INFLUENCE OF NEW ZEALAND MEGASCOLECID EARTHWORMS ON BIOSOLID-AMENDED SOIL

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Earthworms may have an important role in the management of biosolids-amended soil through incorporating this rich source of organic matter into deeper soils, improving the structure of the soil and accelerating the mineralisation of nutrients and trace elements. In agricultural systems, these benefits are often outweighed by real or perceived contamination risks; concerns that are reduced when biosolids are used to rebuild degraded soils for forestry or ecological restoration. Lumbricid earthworms have been introduced from Europe into agricultural soils in New Zealand but, in less intensively managed soils, less is known of the role of the predominant native Megascolecid earthworms. In this study we aimed to evaluate the efficiency of native earthworms (cf. Eisenia fetida) in incorporating biosolids into soil, and to elucidate how these species affect the solubility of N and trace elements, and influence greenhouse gas emission (N_2O and CO_2). Earthworms were incubated with mixtures of biosolids-amended soil (0, 6.25, 12.5, 25, and 50 % biosolids by volume) for 21 days. All species survived in the soil-biosolids mixtures, but not in 100 % biosolids. The native earthworms, Maoridrilus transalpinus and Maoridrilus sp.2 increased KCl-extractable NH_4 and NO_3 by up to 29 %, substantially more than E. fetida. All species significantly increased microbial biomass carbon, dehydrogenase enzymes and $Ca(NO_3)_2$-extractable Cu in biosolids-amended soil. Concentrations of $Ca(NO_3)_2$-extractable Mg, S, Fe, Mn, Cd, Co, and Zn varied between earthworm species and with biosolids addition rates. Both native species significantly increased N_2O emissions from soil, more so than E. fetida. Maoridrilus earthworms have the potential to enhance plant productivity in biosolids-amended soils, but may raise additional environmental concerns.