

## Abstract

We investigated the effects of grazing stock, irrigation and effluent dispersal on earthworm species compositions, densities and biomasses in 615 locations across 41 farms in the Waitaki Basin, New Zealand, between April and September 2012. No native megascolecid earthworms were found, but four introduced European species were encountered. Among earthworms collected, *Aporrectodea caliginosa* accounted for 70% of the total, 23% were *Lumbricus rubellus* and 4% *Aporrectodea longa*. When compared with untreated locations, total earthworm density was higher by 42% in effluent only locations and 72% in irrigated only locations. Maximum densities and biomasses occurred where both effluent and irrigation were applied. *L. rubellus* density was 32% higher in effluent only locations, 123% higher in irrigated only locations and 180% higher in effluent and irrigated locations than untreated locations. *A. longa* occurred in 24% of the sampled locations and appeared to be suppressed in irrigated locations. When equivalent treatments were applied, earthworm densities were 15.4% to 36.6% higher on sheep farms than on dairy farms; earthworm biomasses differed by -3.3% to 55.8% between these two kinds of stock animal farms. Treatment effects on earthworms were evident only in the upper 10 cm soil layer. Effluent and water application may have reduced the risk of desiccation and increased the availability of resources for earthworms. However, local absence of the deep burrowing species (e.g. *A. longa*) raises concerns about ecosystem functioning. This is a topic that should be explored further.