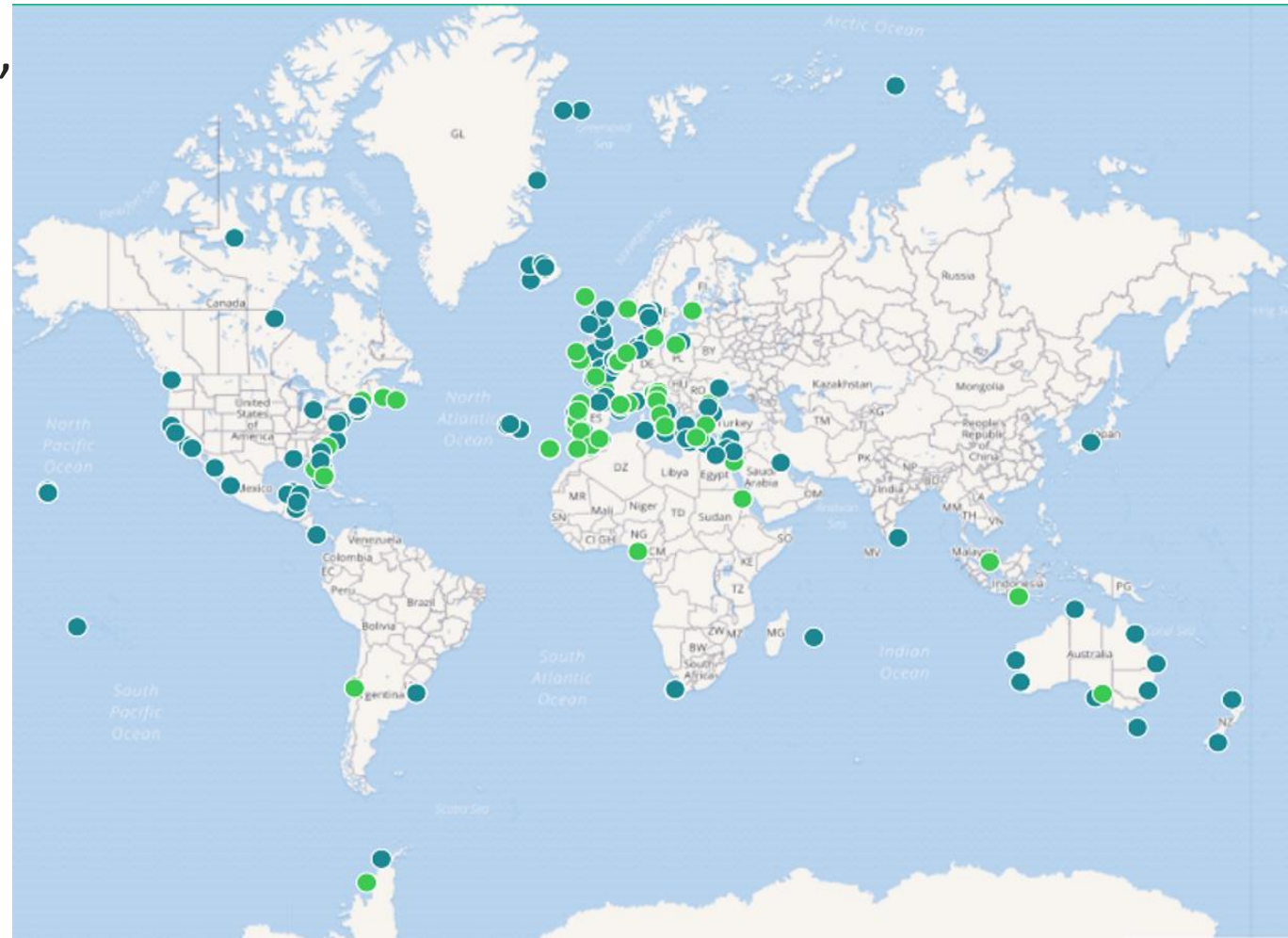
Since OSD 2014, more than 200 marine sites, from all continents, have been registered.

Around 25 new sampling teams (usually sampling more than one site each) have been registered for OSD2018 and OSD2019

Overly, more than 100 sites have been sampled

Many traditional participating teams (e.g. from northern Europe) did not have an active role during this event (due to holidays time etc.)

Dots in **light green** mark sampling sites for OSD2018



“Planning is easy, executing is hard real”

Various problems have arisen, either due to human mistakes, misunderstandings or obstacles we had no control over, at the time

Sampling issues

- **Wrong Filters used**
- Not kept cold/on ice
- Not frozen (-80⁰C) within advised frame time

Legal Issues

(addressed by our legal advisor
Dr Dimitra Manou)

- ABS parties to sign misunderstanding
- Countries obliged to sign ABS agreement?

“Planning is easy, executing is hard real”

Shipping/Delivery issues

- Big quantity of dry ice → Big volume packages → **VERY HIGH SHIPPING COST**
- Not all courier companies handle dry ice shipments
- Customs issues for parcels from abroad → kept in customs → extra cost in money and time to release from customs **OR WORSE** parcels were returned back to sender (?)
- **Samples were sent in RT or in Blue ice** (?)
- While waiting for the primitive results from the analysis of the OSD2018 samples, samples are still arriving at IMBBC, due to one or more reasons from the previous listed.

Changes to be considered

Personal efforts

Participants need to read, study and follow instructions → show commitment

The head of each participating team needs to advise the people (technicians, students, etc.) who handle the sample shipment, in greater detail (if shipping is not handled by members of the team itself), in order to reinsure the successful delivery of samples.

Changes to be considered

Shipping Method

The way samples are being shipped should be changed drastically → more than 50% less samples should gone bad during delivery.

At the moment, the method of choice is shipping the filters in -80°C (dry ice). We propose each lab to proceed, independently using *benchmarked protocols* (?), with the DNA extractions and then send only DNA in RT(?)/ 4°C .

- Smaller packages → decreased cost
- Lower chance the package to be declined from courier companies to be delivered due to dry ice content
- Lower chance the package to be kept in customs due to high declared value

Wrapping up

Year by year, more research teams are interested to participate, recognizing the impact such a campaign could have in modern marine science

A large audience was reached by spreading the word that EMBRC and assemblePlus is shaping sustainable Genomic observatories.

By the end of this year, all DNA extractions and Sequencing will be finished. Next step will be all participants to be updated of the DNA quality results their samples have given.

OSD2018 test event had served its purpose: it taught us a number of lessons on difficulties and hurdles to avoid during the main event OSD2019

Big event is coming: OSD 2019

- Be a part -



**JRA1: Autonomous Reef Monitoring Structures
(ARMS)**

Divers cover the ARMS with recovery crate to avoid animals escaping © Chris Meyer

What is ARMS



Autonomous Reef Monitoring Structures

"Standardizing marine biodiversity assessment and monitoring"



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ARMS deployed for 2 years on CO2 seeps in Papua New Guinea © Laetitia Plaisance

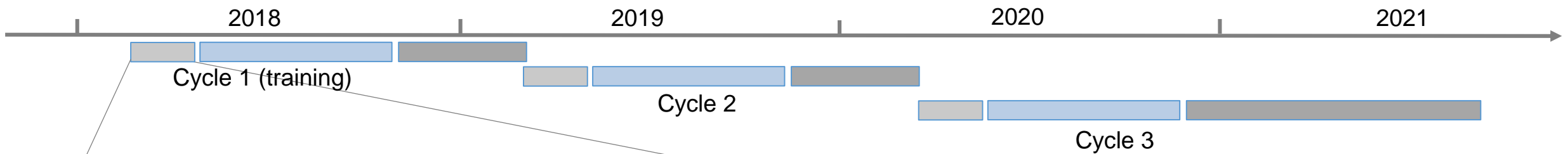
The Global ARMS Program is a Smithsonian Institution initiative hosted at the National Museum of Natural History in Washington DC. The program centralizes and makes available information and documentation on the ARMS and standardized processing protocols. The program curates a database of worldwide ARMS deployments that can be searched freely on the ARMS portal.



News

- MarineGEO survey conducted in Hong Kong

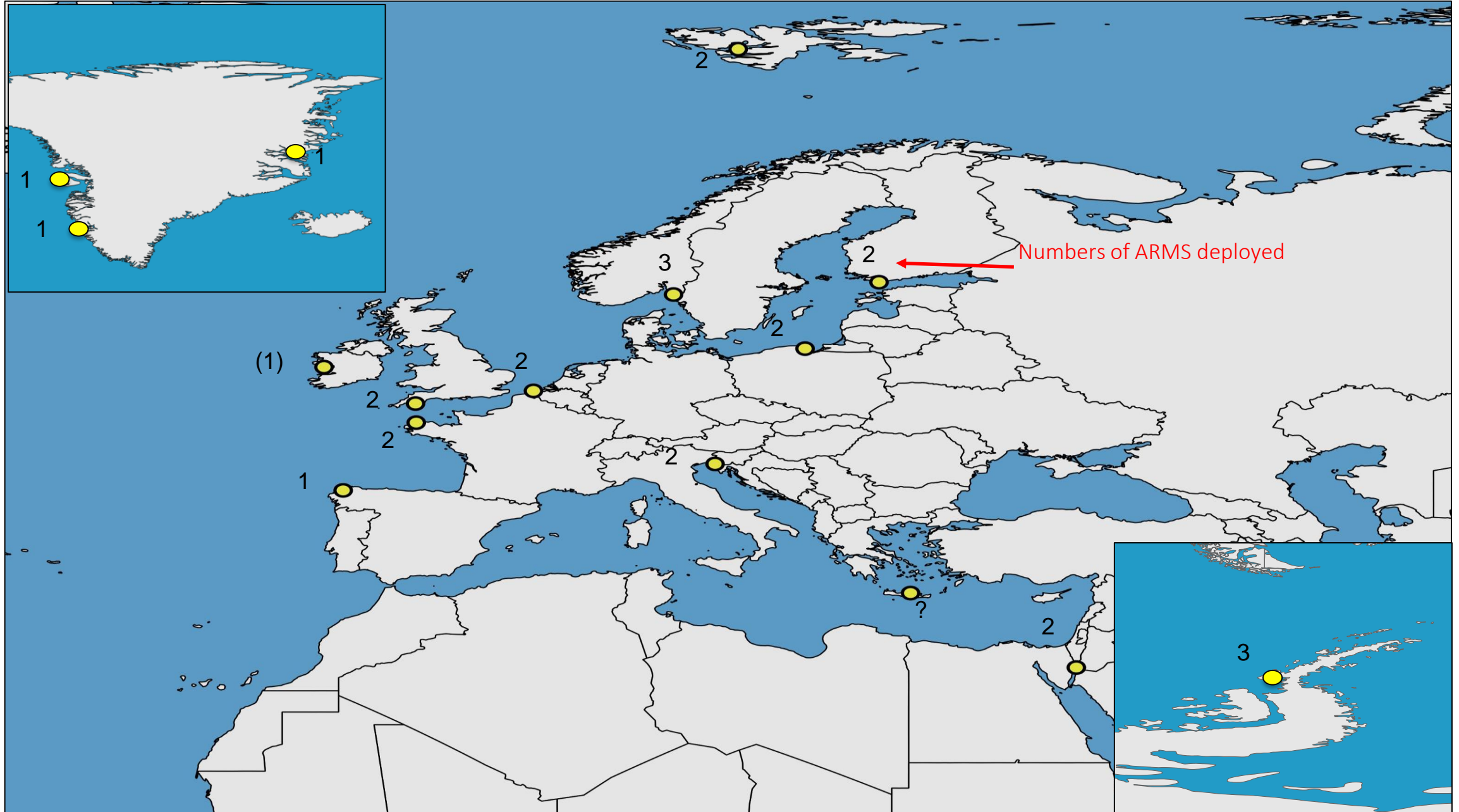
Phase 1 (March-April 2018)



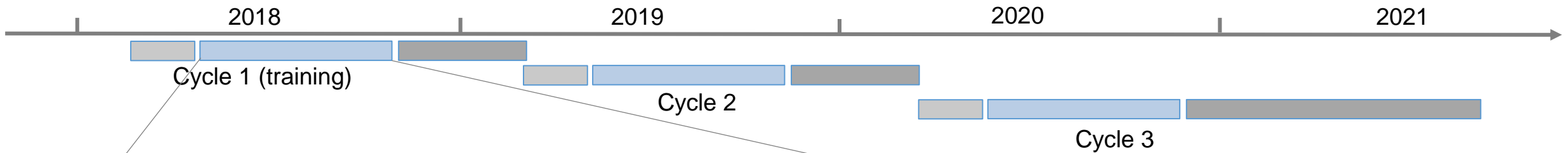
Preparation

- ARMS concept discussed at Faro workshop
- Decisions made:
 - *use ARMS for genetic seafloor monitoring*
 - *use MDA & GeoMe for data management*
 - *UGOT coordinator*
 - *HCMR sequencing*
- Call for participation resulted in network with 14 partners

16 ARMS sites in 2018 (10 continental Europe, 5 polar, 1 subtropical)



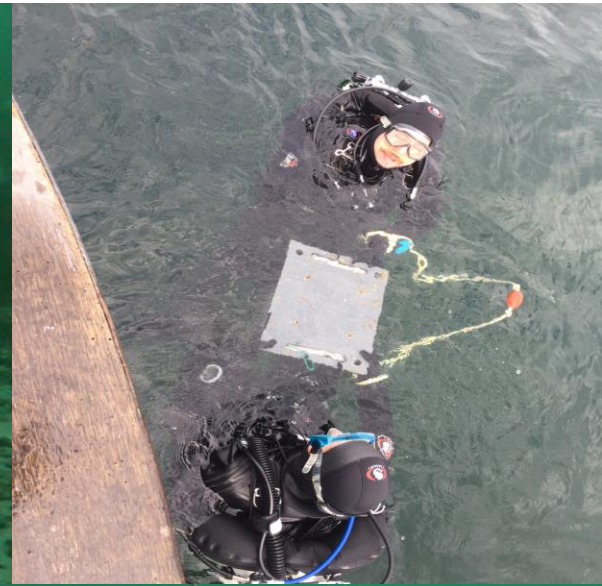
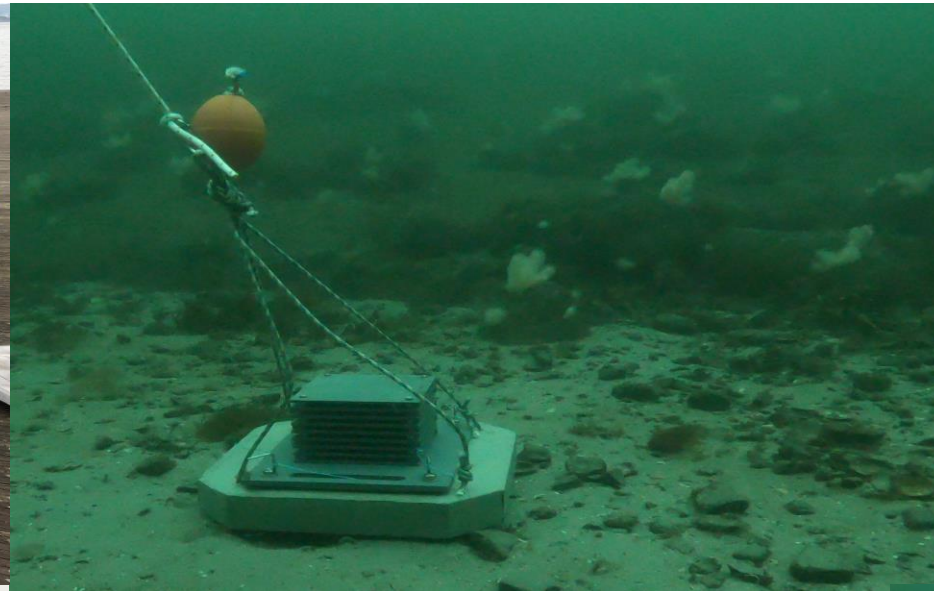
Phase 2 (May-Oct 2018)



Field work

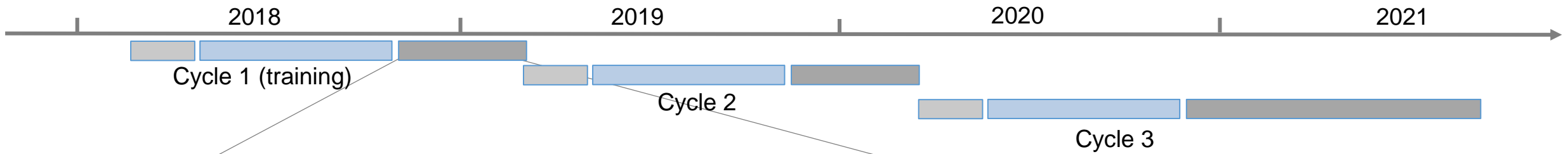
- Handbook with field guidelines produced and distributed
- ARMS ordered and shipped from USA
- Metadata submitted by all partners
- Field trials conducted and documented (deployment & retrieval)
- Online workshop held with Smithsonian Institution

Field work during summer 2018



#	Region	Ctr	Contact name	In-Out (Duration)	dpth	habitat	repl
1	Baltic Sea	Finland	J Norkko	Jul-Oct (3m)	4 m	Soft, mixed	2
2	Baltic Sea	Poland	R Lasota	Aug-???	< 20 m	sandy	2
3	North Sea - Skagerrak	Sweden	M Obst	Jun-Sep (3m)	18 m	sandy	3
4	North Sea - Belgian coast	Belgium	P Hablutzel	Jul-Aug (1m)	37 m	sandy	2
5	British channel	UK	N Christmas	Jul-Oct (3m)	1-10 m	mixed	2
6	British channel	France	F Viard	Jul-Oct (3m)	6-20 m	rocky	2
7	Atlantic coast - Vigo	Spain	J Troncoso	Jun-Sep (3m)	>15 m	rocky, maerl, sand	1
8	Atlantic Ocean	Ireland	AM Power	Practical problems			(1-3)
9	Mediterranean	Slovenia	B Mavrič	Aug-Oct (2m)	9 m	sandy, mud	2
10	Mediterranean	Greece	C Arvanitidis	Sep-Oct (2m)			?
11	Red Sea	Israel	A Genin	Jul-Oct (3m)	10 m	rocky	2
12	Svalbard	Poland	W Roman	Aug2018- Aug2019 (1 yr)	15 m	Nearshore, kelpforest	2
13	Antarctica	UK	M Clark	Jan2019-Jan 2020 (1y)	10-15 m	rocky	3
14	Greenland	UK	J Thyrring	May2019-May2020 (12m)	>15 m	Nearshore, kelpforest	3

Phase 3 (Nov 2018-Feb 2019)



Analysis

- Partner reporting & discussions in Galway
- Finalizing metadata submission
- Shipping of samples
- Sequencing & analysis
- Online workshop in January 2019, Kristineberg Marine Station, SE
 - *Discuss results & science*
 - *Data management*
 - *Design of Cycle 2*

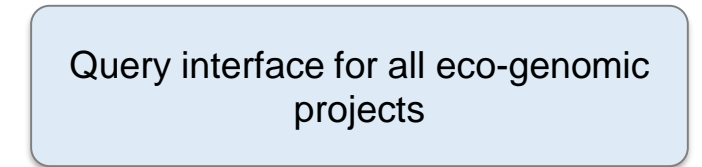
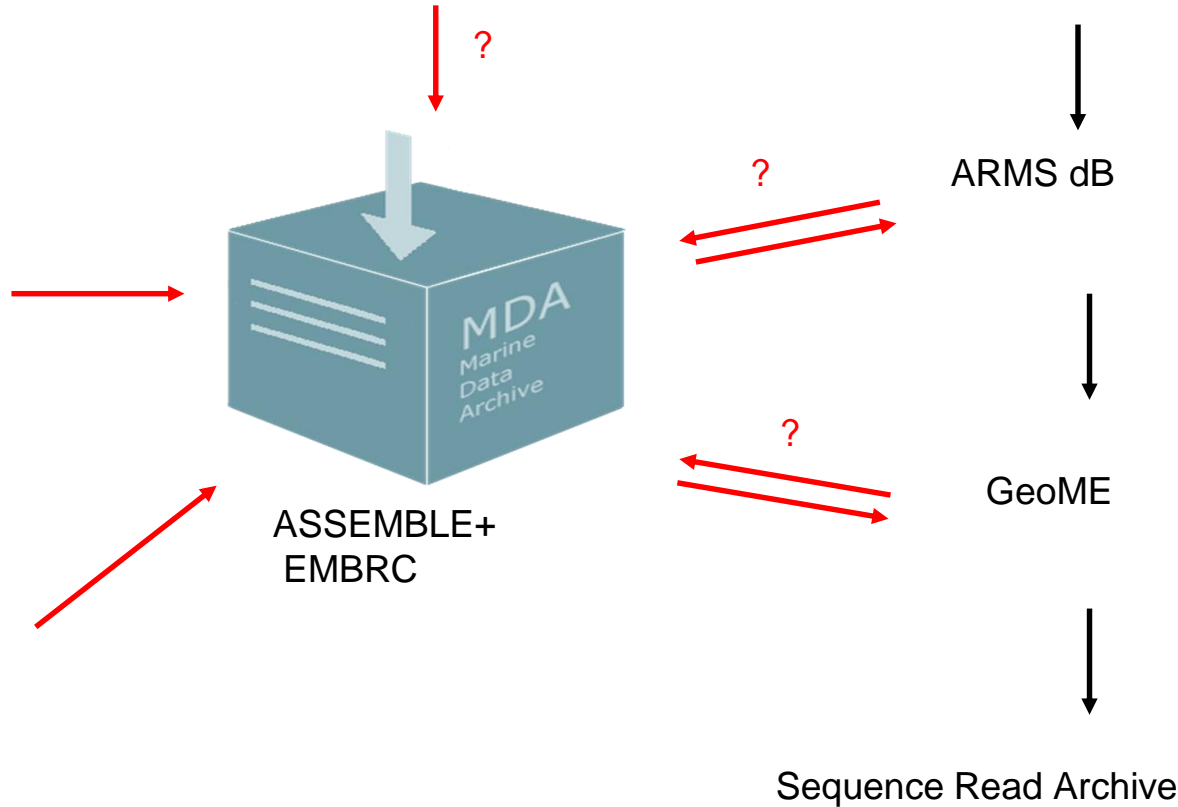
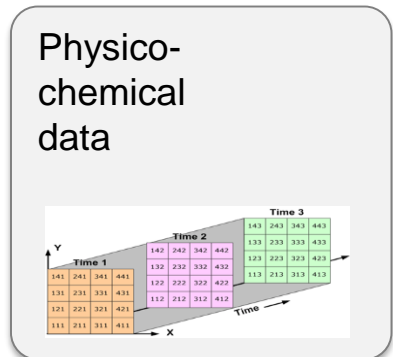
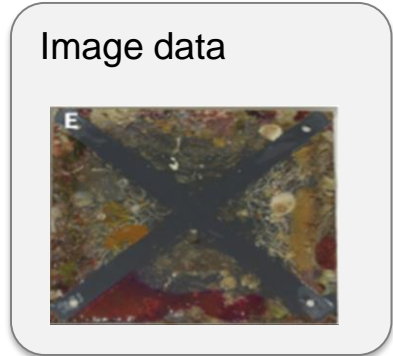
Data management

Original data produced by ARMS

1. Metadata
2. Sequence data, including microbial (OSD)
3. Image data
4. Physico-chemical data

Metadata

I	J	K	L	M	N	O	P
stationID	depthInMeters	decimalLongitude	decimalLatitude	habitat	substrateType	siteDetails	continentOcean
Koster_Vatten	20	11.103194	58.875155	rocky seafl	hard	sampling site wit Europe	
Koster_Vatten	20	11.111884	58.87633	rocky seafl	hard	sampling site wit Europe	
Koster_Vatten	20	11.080491	58.859877	rocky seafl	hard	sampling site wit Europe	



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Thank You

Contact Details:

kotoulas@hcmr.gr

osd-contact@embrc.eu

www.oceansamplingday.org

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