Left in the Dark

The effect of agriculture on cave streams

Mahue i roto i te pō

Ko te ariā o te ahuwhenua i ngā hikuawa o ngā ana

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General Abstract

The ecology of cave stream environments has received far less attention than surface streams in New Zealand. As a result, the impacts of human stressors on the communities of caves are uncertain. The impacts of agricultural practices on surface stream communities are wide spread and well-studied. In the surface environment, agricultural use of the surrounding catchment has been associated with lower QMCI and EPT scores and influences the structuring of communities and trophic base. Given the knowledge that the effects found on the surface are so far reaching, the aim of this thesis was to establish the effect of agricultural land use on cave stream communities in comparison to surface stream communities, find principal stressors to the cave communities and to examine how land use practices alter the trophic bases of underground communities. The relationships between land use and cave stream communities were examined for four cave streams and their surface stream origins in the Manawatū region of New Zealand. The communities were sampled and in stream environmental measurements were taken. Catchment and riparian zones were mapped using GIS software to establish the extent of agricultural use of land. Stable isotope ratios of carbon and nitrogen were analysed for the communities at each site and for a few potential food sources to determine the source of energy for the communities. Cave stream communities were found to be influenced by surface land management practices. For both the cave and the surface environments, a negative relationship was found for QMCI and EPT against agricultural development. When cave and surface streams are considered apart, the relationship between QMCI and EPT with agriculture was not as steep. This was attributed to the attenuation of sediment transport through caves and the lack of photosynthetic ability limiting the negative impacts of nutrient sequestration. Although sediment attenuated through the cave, it was the primary stressor on stream communities both on the surface and within the caves. Between cave and surface environments within the same dominant catchment cover type, resource use was similar. Between catchment types, however, the use of resources was different with an increased reliance on biofilm derived energy in agricultural catchments for both cave and surface sites. Considered along with the change in functional feeding groups that was detected, it is likely that the changes in resource use by communities as a response to the different inputs from agriculture are reflected in a different community structure. Overall agriculture was found to have a definite impact on cave stream communities. It is likely that through sedimentation and changing resource uses, the communities are altered in a

way similar to what is found on the surface but to a lesser degree, reflecting the lower range of potential stressors on the cave from agriculture.

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Tēnei au, tēnei au
Te hōkai nei i tāku tapuwae
Ko te hōkai-nuku
Ko te hōkai-rangi
Ko te hokai o to tīpuna
A Tāne-nui-a-rangi
I pikitia ai
Ki te Rangi-tūhāhā
Ki Tihi-o-Manono
I rokohina atu rā
Ko Io-Matua-Kore anake
I riro iho ai
Ngā Kete o te Wānanga
ko te Kete Tuauri
ko te Kete Tuatea
ko te Kete Aronui
Ka tiritiria, ka poupoua
Ki a Papatūānuku
Ka puta te Ira-tangata
Ki te whai-ao
Ki te Ao-marama

Tihei mauri ora!

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