ABSTRACT

Soil bacterial diversity from three locations on maritime Antarctica was analyzed using 16S rRNA gene clone library construction and restriction fragment length polymorphism (RFLP) fingerprinting. Soil samples were from near Rothera Research Station in Rothera Point from Adelaide Island, from Viking Valley on north-eastern side of Mars Glacier from Alexander Island, and from Léonie Island on northern Marguerite Bay, Antarctic Peninsula. Five hundred and forty-eight clones were screened by RFLP and representatives of each phylotype were sequenced for identification. The phylotype sequences showed close relationship (i.e. ≥95% similarity) with bacterial divisions Acidobacteria, Actinobacteria, Bacteroidetes, Chloroflexi, Cyanobacteria, Firmicutes, Gemmatimonadetes, Proteobacteria, Verrucomicrobia and Unclassified Bacteria. The least number of phylotypes were observed in Rothera Point soil sample (25) whereas the highest phylotype diversity belonged to Léonie Island (35). Certain phylotypes were exclusive to one site or two, whereas 33% of the phylotypes were shared by all clone libraries. Shannon diversity index (H’) revealed the highest bacterial diversity in Léonie Island (3.14) and lowest diversity in Rothera Point (2.93). The soil from Viking Valley showed high diversity (H’=3.09) comparable to that of the vegetated soil of Léonie Island despite the severity of its climate condition. There is an evident environmental influence on the pattern of biodiversity where the human-disturbed soil sample of Rothera Point revealed less bacterial diversity than the undisturbed soils of Léonie Island and Viking Valley.
ACKNOWLEDGEMENTS

I wish to begin with the name of God, who is the meaning of everything and without whom none of this would be. He is the one true light that I seek in darkness, and is the only one who keeps me sane throughout hard times. There is no possible way that I can ever show my gratitude and humbleness towards Him and for that I bow before Him alone and say: “al-Hamduillah” (thanks to God).

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And last but certainly not least, to the two most important people in my life, I dedicate this to my parents for believing in me when I had no trust in myself and for pushing me beyond my boundaries. I can simply say thank you for all you have done and God bless you.
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ABBREVIATIONS

% : percent
= : equal to
≥ : greater than or equal to
≤ : smaller than or equal to
℃ : degree Celsius
µg : microgram
µl : microlitre
µM : micromolar
$A_{260}/A_{230}$ : ratio of UV absorbance at 260nm and 230nm
$A_{260}/A_{280}$ : ratio of UV absorbance at 260nm and 280nm
ARDRA : amplified ribosomal DNA restriction analysis
ATS : Antarctic Treaty System
BAS : British Antarctic Survey
BLAST : basic local alignment search tool
bp : base pairs
CaCl$_2$ : calcium chloride
cAMP : cyclic adenosine monophosphate
CAP : catabolite activator protein
CD : community-dominant
cm : centimetre
$D$ : Simpson’s diversity index
DGGE : denaturing gradient gel electrophoresis
dH$_2$O : distilled water
DNA : deoxyribonucleic acid
dNTP : deoxyribonucleoside triphosphate
dsDNA : double-stranded deoxyribonucleic acid
EDTA : ethylenediaminetetraacetate acid
$E.~coli$ : *Escherichia coli*
ET : extra-terrestrial
EtBr : ethidium bromide
F : forward
g : gram
sec : second
SOC : super optimal broth with catabolite repression
SSCP : single strand conformation polymorphism
ssDNA : single-stranded deoxyribonucleic acid
ssu : small subunit
TAE : tris acetate ethylenediaminetetraacetate acid
Taq : *Thermus aquaticus*
TGGE : temperature gradient gel electrophoresis
UV : ultraviolet
V : volt
VV : Viking Valley
w/v : weight per volume
X-Gal : 5-bromo-4-chloro-3-indolyl β-D-galactopyranoside