JRA1 (WP7)
Genomics Observatories

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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

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

*Davies et al. GigaScience*
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 manned, 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 March 2018, 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
  - MetaTrancriptomics
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**

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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

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
4. Talk to legal advisors and prepare documents resolving legal issues, for all participants to sign before sending their samples to HCMR
5. 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://fb.me/OCEANSAMPLINGDAY), [https://twitter.com/OSD18_19](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 (-80°C) within advised frame time

**Legal Issues**
- ABS parties to sign misunderstanding
- Countries obliged to sign ABS agreement?

(addressed by our legal advisor Dr Dimitra Manou)
“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 advice 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 reinsurance 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

Matthias Obst, Dpt. of Marine Sciences, University of Gothenburg
What is ARMS

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.
**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)

Numbers of ARMS deployed
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
<table>
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<th>Region</th>
<th>Ctr</th>
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<td>UK</td>
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<td>Jul-Oct (3m)</td>
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<td>France</td>
<td>F Viard</td>
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<td>Spain</td>
<td>J Troncoso</td>
<td>Jun-Sep (3m)</td>
<td>&gt;15 m</td>
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<td>Atlantic Ocean</td>
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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

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Overview interface for ARMS projects
Query interface for all eco-genomic projects

Image data
Physico-chemical data
Thank You

Contact Details:
kotoulas@hcmr.gr
osd-contact@embrc.eu
www.oceansamplingday.org
@ASSEMBLE_Plus

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