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DEGLI STUDI DI BARI  
ALDO MORO



Consiglio Nazionale  
delle Ricerche



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Biomolecular  
Thematic Centre





## The Biomolecular Thematic Centre and MoBiLab

### Investigation field

The study of Biodiversity aims at understanding and classifying the taxonomic and functional diversity of living organisms, whatever their size and their level of organization, from the single organism to the entire ecosystem. The DNA analysis technologies, thanks to their extraordinary progress, represent a precious tool to investigate Biodiversity and greatly extend its perspectives. Currently, a huge amount of molecular data are produced daily through the next generation sequencing (NGS) platforms. Their analyses by means of sophisticated computational tools allow to characterize the taxonomic and functional biodiversity in environmental, food and clinical samples with unprecedented depth and extent.

### Objectives

The virtual research environment, the Biomolecular Thematic Centre (CTB), realized within the Italian contribution to the LifeWatch European infrastructure for Biodiversity, along with the related Molecular Biodiversity Laboratory (MoBiLab) established thanks to targeted funding within the PONa3\_00025 - BIOforIU project, take part in this ambitious and innovative initiative. In the CTB, skills and advanced facilities for molecular and bioinformatics analyses are integrated to provide the scientific community with services and counselling for Molecular Biodiversity studies. The activities of the Thematic Centre are supported by MoBiLab, with its fully operative platforms based on the most innovative NGS technologies and powerful resources of data storage and computational analysis. These facilities allow to obtain detailed taxonomic and

genetic/functional information, from environmental, food or clinical samples. In addition to their support to LifeWatch, the services hosted by MoBiLab contribute to the Italian node of the European infrastructure ELIXIR.

### Activities and skills

The main activities of the LifeWatch CTB supported by MoBiLab consist of the design and application of massive meta-barcoding or shotgun DNA sequencing protocols for the analysis of genomes and transcriptomes of individual organisms and natural communities. The approach relies on NGS technologies and bioinformatics resources for the analysis of molecular data, including specialized and interoperable databases and computational workflows. These are developed in collaboration with the National Institute of Nuclear Physics (INFN) and the University of Bari, which also provide powerful platforms of information technology and communication (ICT), with high storage and computing capacity. A wide collaboration is also ongoing with the ICT group of LifeWatch for the construction and maintenance of an infrastructure for the extraction of Molecular Biodiversity data and associated metadata from remote bioinformatics resources that are accessible worldwide, as well as for their storage and usability. Moreover CTB cooperates with the Collections and Mediterranean Thematic Centres by contributing to the creation of the molecular Thesaurus of LifeWatch-ITA platform.

### Achievements

The following products and services are currently fully operational:

- Advanced experimental protocols, based on NGS and computational technologies, for the

qualitative and quantitative characterization of the microbiome in environmental, food and clinical samples and for the analysis of complete genomes and transcriptomes.

- ITSoneDB database (<http://itsonedb.ba.itb.cnr.it:8080/ITS1/>), a reference resource for ITS1 rRNA metagenomic analysis of fungal communities, the target-oriented metagenomic analysis pipeline BioMaS (<https://recasgateway.ba.infn.it/>, <http://galaxy.cloud.ba.infn.it:8080>) and MetaShot analysis pipeline, aimed at taxonomic and functional studies of microbial communities from NGS data produced by shotgun protocols.
- The CTB and MoBiLab participate to the Ocean Sampling Day (OSD) international initiative launched through the EU project MicroB3 (<http://www.microb3.eu/osd>), by collaborating in sampling, NGS sequencing and analysis of the eukaryotic plankton. The OSD takes place at summer solstice, June 21, when more than 190 teams of marine scientists from all over the world collect samples in order to study the biodiversity of marine microbial world and its functions with advanced molecular methods. With the Citizen Science MyOSD initiative, this year citizens were involved in the OSD scientific campaign. The Stazione Zoologica "Anton Dohrn", as MyOSD-Hub, has distributed sampling kits with which citizens will contribute, together with scientists, to a deeper understanding of the oceans.

### Benefits

The benefits and applications field of national and international interest are manifold. First, the constitution and the increasing consolidation of excellence research infrastructure provide a significant support in terms of scientific development. The effects of the research activities carried out by the Thematic Centre and the Mobilab are also notable for human health, nutrition and, in general, human and environmental welfare.