

Peek into Biodiversity and Beyond- A hands-on training workshop on NGS

Workshop Summary Report

Submitted by

Punyasloke Bhadury

ISME Ambassador, India.

The term ‘Biodiversity’ encompasses all forms of life on Earth and has been playing key roles in the evolution of Earth and human civilizations. Quantifying biodiversity across ecosystems have relied on a number of approaches including using microscopy. However due to changing climate and multitude of anthropogenic pressures, ecosystems and biodiversity are undergoing dramatic changes including loss of many taxa which are possibly unknown to science. One of the key aspects of studying biodiversity is the methodological approach or approaches used to answer the hypotheses. Many methods that are non-invasive can allow us to elucidate biodiversity such as structure and functioning of microbial communities without the need to shift communities from their habitat.

Microbial ecology is an important theme under biodiversity that provide insights on the structure, functions and interactions between microbial communities within a habitat. Therefore, it is possible to understand the importance of a microbial cell within an environment such as soil, water or within the human gut. The advent of next-generation sequencing (NGS) for more than a decade ago has revolutionized the domain of Biology including theme of microbial ecology. In South Asia, microbial ecology is an emerging theme of interest among early-career researchers (Ph.D./Postdoc levels), early-career faculty and mid-career faculty. A workshop with the theme ‘Peek into Biodiversity and Beyond- A hands-on training workshop on NGS’ was organized in Kolkata, India from 4th-6th March, 2022 and supported by the International Society for Microbial Ecology (ISME). The ISME supported workshop is a dedicated capacity building workshop intended for promoting microbial ecology research throughout South Asia. This workshop provided a platform and had participation of 60 early career researchers at different stages of their career (Ph.D. level to early-career faculty) and some of the leading experts encompassing different areas of microbial ecology in India. The participants were from different geographical corners of the country and represented a number of academic institutions. The participation of early career researchers was focused to ensure fair representation of gender, career stage, and geography. The workshop was conducted in hybrid mode thus allowing participation of early career researchers who could not attend in person. The experts laid key foundation of how NGS can be used effectively as a tool to answer fundamental questions in microbial ecology. The lectures by experts covered the broad themes of aquatic microbial ecology, deep subsurface microbiology, rhizosphere associated microbes in commercially important crop, human health microbiology, vector diseases and microbial ecology, wastewater surveillance and coastal ecosystems restoration such as mangroves. The workshop included dedicated hands-on sessions where participants had the opportunity to observe, set up and run next-generation sequencing instruments such as ONT MinION as well as instruments required for quantification following library preparations (e.g. Qubit). Environmental DNA extracted from coastal water were prepared and subsequently were ran on ONT MinION. The participants got a glimpse of how data is generated real-time in a NGS

platform. Besides, detailed sessions on Illumina sequencing chemistry, platforms and steps of raw data generation were explained to everybody including virtual participants. In the workshop, dedicated sessions on processing of raw data (Illumina and Nanopore) including steps of annotation were undertaken using web-based servers. The participants also got the opportunity to learn and practice these steps along with introduction to new tools such as MG-RAST, SILVAngs, Galaxy, Proksee, and Gview. These sessions were interactive with plenty of questions and answers discussed between the participants and experts. As part of this workshop, the participants were also provided with raw data of a bacterial genome and they learnt steps of performing sequence quality control, followed by annotation and sequence data visualization. During the workshop, the participants were introduced to the concepts of metatranscriptomics and metaproteomics. One of the most important aspects of this workshop was a dedicated session where participants discussed about key questions on microbial ecology and how NGS tools can be effectively used to answer these questions. Besides, the workshop has paved way for establishing collaboration between early career researchers and experts in the area of microbial ecology and beyond. Overall the workshop activities which was supported by ISME laid much needed foundation of NGS and its application in conducting microbial ecology research in India and also across South Asia.

