

Diversity and Ecological Theory: Does Size Matter?

JI Prosser

School of Biological Sciences, University of Aberdeen, Cruickshank Building, St Machar Drive, Aberdeen, Scotland, AB24 3UU, United Kingdom

The use of molecular techniques to characterise bacterial and archaeal communities in natural environments has led to remarkable discoveries. Initial studies demonstrated considerable diversity in established groups and demonstrated the existence of new microbial groups, with no cultivated representatives, that were abundant and universally distributed. Fifteen years later, new phylogenetic groups are still being discovered at an exponential rate. Surveys of diversity were followed by investigations into the influence of environmental factors on community composition and differences between communities in different situations.

Molecular techniques continue to develop and expand and their increasing availability, reduced cost and the ease with which sequence data can be collected, have led to an explosion of information on bacterial and archaeal diversity. Unfortunately, these technical advances have not been accompanied by equivalent advances in theory and diversity studies rarely involve testing of ecological theory and, frequently, are descriptive and discovery-driven. As a consequence many of the findings from diversity studies are not generic, do not provide information on underlying mechanisms driving diversity and are not predictive.

A similar situation in plant and animal ecology led to the development of ecological theory which, potentially, can be applied in several areas of bacterial and archaeal ecology. Several studies have investigated the relevance of general ecological theory to patterns of microbial diversity. The most obvious feature distinguishing microorganisms from plants and animals is their microscopic size, but this may not prevent application of theory. However, other features of bacteria and archaea may require revision or reassessment of the generality of ecology theory.

References

Prosser, J.I., Bohannan, B.J.M., Curtis, T.P., Ellis, R.J., Firestone, M.K., Freckleton, R.P., Green, J.L., Green, L.E., Killham, K., Lennon, J.J., Osborn, A.M., Solan, M., van der Gast, C.J. and Young, J.P.W. (2007). The role of ecological theory in microbial ecology. *Nature Reviews in Microbiology* 5, 384-392.