

Description of Additional Supplementary Files:

Supplementary Data 1: The list of samples, including sample IDs, quantities, collection times, locations (with latitude and longitude), and relevant details for experiments.

Supplementary Data 2: The list of potential contaminant sequences, accompanied by their corresponding taxonomic annotations.

Supplementary Data 3: The list of genomes used in the study, along with their taxonomic annotations, sources, and CheckM results.

Supplementary Data 4: The information of COGs with significant distribution differences (Fisher's exact test) between cultivable and uncultivable genomes