# MYOSD: MARINE MICROBIOLOGY MEETS CITIZEN SCIENCE

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## Abstract
The Ocean Sampling Day (OSD) is a global sampling campaign, conducted regularly on the 21st of June with the aim to generate a worldwide snapshoot of the marine microbial diversity and function. The first OSD took place in 2014 and researchers all around the world contributed with standardized samples. As citizens expressed a strong interest in participating in OSD, citizen scientists have become a key part of OSD and are coordinated through the MyOSD project. In 2015, a special MyOSD sampling kit, to make the sampling possible for citizen scientists, was developed and participants collected 192 samples, doubling the amount of OSD samples gathered in the previous year. Consequently, their combined efforts generated the largest standardized, open-access microbial data set derived from samples collected on a single day.

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Marine microbiology research plays a fundamental role in marine science. Nevertheless, in the broad public the importance or even existence of marine microorganisms is often hardly known. Therefore, the general public was invited to join the Ocean Sampling Day (OSD) with the MyOSD initiative, not only to enlarge the OSD dataset but also to raise awareness about marine microbiology. The OSD was initiated within the EU FP7 funded project Micro B3 (Marine Microbial Biodiversity, Bioinformatics, Biotechnology) to analyze the marine microbial diversity and their genetic potential. Since 2014 it embraces a global network of scientists to collect water samples on one single day, the 21st of June. Already from the beginning, citizen scientist contributed environmental data to the OSD dataset in the citizen science initiative MyOSD. Citizens scientists measured water temperature, salinity and additional environmental parameters and sent them via the smartphone application "OSD Citizen App" directly to the OSD server [1]. After a positive evaluation of the data received from citizen scientists in 2014 [2] and their strong request to also sample marine microbes, the MyOSD project was developed further. For MyOSD 2015, we created a special sampling kit (Figure 1) based on the same protocol used by OSD scientists, which gives citizen scientists the possibility to sample marine microbes and work hand in hand with professional scientists.

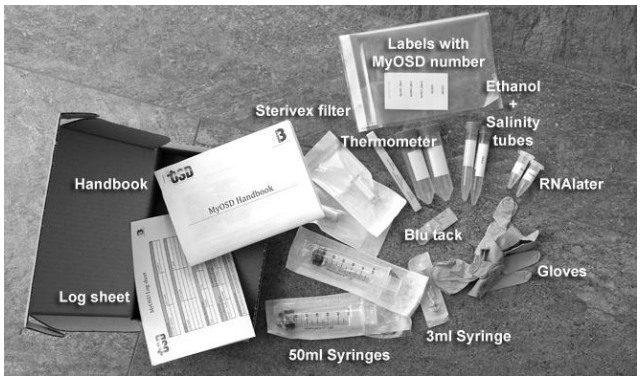


Fig. 1. Content of the MyOSD sampling kit. Each kit had a unique MyOSD number to keep better track of the collected sample and its contextual data.

To be in compliance with the Nagoya Protocol on Access and Benefit Sharing for Marine Genetic Resources, as well as with the Convention on Biological Diversity, legal permits to ship biological material across borders were required for some countries [1]. Therefore, we built up a network of MyOSD hubs holding those permits. These hubs distributed the sampling kits to citizen scientists in their country, collected them afterwards and sent them to the Max Planck Institute for Marine Microbiology in Bremen, Germany, for centralized DNA extraction and sequencing. In total, 270 sampling kits were produced, and distributed by 31 MyOSD hubs located in 19 different countries (Figure 2). Next to marine samples also samples from rivers were accepted. In total, 192 samples were returned (71% of initial distributed sampling kits) and with this doubling the amount of OSD samples (191 OSD samples in 2014).

Fig. 2. Locations of the 192 MyOSD samples (white pins) collected by citizen scientists all around the world in 19 different countries. Visualization was done with Google maps and the tool MapAList.

Out of 192 MyOSD samples, 167 were used for 16S rRNA gene amplicon sequencing due to insufficient amounts of DNA or missing of legal permits. In total 13,958,128 read pairs were sequenced, resulting in an average of 83,581 sequences per sample. These sequences are currently analyzed for obvious contaminations during the sampling procedure to assure that citizen scientists provide valuable data for marine microbiological studies. Once approved, the MyOSD samples will become an integral part of the OSD dataset for global marine microbial diversity analysis. The next challenge is to analyze and visualize the data in a meaningful way for citizen scientists with further information about the microbes found in their samples.

## References
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