



Pressure-Retaining Sampling and Measurement Devices

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During the execution of the mega-project (Developing world-leading technologies for exploration and exploitation of hadal biological resources and conducting frontier research on biological processes and genetic resources, funded by Ministry of Science and Technology of China, total budget CNY 18.53 million, 08-2018–12-2021), directed by Dr. Fang (Chief Scientist), we developed seven sets of pressure-retaining (PR) sampling samplers (seawater, sediment, macrofauna, biofilms), PR transfer devices, an in-situ filtration of particle-attached and free-living microbes with preservation (by adding RNAlater in situ), and a device for measuring microbial ectoenzyme activities at in-situ temperature and pressure conditions, all at full-ocean-depth (Figure 1).

We also performed the first ever activity measurement of four microbial ectoenzymes (alkaline phosphatase, aminopeptidase, α - and β -glucosidase) in the Challenger Deep of Mariana Trench. Our results showed that microbial ectoenzyme activities measured under in-situ T&P conditions (ISTP) are drastically different from those obtained from using the traditional methods measured under atmospheric T&P conditions (ATTP) (Figure 2). microbial ectoenzyme activities varied with depth (T&P) and different enzyme showed different results between ISTP and ATTP.

These devices will be used for the DOME programme and shared with other scientists of DOME projects.

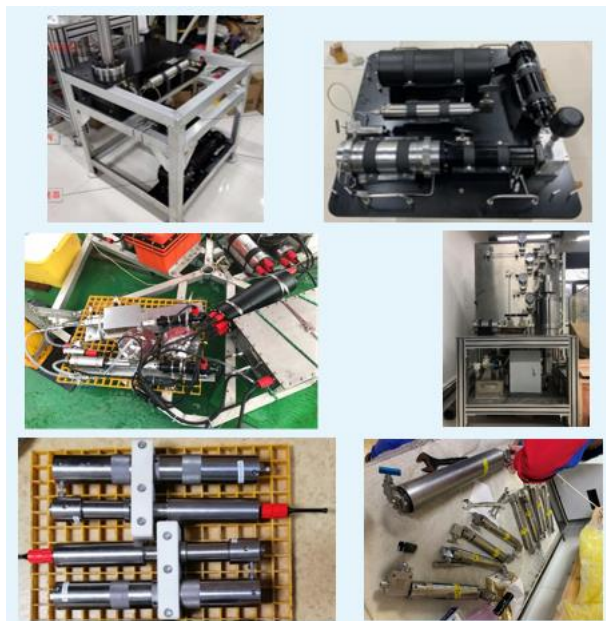


Figure 1. Pressure-retaining devices for sampling seawater, sediment, macrofauna and PR transfer devices.

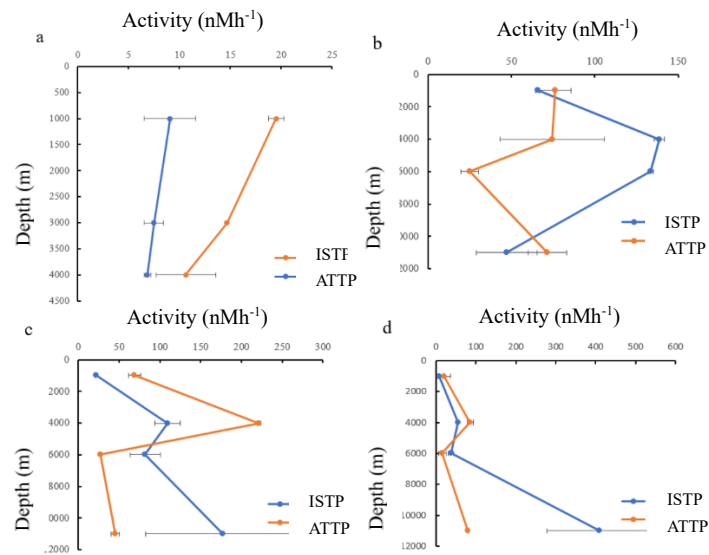


Figure 2. Activities of four microbial ectoenzymes (alkaline phosphatase (a), aminopeptidase (b), α - (c) and β -glucosidase (d)) measured under in-situ temperature and pressure (blue curves) and atmospheric temperature and pressure conditions (red curves).