



Marine Microbial Biodiversity, Bioinformatics & Biotechnology

Deliverable 2.8

Ocean Sampling Day Event

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Summary

Aiming to analyse the marine microbial biodiversity and function of the world's ocean, the main OSD Event successfully took part on June 21st 2014 through the coordinated effort of the Ocean Sampling Day Consortium, comprising of 191 formally registered sites in the OSD Sites Registry. This deliverable provides details on the activities and achievements from the day of the event and how this enormous success is helping OSD Coordination Team plan the next set of tasks and future activities.



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Ocean Sampling Day

The OSD Main Event, the world's first simultaneous global megasequencing campaign to analyze marine microbial community compositions and embedded functional traits on a single day, successfully took part on June 21st 2014. As day-length appears to be the primary driver to structure marine communities [1], the solstice on June 21st 2014 was chosen as the sampling date. 191 research teams around the world formally expressed interest and were registered at the OSD Sites Registry to conduct sampling in a collaborative effort to generate the largest dataset on marine microbes related in time, space and environmental parameters. Despite not-permitting weather conditions in some of the OSD sampling sites as well as unforeseen problems such as injuries of participants, on June 21st 2014, samples from more than 150 OSD sites were successfully collected. Participating OSD sites range from subtropical waters in Hawaii to extreme environments such as the Fram Strait in the Arctic Ocean (Figure 1). All seven major oceanic divisions (Pacific-, Atlantic-, Indian-, Antarctic- and Arctic Ocean) and continents are covered but with most still in Europe (105) and North America (34). The vast majority of the OSD sites are therefore located in the Northern Hemisphere (171). 37 sites are located in the Mediterranean and the Black Sea and as such form the OSD-Med sub-network. The best coastal coverage occurred along the western coast of Portugal with 13 sites.

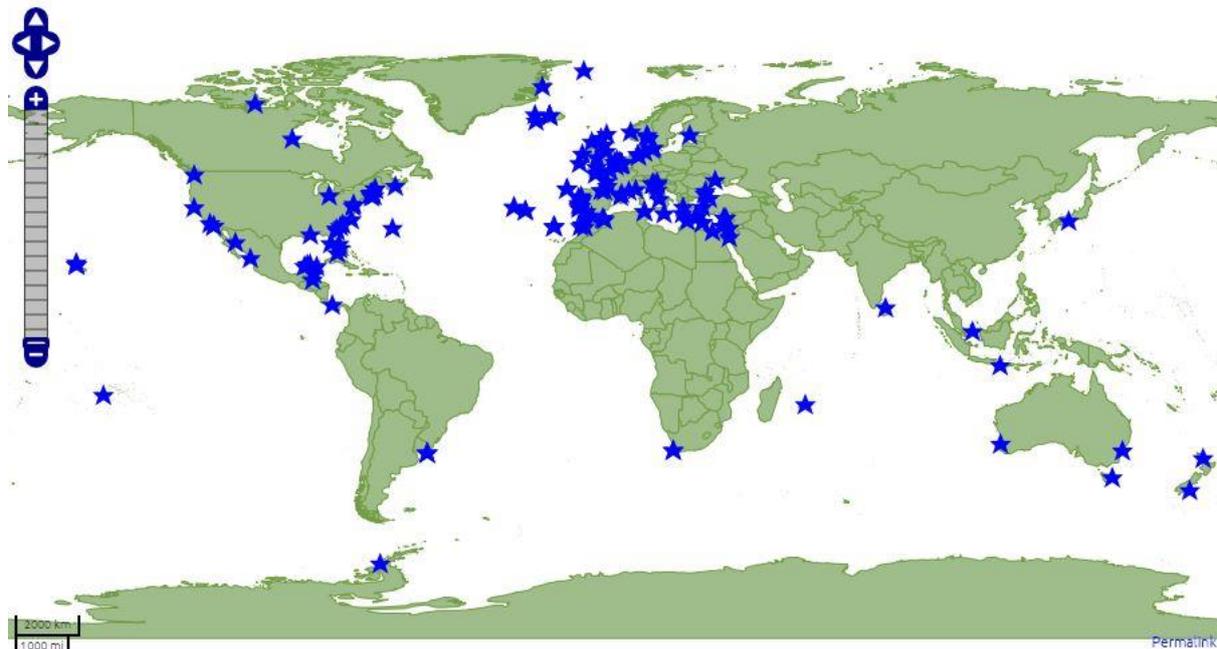


Figure 1: Map of registered sites for OSD 2014

OSD Data Generation

OSD excels through the application of standardized procedures which assure a high level of consistency and data interoperability. The first step included defining a centralized hub for laboratory work. DNA extractions took place at Biological Institute Helgoland of the Alfred

Wegner Institute by OSD Core Team, while sequencing is currently being performed at LGC Genomics in Berlin, Germany. For all OSD samples large scale 16S and 18S rRNA sequencing will be performed as well as 150 shotgun metagenomes (one metagenome per site). If a sampling site took samples from different depths the preference for metagenome sequencing goes to the surface sample. Results are expected in January 2015. Additional sequence data will be provided by collaborating parties as described in the section “OSD Partnerships”.

OSD Data Flow

All OSD sequence and environmental data will be deposited into relevant public repositories, as shown in Figure 2 below. Once available from the sequencing center, all OSD raw sequences will be submitted to ENA. For OSD environmental data; through PANGAEA, oceanographic data will be submitted to SeaDataNet whereas biodiversity data will be submitted to EurOBIS. Furthermore, all OSD samples will be bioarchived at the Smithsonian Institute. The entire OSD data flow will be automatically handled by the Micro B3 Information System (Micro B3-IS) on behalf of the OSD participants, avoiding the need for any manual submissions by participants themselves.

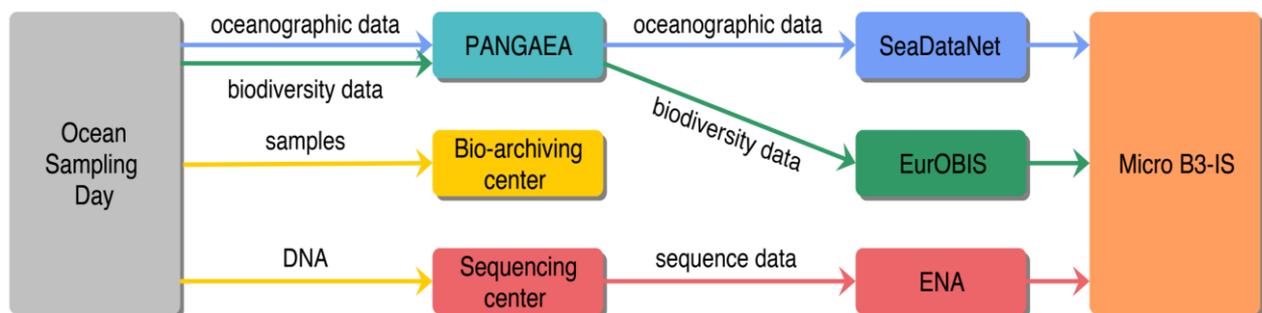


Figure 2: OSD Data Flow



OSD Data Analysis

Micro B3-IS will also provide the bioinformatics capacity for the processing, analysis and biotechnological exploitation of marine biodiversity data. Moreover, the associated online submission tool enabled all participants to submit their metadata. This allowed efficient capture of standardized metadata among all participants, ensuring mandatory metadata to be entered by all participants at a minimum. The newly developed Marine Microbial Biodiversity, Bioinformatics and Biotechnology (M2B3) standards [2] ensure correct data storage in relevant domain-specific data archives. The ultimate reward will be a unique collection of standardized marine data.

To coordinate any efforts on OSD data analysis, an OSD Analysis Core Group (OACG) was established in October 2014, consisting of 21 experts in the field and led by the WP2 Leader Dr. Mesude Bicak. The primary objective of OACG is to carry out and publish a global analysis of the June 2014 OSD as well as OSD pilot event datasets. A collaborative working document outlining details on its members, working groups, plans, telecons, minutes and actions can be found via the following link:

<https://docs.google.com/document/d/10YjRuEL7mXeQOAPcEJmwOmWr7quFBaUuvNLA0AkChPM/edit>

CIESM Charter

The OSD Team kick-started OSD Main Event on June 21st, 2014 in Monaco, where Prof. Dr. Frank Oliver Glöckner, Micro B3 Coordinator and Prof. Dr. Frédéric Briand, General Director of the Mediterranean Science Commission (CIESM) signed the CIESM Charter on Access and Benefit Sharing. This Charter aims to maintain and protect access to scientific knowledge to everyone while preventing any potential abuse of the ocean global commons. The endorsement of the CIESM Charter in the context of OSD provided a perfect opportunity for scientists to support the exploration of marine ecosystems by promoting the sustainable use of Marine Genetic Resources without penalizing potential biotechnological and economic developments. To date 391 scientists from all over the world have endorsed the charter. A full list can be found via <http://ciesm.org/marine/charter/index.php>.



OSD Partnerships

To accomplish an ambitious simultaneous megasequencing campaign like OSD, endorsement of the community and fruitful partnerships proved essential. Supported by the Argonne National Laboratory, the generous cooperation with the Earth Microbiome Project (EMP) [3] enabled in-kind amplicon sequencing of OSD pilot studies which were conducted on each solstice in 2012 and 2013, respectively. The pilot events were essential for the successful establishment of co-ordination, logistics, bioinformatics and OSD data policies. Consequently, OSD data is EMP compliant contributing towards construction of a global catalogue of the uncultured microbial diversity of the whole planet [3]. Furthermore, cooperation with the LifeWatch project secured additional 18S rRNA gene sequencing for the OSD main event, while Pacific Bioscience (PacBio) [4] allowed sequencing almost full-length 16S rRNA gene amplicons and metagenomes from selected OSD sampling sites. Support for the development of analysis pipelines has included resources delivered in kind from partner institutions and externally funded activities such as the UK NERC Environmental Omics Synthesis Cloud project [6]. We acknowledge the generosity and tremendous support from our partners and participants that not only enriched the data set but also allowed the OSD Consortium to save resources for future OSD activities.

MyOSD Citizen Science

We initiated the idea of the citizen science project MyOSD to connect people in a worldwide environmental movement and raise awareness on the topic of marine microbiology with various outreach activities. On Ocean Sampling Day everyone could be a scientist by joining MyOSD and contributing to science by collecting important environmental parameters like latitude, longitude, temperature, weather condition, wind speed and, with a little investment, also further data. For this purpose the OSD App for smartphones (Android and iOS) had been developed. Moreover, a dedicated webpage was created as part of the Micro B3 website (<http://www.microb3.eu/myosd>). In total 61 contributions from all around the world have been recorded adding value to OSD by sending environmental parameters as well as pictures.

OSD in Press & Media

OSD has been recognized by press and media all over the globe with around 60 press articles and several TV stations broadcasting interviews and footage about OSD. For example, the German/French TV channel Arte showed a 20 minute report about OSD in their X:enius broadcast. Also other scientific partners joined the outreach by advertising the event on their webpages and provided valuable information content. In particular, National Oceanic and Atmospheric Administration (NOAA) invited Dr. Anna Kopf née Klindworth to present OSD/MyOSD as part of their College of Exploration workshop (<http://vimeo.com/94242404>) and produced a Student Video, the Microbes Photo Gallery, Fact Sheet, Classroom Activities, and much more (<http://oceanexplorer.noaa.gov/ocean-sampling-day/welcome.html>). Furthermore, intensive use of social media such as Twitter (https://twitter.com/Micro_B3) and Facebook (<https://www.facebook.com/microb3osd>) helped us to spread the word. It was a pleasure to see that OSD/MyOSD participants supported us in this manner by using their personal accounts. The majority of the posts can be tracked by **#osd2014** and **#oceansamplingday** hashtags. The full list of press releases as well as press articles from



around the world can be found at <https://zarafa.mpi-bremen.de/owncloud/public.php?service=files&t=ed471e7d212ceedad863428b0ac411f1>

OSD Beyond 2014

The OSD and its consortium aim for continued growth and the addition of new technologies and methods including expansion towards multicellular organisms. The OSD Coordination Team will continue administration of the network and develop future key objectives and strategies in a collaborative effort. The first step towards this has been drafting a publication on the OSD event as the first publication from the OSD Consortium. The draft has been circulated to all OSD Site Coordinators for approval and with submission planned to be submitted to GigaScience Journal beginning of 2015. Future key tasks are to work more closely together with the GOs Network [5] towards biocoding the ocean and to expand to further locations and habitats, as well as to establish long-term funding bodies, resources and commitments towards an OSD time series dataset. Many sites have already expressed an interest in participating in OSD 2015 and beyond. The long-term vision of the OSD consortium is to generate a health index for (but not limited to) marine microbial communities, which will aim to monitor the health of the oceanic ecosystem, prioritize scientific research and raise public awareness.

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