

Soil Biodiversity

NERC Thematic Programme

Publication list

I. Refereed papers listed on the ISI database

- Anderson, AS and Wellington, EMH (2001). The taxonomy of *Streptomyces* and related genera. *Int J. Syst. Evolu. Microbiol.* **51**: 797-814.
- Bardgett, RD (2002) Causes and consequences of biological diversity in soil. *Zoology*, **105**: 367-374
- Blaxter, M and Floyd, R (2003). "Molecular taxonomics for biodiversity surveys: already a reality." *Trends in Ecology & Evolution* **18**: 268-269.
- Blaxter, M Counting Angels with DNA (2003) *Nature* **421** : 122-124
- Bradford, MA and Newington, JE (2002). Life underground with the worms: soil biodiversity and ecosystem functioning. *Biologist.* **3** 127-130
- Bradford, MA, Tordoff, GM, Eggers, T, Jones, TH, Newington, JE (2002). Microbiota, fauna, and mesh size interactions in litter decomposition. *Oikos* **99**: 317-323
- Bradford, MA, Jones, TH, Bardgett, RD, Black, H, Boag, B, Bonkowski, M, Cook, R, Eggers, T, Gange, AC, Grayston, SJ, Kandeler, E, McCaig, AE, Newington, JE, Setälä, H, Staddon, PL, Tordoff, GM, Tshcerko, D, Lawton, JH (2002). Impacts of soil faunal community composition on model grassland ecosystems. *Science*, vol **298** 615-618.
- Brown, S (2002). Aspects of soil protozoa on a grassland farm. *European Journal of Protistology* **37**: 359-360
- Bruneau, PMC, Ostle, N, Davidson, DA, Grieve, IC and Fallick A (2002). Determination of rhizosphere ¹³C pulse signals in soil thin sections by Laser Ablation Isotope Ratio Mass Spectrometry (LA-IRMS). *Rapid Communication in Mass Spectrometry*, **16**, 2190-2194.
- Bruneau, P. M.C., Davidson, D. A. and Grieve, I. C. (2004) An evaluation of image analysis for measuring changes in void space and excremental features on soil thin sections in an upland grassland soil. *Geoderma* **120**, 165-175
- Bruneau, Patricia MC, Davidson, Donald A and Grieve, Ian C (2004) An evaluation of image analysis for measuring changes in void space and excremental features on soil thin sections in an upland grassland soil. (2004) *Geoderma* **120** (3-4) : 165 – 175
- Catovsky, S, Bradford, MA and Hector, A (2002). Biodiversity and ecosystem productivity : implications for carbon storage. *Oikos.* **97** (3) : 443 - 448
- Davidson, D, Bruneau, PMC, Grieve, IC, Young, IM, (2002) Impacts of fauna on an upland grassland soil as determined by micromorphological analysis. *Applied Soil Ecology* **20** 133-143
- Davidson, D (2001) Bioturbation in Old Arable Soils : Quantitative Evidence from Soil Micromorphology *Journal of Archaeological Science* (2002) **29** 1247-1253
- Davidson, D.A., Bruneau, P.M.C., Grieve, I.C. and Wilson, C.A. (2004). Micromorphological assessment of the effect of liming on faunal excrement in an upland grassland soil. *Applied Soil Ecology* **26**, 169 - 177.
- Dawson, L A , Grayston, S J , Murray, P J , Cook, R , Gange, A C , Ross, J M , Ord, B (2003) Influence of pasture management (nitrogen and lime addition and insecticide treatment) on soil organisms and pasture root system dynamics in the field *Plant and Soil* **255** : 121-130
- Esteban, GF, Finlay, BJ, Charubhun, N & Charubhun, B (2001). On the geographic distribution of *Loxodes rex* (Protozoa, Ciliophora) and other alleged endemic species of ciliates. *Journal of Zoology*, **255**: 139-143.
- Esteban, GF, Olmo, JL & Finlay, BJ (2001). Redescription of *Psilotricha acuminata* Stein, 1859 and revisions of the genera *Psilotricha* and *Urospinula* (Ciliophora, Hypotrichida). *Journal of Eukaryotic Microbiology*, **48**: 280-292.
- Esteban, GF, Olmo, JL & Finlay, BJ (2001). Re-discovery of a "missing link" ciliated protozoan. *Limnetica*, **20**: 15-21.

- Esteban, GF & Finlay, BJ (2002). Historical encounters with a little-known ciliate (*Gerda glans* Claparède and Lachmann, 1858) from the 'Jungfernheide'. *Protist*, **153** : 79-86
- Esteban GF, Clarke KJ, Finlay BJ. (2005). *Paraluffisphaera tuba* n. gen., n. sp. – a newly-discovered eukaryote. *Acta Protozoologica*, **44**: 265-270.
- Eyuaem, A & Blaxter, ML. (2003). Comparison of biological, molecular and morphological methods of species Identification in a set of cultured *Panagrolaimus* Isolates *Journal of Nematology* **35** : 119-128
- Finlay, B.J. (2002). Global dispersal of free-living microbial eukaryote species. *Science* **296**: 1061–1063.
- Finlay, BJ, Black, HIJ, Brown, C, Clarke, KJ, Esteban, GF, Hindle, RM, Olmo, JL, Rollet, A and Vickerman, K (2000). Estimating the growth potential of the soil protozoan community. *Protist*, **151**: 69-80.
- Finlay, BJ, Black, HIJ, Brown, C, Clarke, KJ, Esteban, GF, Hindle, RM, Olmo, JL, Rollet, A and Vickerman, K (2000). Estimating the growth potential of the soil protozoan community. *Corrigendum Protist*, **151**: 367.
- Finlay, BJ & Esteban, GF (2001). Exploring Leeuwenhoek's legacy; the abundance and diversity of protozoa. *International Microbiology*, **4**: 110-116.
- Finlay, BJ & Esteban, GF (2001). Ubiquitous microbes and ecosystem function. *Limnetica*, **20**: 161-173.
- Finlay, BJ, Esteban, GF, Clarke, KJ & Olmo, JL (2001). Biodiversity of terrestrial protozoa appears homogeneous across local and global scales. *Protist*, **152** : 355-366.
- Finlay, BJ & Fenchel, T (2001). Protozoan community structure in a fractal soil environment. *Protist*, **152**: 203-218.
- Fitter A.H., Gilligan C.A., Hollingworth K., Kleczkowski A., Twyman R.M., Pitchford J.W. and the members of the NERC Soil Biodiversity Programme (2005). Biodiversity and ecosystem function in soil *Func. Ecol.* **19**, 369-377.
- Floyd RM, Abebe E, Papert A, Blaxter ML (2002) Molecular barcodes for soil nematode identification. *Molecular Ecology*, **11**, 839-850.
- Ghosh, A, Frankland, J C, Thurston, C F & Robinson, C H (2003). Enzyme production by *Mycena galopus* mycelium in artificial media and in *Picea sitchensis* F1 horizon needle litter. *Mycological Research* **107** : 996 - 1008
- Goddard MR, Bradford, MA (2003). The adaptive response of a natural microbial population to carbon- and nitrogen-limitation. *Ecology Letters*, **6**: 594-598
- Gray, ND, Hastings, R, Sheppard, SK, Loughnane, JP, McCarthy, AJ, Lloyd, D, and Head, IM (2002) Effects of soil improvement on bacterial community structure and soil processes in an upland soil. *FEMS Microbiology Ecology* **46**, 11-22.
- Grayston SJ ,Treonis AM, Murray PJ, Dawson LA, Ross J, Pratt S, Reid EJ & MacDougall R (2001). Impact of root herbivory by insect larvae on soil microbial communities. *European Journal of Soil Biology* **37**: 277 – 280.
- Grieve, I.C., Davidson, D.A. and Bruneau, P.M.C. (in press) Effects of soil fauna on void space and aggregation in an upland grassland soil. *Geoderma* **125** (1-2) 39-48
- Griffiths, BS, Kuan, HL, Ritz, K, Glover KA, McCaig, AE, Fenwick, C. (2004) The relationship between microbial community structure and functional stability, tested experimentally in an upland pasture soil. *Microbial Ecology* **47** (1) : 104 – 113
- Griffiths, R, Whiteley, AS, O'Donnell, AG and Bailey, MJ (2003). Influence of depth, sampling time and rhizodeposition on bacterial community structure in an upland grassland soil *FEMS Microbiol Ecol.* **43** : 35-43
- Griffiths, R I, Whiteley, AS O'Donnell, AG and Bailey, MJ, (2003). Pysiological and community response of established grassland bacterial populations to water stress *Appl. Env Microbiol* **69** : 6961-6968
- Griffiths, BS, Ritz, K, Wheatley, R, Kuan, HL, Fenwick, C, Christensen, S, Ekelund, F, Sorensen, SJ, Muller, S & Bloem, J (2001). An examination of the biodiversity-ecosystem function relationship in arable soil microbial communities. *Soil Biology and Biochemistry* **33**: 1851-1858.
- Griffiths, RI, Whiteley, AS, O'Donnell, AG & Bailey, MJ (2000). A rapid method for the co-extraction of DNA and RNA from natural environments for the analysis of rDNA and rRNA based microbial community composition. *Applied Environmental Microbiology* **66**: 5488-5491.

Robert I. Griffiths, Mike Manefield, Nick Ostle, Niall McNamara, Anthony G. O'Donnell, Mark J. Bailey and Andrew S. Whiteley, (2004). $^{13}\text{CO}_2$ Pulse Labelling in Tandem with Stable Isotope Probing: Methodological Considerations for Examining Rhizosphere Microbial Function *Journal of Microbiological Methods* Volume 58, Issue 1, 119-129.

Johnson D, Leake JR, Ostle N, Ineson P & Read DJ (2002). *In situ* CO_2 - ^{13}C pulse-labelling of upland grassland demonstrates a rapid pathway of carbon flux from arbuscular mycorrhizal mycelia to the soil. *New Phytologist* **153**: 327-334.

Johnson, D, Leake JR & Read, DJ (2001). Novel in-growth core system enables functional studies of grassland mycorrhizal mycelial networks. *New Phytologist* **152**: 555-562.

Johnson D, Leake JR & Read DJ. (2002) Transfer of recent photosynthate into mycorrhizal mycelium of an upland grassland: short-term respiratory losses and accumulation of ^{14}C . *Soil Biology & Biochemistry*. **34**, 1521-1524

Johnson D, Booth RE, Whiteley AS, Bailey MJ, Read DJ, Grime JP, Leake JR 2003 Plant community composition affects the biomass, activity and diversity of microorganisms in limestone grassland soil *European Journal of Soil Science* **54**: 671-677

Johnson D, Krsek M, Stott AW, Wellington EMH, Cole L, Bardgett RD, Read DJ & Leake JR (2005) Soil Invertebrates Disrupt Carbon Flow through Fungal Networks. *Science* vol 309 : 1047

Johnson D Johnson, P, Vandenkoornhuyse J, Leake JR, Gilbert L, Booth RE, J Grime P, Young JPW, Read DJ. 2004 Plant communities affect arbuscular mycorrhizal fungal diversity and community composition in grassland microcosms *New Phytologist* **161**: 503-516.

Jones, TH. (2003). Climate change and biodiversity. *Biological Sciences* **16** : 14

Jones, TH and Bradford, MA (2001). Assessing the functional implications of soil biodiversity in ecosystem. *Ecological Research* **16**: S31 – S44.

Krsek, M, and Wellington, EMH (2001). Assessment of Chitin Decomposer Diversity within an Upland Grassland. *Antonie van Leeuwenhoek* **79**: 261-267.

Metcalfe, AC, Krsek, M, Gooday, GW, Prosser, JI, and Wellington, EMH. (2002) Molecular Analysis of a Bacterial Chitinolytic Community in an Upland Pasture. *Appl. Envir. Microbiol.* **68**: 5042-5050.

Olmo, J.L. (2000). Morphology and morphogenesis of *Uroleptus lepisma* (Ciliophora, Hypotrichida). *European Journal of Protistology*, **36**: 379-386.

Olmo, JL (2000). Morphology and morphogenesis of *Uroleptus lepisma* (Ciliophora, Hypotrichida). *European Journal of Protistology*, **36**: 379-386.

Ostle, N, Whiteley, AS, Manefield, MJ, Bailey, MJ & Sleep, D (2003). Microbial RNA turnover in a grassland soil estimated using a $^{13}\text{CO}_2$ spike. *Soil Biology & Biochemistry* **35**: 877-885

Pacey, MS, Barnes, MM, Monday, RA, Ritzau, M and Wellington, EMH (2001). Biotransformation of selamectin with *Streptomyces lydicus* SX-1298 using a novel static agar fermentation system with reemay mesh. *J. Antibiotics* **54**: 448-454.

Porazinska, DL, Bardgett, RD, Blaauw, MB, Hunt, WH, Parsons, A, Seastedt, TR and Wall, DH (2003). Relationships at the aboveground-belowground interface: plants, soil microflora and microfauna, and soil processes *Ecological Monographs* **73** : 377-395

Sheppard, SK and Lloyd, D (2002) Diurnal oscillations in gas production (O_2 , CO_2 , CH_4 , and N_2) in soil monoliths. *Journal of Biological Rhythms* **33**, 577-591.

Sheppard SK, Lloyd D (2002) Effects of soil amendment on gas depth profiles in soil monoliths using direct mass spectrometric measurement. *Bioresource Technology* **84** (1): 39-47

Sheppard SK, Lloyd Dm (2002) Direct mass spectrometric measurement of gases in soil monoliths. *Journal of Microbiological Methods* **50** (2): 175-188

Smirnov, A V and Brown, S (2000). First isolation of a cyst-forming *Vannella* species, from soil – *Vannella persistens* n. sp. (Gymnamoebia, Vannellidae). *Protistology*, **1**:120-123.

Smith, VC, Bradford, MA (2003). Do non-additive effects on decomposition in litter-mix experiments result from differences in resource quality between litters? *Oikos*, **102**: 235-242.

Smith, VC, Bradford, MA (2003). Litter quality impacts on grassland litter decomposition are differently dependent on soil fauna across time. *Applied Soil Ecology*, 24: 197-203

Staddon, PL & Fitter, AH (2001). The differential vitality of intraradical mycorrhizal structures and its implications. *Soil Biology & Biochemistry* 33: 129-132.

Staddon, PL, Thompson, K, Fitter, AH, Jakobsen, I, Grime, JP & Askew, AP (2003). Mycorrhizal fungal abundance is affected by long-term climatic manipulations in the field. *Global Change Biology* 9: 186-194

Staddon, PL, Ramsey, CB, Ostle, N, Ineson, P & Fitter, AH (2003). Rapid turnover of hyphae of mycorrhizal fungi determined by AMS microanalysis of ¹⁴C. *Science* 300: 1138-1140

Staddon, PL, Ostle, N, Dawson, LA, Fitter, AH (2003). The speed of soil carbon throughput in an upland grassland is increased by liming. *Journal of Experimental Botany* 54: 1461-1469.

Van Elsas, JD, Smalla, K, Lilley, AK & Bailey, MJ (2001). Methods for sampling soil micro-organisms. In: *Manual of Environmental Microbiology*, ASM Washington. pp. 505-515.

Vandenkoornhuysen P, Baldauf SL, Straczek J, Leyval C, Young JPW (2002) Extensive and novel fungal diversity in plant roots. *Science*, 295: 2051

Vandenkoornhuysen P (2002) Fungal diversity and plant roots. *Science*, 296: 1969

Vandenkoornhuysen P, Husband R, Fitter AH, Young JPW (2002) Patterns of arbuscular mycorrhizal community composition with co-occurring plant species from a grassland ecosystem. *Molecular Ecology*, 11: 1555-1564

Vandenkoornhuysen P, Ridgeway, KP, Watson, IJ, Fitter, AH, Young, JPW (2003). Co-existing grass species have distinctive arbuscular mycorrhizal communities. *Molecular Ecology* 12 : 3085-3095

Vickerman, K, Le Ray D, Hoef-Emden, K & De Jonckheere, J (2002). The soil flagellate *Proleptomonas faecicola*: cell organisation and phylogeny suggest that the only described free-living trypanosomatid should not be assigned to the Kinetoplastida. *Protist* 153: Sept-24.

Voigt W, Perner J, Davis AJ, Eggers T, Schumacher J, Bahrmann R, Fabian B, Heinrich W, Kohler G, Lichter D, Marsteller R & Sander FW Trophic levels are differentially sensitive to climate. *Ecology* 84 : 2444-2453

Whiteley, AS, Wiles, S, Lilley, AK, Philp, J & Bailey, MJ (2001). Ecological and physiological analyses of *Pseudomonas* species within a phenol remediation system. *Journal of Microbiological Methods* 44: 79-88.

Whiteley, AS, Griffiths, RI and Bailey, MJ (2003). Analysis of the microbial functional diversity within water stressed soil communities by flow cytometric analysis and CTC+ cell sorting. *Journal of Microbiological Methods* 54 : 257-267

2. Other refereed publications (incl. book chapters)

Cole, L and Bardgett, R Soil Animals, Microbial Interactions and Nutrient Cycling. In *Encyclopedia of Soil Science – Soil Mesofauna and Macrofauna*, Marcel Dekker Inc. New York. (Book chapter).

Griffiths, R. I., M. Manfield, A. S. Whiteley, and M. J. Bailey. (2004). DNA and RNA extraction from soil. In J. D. van Elsas (ed.), *Molecular Microbial Ecology Manual*, Kluwer.

Griffith, GW, Easton, GL and Jones, AW Ecology and Diversity of Waxcap (*Hygrocybe* spp.) Fungi (2002). *Botanical Journal of Scotland*, 54(1): 7-22.

Olmo, JL and Esteban, GF (2000). *Sathrophilus antarcticus* Thompson, 1972 (Protozoa, Ciliophora) from Europe. *Quekett Journal of Microscopy*, 38: 531-536.

Symposium contribution refereed:

Krsek, M, Metcalfe, A, Williamson, N, and Wellington, EMH (2001). Approaches to studying the molecular diversity of chitinase genes in soil. In: *Chitin Enzymology 2001*, RAA Muzzarelli, ed., Atec, Italy, 2001: 361-272.

3. Non-refereed publications

Reports:

Usher, MB (2004). Life underground. *Planet Earth*, Spring 2004

Deacon, LJ (2001). Fruits of the field. *NERC News*, Autumn 2001, pp. 24-25.

NERC studentship reports by Janie Pryce-Miller & Lewis Deacon (June 2001).

Conference abstracts/proceedings:

International Working Meeting On Soil Micropedology. ITC-Ghent University: July 9-13, 2001

Patterns of microarthropod diversity in soils - Abstract: *British Ecological Society Winter Meeting*, Birmingham University, 3rd-5th January, 2001.

Bruneau, PMC, Davidson, DA, Grieve, I, Young, I, Crawford, J. Relationship between soil fauna and soil structure: quantification of void and excremental pedofeatures using image analysis

Davidson, DA. A quantitative analysis of the distribution of excremental pedofeatures in upland soil profiles.

Krsek, M (2001). A molecular approach to analysis of a soil chitinolytic community *Program Book of Joint Meeting of the American Phytopathological Society, Mycological Society of America, Society of Nematologists* August 25-29, 2001, Salt Lake City, Utah, p 19.

Krsek, M, and Wellington, EMH (2001). Diversity of fungal chitinase genes at Sourhope Research Station In: *Interactions in the Microbial World 9th International Symposium on Microbial Ecology, ISME – 9, 26-31 August 2001*, Amsterdam, The Netherlands Final Programme and abstracts p 246.

Krsek, M, Wellington, EMH (2001). Role of fungi in chitin degradation at Sourhope research station. Abstract published in *Proceedings from 3rd International Symposium on Chitin Enzymology and 4th Conference of the European Chitin Society*, Ancona, Italy, 6 –10 May 2001.

Metcalfe, A, Wellington, EMH (2001). A molecular approach to understanding a chitinolytic community In: *Interactions in the Microbial World 9th International Symposium on Microbial Ecology, ISME – 9, 26-31 August 2001*, Amsterdam, The Netherlands Final Programme and abstracts p 246.

Metcalfe, A, Wellington, EMH (2001). A molecular approach to understanding a chitinolytic community. Abstract published in *Proceedings from 3rd International Symposium on Chitin Enzymology and 4th Conference of the European Chitin Society*, Ancona, Italy, 6 –10 May 2001.

Prosser, JI (2001). Molecular and functional diversity in fungi. *Abstracts of ICOM3 3rd International Conference on Mycorrhizas 'Diversity and Integration in Mycorrhizas'*, Adelaide, Australia, July, 2001.

Offered and invited presentations:

Bailey, MJ. Assessing microbial diversity and ecosystem function in soils. Bangor University (June 2001).

Griffiths, R, Whiteley, AS, O'Donnell, A & Bailey, MJ (2000). A rapid method for total nucleic acid extraction from soils for the analysis of 16S rRNA and rDNA. *SGM Irish Branch*, April 2000. Prize awarded for the best poster.

Griffiths, RI, Whiteley, AS, O'Donnell, AG and Bailey, MJ (2001). Bacterial community structure in a grassland soil revealed by rDNA and rRNA analyses. *UK, Molecular Microbial Ecology Group meeting*, University of York. April 2001.

Griffiths, RI, Whiteley, AS, O'Donnell, AG and Bailey, MJ (2001) Spatial and temporal bacterial community structure in a grassland soil revealed by rDNA and rRNA analyses *ISME-9*, Amsterdam, September 2001.

Krsek, M (2001) Application of modern microbial methods to DOM research A talk at ESF/LESC Exploratory Workshop on: The prediction of the environmental function of the Dissolved Organic Matter (DOM) in ecosystems Schloss Hirschberg, Beilngries, Germany, 2-6 July 2001.

Wellington EMH. Actinomycetes in soils. *Symposium on Fungi and actinomycetes in food and water SfAM January meeting*, Manchester January 10th.

Wellington EMH. Chitinolytic actinomycetes in soils. *12th International Symposium on the Biology of Actinomycetes*, Vancouver Canada August 5-10th.

Wellington EMH. Exploiting microbial biodiversity *BIOWISE workshop*, Rothamsted November 9th.

Wellington EMH. Molecular approaches to studying actinomycete populations in soil. *Schering Plough*, NJ USA.

Whiteley, AS & Bailey, MJ NERI, Elsinore Denmark (May 2001) How can we determine the impact of perturbing agents on soil microbial communities *National workshop on "Fate and Effects of Microbial Inoculants"*.

Whiteley, AS & Bailey, MJ SGM Irish Branch, Belfast (September 2001) Determining microbial community structures at the molecular level (ASW).

Miscellaneous articles:

Black, H. Functional differences between worm species (Section in CEH Annual Report, 2000-2001).

Finlay, B. Fractal soil communities (Section in CEH Annual Report, 2000-2001).

4. Publications in press

De Ley, P & Blaxter, M (2003). A new system for Nematoda: combining morphological characters with molecular trees, and translating clades into ranks and taxa *Nematology* (in press)

Esteban GF, Clarke KJ, Olmo JL, Finlay BJ. (2006). Soil Protozoa – an intensive study of population dynamics and community structure in an upland grassland. *Applied Soil Ecology* (in press)

Finlay, BJ (ed) (2002). *A Guide to the Identification of Soil Protozoa*. ca 200pp. in prep/press (with contributions from Vickerman, Clarke, Brown, Smirnov, Olmo, Esteban, Black). (Book).

Manefield, M., R. I. Griffiths, A. S. Whiteley, and M. J. Bailey. (2004). Stable Isotope Probing: A critique of its role in linking phylogeny and function. In P. Nannipieri and K. Smalla (ed.), *Nucleic Acids and Proteins in Soil*, Springer-Verlag, Heidelberg. In press

Lewis J. Deacon, E. Janie Pryce-Miller, Juliet C. Frankland, Brian W. Bainbridge, Peter D. Moore and Clare H. Robinson (2005) Diversity and function of decomposer fungi from a grassland soil
In Press, *Soil Biology and Biochemistry*

PhDs awarded

Lewis Deacon

Functional Biodiversity of Grassland Saprotrophic Fungi King's College, London. 2003

Janie Pryce-Miller

Taxonomic biodiversity and community structure of saprotrophic fungi in an 'improved' and unimproved upland grassland. Kings College, London 2003

Rob Griffiths

Soil Bacteria and Carbon Flux: the Correlation with Diversity and Perturbation University of Newcastle 2003

Samual Shepphard

'Effects of amendment on soil microbial structure and function' University of Cardiff 2002

Hannah Bishop

The Ecology of Earthworms and their Impact on Carbon Distribution and Chemical Characteristics in Soil University of Stirling 2003

Robin Floyd

Molecular Assessment of Soil Nematode Diversity University of Edinburgh 2003,

Amanda Currie

Interactions between root-feeding insects and arbuscular mycorrhizal fungi" Royal Holloway College 2003

Christian Davies

Nitric and nitrous oxide production and emission from an upland agricultural grassland soil
University of Edinburgh 2003

Ling Kuan

Resilience of soil microbial community function in an upland grassland soil.
University of Aberdeen, 2004.

Angela Metcalfe

Molecular Analysis of a Bacterial Chitinolytic Community in an Upland Pasture University of Warwick 2002

Christian Spring

The effects of earthworms on soil structure in an upland grassland University of Stirling 2003

Mark Pawlett

The interaction between earthworms, liming and soil microbial community diversity and function in upland grassland" University of East London. 2004