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Bacterial Diversity Reports Contamination around the Ichkeul Lake in Tunisia

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Abstract : The anthropogenic pressure in coastal areas increases dramatically with the exploitation of environmental resources. Biomonitoring coastal areas are crucial to determine the impact of pollutants on bacterial communities in soils and sediments since they provide important ecosystem services. However, relevant biomonitoring tools allowing fast determination of the ecological status are yet to be defined. Microbial ecology approaches provide useful information for developing such microbial monitoring tools reporting on the effect of environmental stressors. Chemical and microbial molecular approaches were combined in order to determine microbial bioindicators for assessing the ecological status of soil and river ecosystems around the Ichkeul Lake (Tunisia), an area highly impacted by human activities. Samples were collected along soil/river/lake continuums in three stations around the Ichkeul Lake influenced by different human activities at two seasons (summer and winter). Contaminant pressure indexes (PI), including PAHs (Polycyclic aromatic hydrocarbons), alkanes, and OCPs (Organochlorine pesticides) contents, showed significant differences in the contamination level between the stations with seasonal variation. Bacterial communities were characterized by 16S ribosomal RNAs (rRNA) gene metabarcoding. Although microgAMBI indexes, determined from the sequencing data, were in accordance with contaminant contents, they were not sufficient to fully explain the PI. Therefore, further microbial indicators are still to be defined. The comparison of bacterial communities revealed the specific microbial assemblage for soil, river, and lake sediments, which were significantly correlated with contaminant contents and PI. Such observation offers the possibility to define a relevant set of bioindicators for reporting the effects of human activities on the microbial community structure. Such bioindicators might constitute useful monitoring tools for the management of microbial communities in coastal areas.

Keywords : bacterial communities, biomonitoring, contamination, human impacts, microbial bioindicators
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