

Zooplankton Communities in Farm Dams and Natural Ponds— Fact sheet

Linking lake research with end users for positive environmental outcomes

Introduction

Small, shallow ponds (<1 ha) have been identified as biodiversity 'hotspots' that play an important role in supporting and maintaining biodiversity, particularly for zooplankton. (Figure 1). Zooplankton are microscopic swimming animals that feed on algae and are an essential link in the food web between algae and fish. Surveys of zooplankton biodiversity and community assemblages have mostly concentrated on large lakes, constructed reservoirs or urban ponds, while small ponds in rural environments are rarely investigated. These findings summarise the biodiversity and community composition of zooplankton in rural natural ponds and constructed dams in the Waikato region.



Figure 1: Examples of zooplankton from Waikato farm dams and natural ponds. Rotifer *Keratella procurva* (left) and crustacean *Simocephalus vetulus* (right)

Nineteen constructed farm dams and 19 natural farm ponds (Figure 2), were sampled for zooplankton in the winter/spring (August–September 2018) and summer (January 2019). Environmental factors, including water temperature, dissolved oxygen, conductivity, water colour (gilvin), pH, chlorophyll-*a*, nutrient concentrations (total nitrogen and phosphorus), elevation, pond surface area and the number of waterbodies within a 2 km radius were also recorded.

Key Findings

All 38 ponds had poor water quality and were categorised as either eutrophic or supereutrophic. Open water zooplankton species recorded in both pond types were typical of eutrophic conditions, including *Brachionus* species, *Keratella* species and *Polyarthra dolichoptera*. Littoral and benthic species were also common (e.g., *Platyias*, *Testudinella* and *Euchlanis* species) in both pond types, likely a result of the near-shore sampling bias, small habitat size, and in some cases, the presence of macrophytes, which increases habitat heterogeneity.

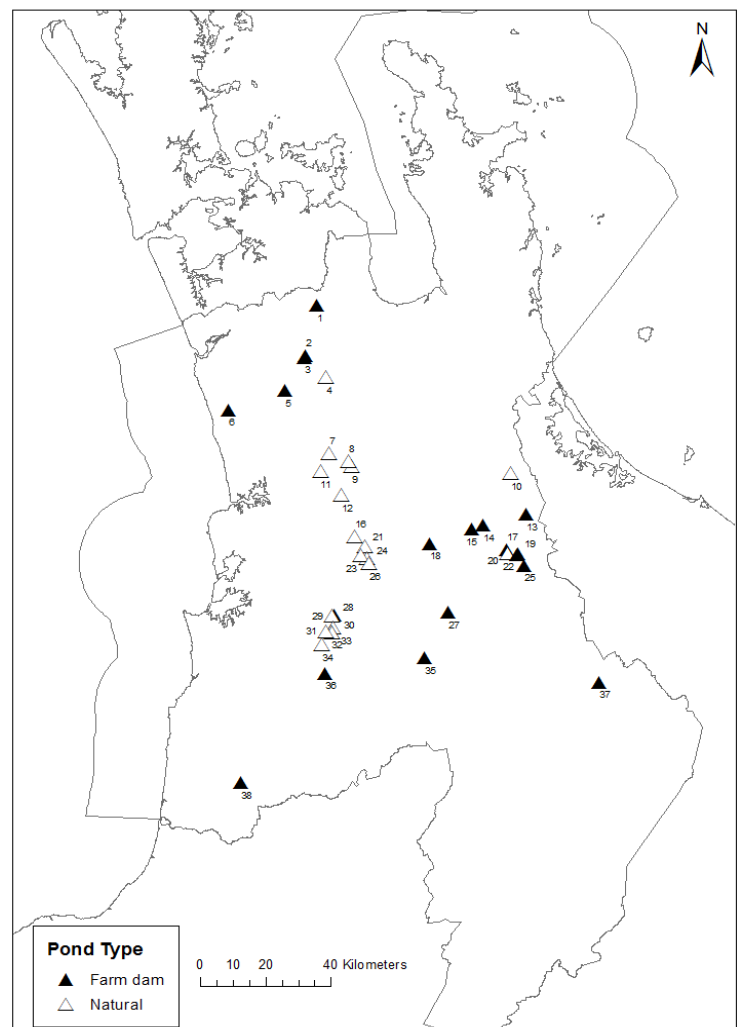


Figure 2: Farm dam and natural pond site locations for zooplankton sampling within the Waikato region, New Zealand.

Zooplankton Communities in Farm Dams and Natural Ponds – Continued

Key Findings — continued

Both natural and constructed water bodies had high zooplankton species diversity (totalling 83 and 91 different species, respectively). Community composition differed between pond types with crustaceans, and the cyclopoid copepod *Acanthocyclops robustus* present at higher abundances in natural ponds (Figure 3). In contrast, small planktonic rotifers such as *Polarthra dolichoptera* and *Keratella tecta* were more common and abundant in farm dams. This suggests that constructed farm dams were inhabited mainly by species capable of dispersing at faster rates, than the larger, slowly dispersing crustacean species characteristic of natural ponds.

Two genera (*Erignatha* and *Octotrocha*) and one species (*Cephalodella theodora*) had not previously been reported in New Zealand. Approximately 70% of New Zealand rotifers are shared with Australia and it is likely that these species naturally occur in New Zealand, but have never been previously documented.

Three non-native cladoceran species were more frequent in farm dams than natural ponds; *Daphnia galeata*, *D. pulex* and *Boeckella minuta* (Figure 4). Interestingly, the frequency of occurrence for non-native species was low compared to findings from studies conducted on urban ponds, suggesting that constructed farm dams do not facilitate the movement of non-native species across the landscape.



Figure 4: Non-native crustaceans *Daphnia pulex* (left) and *D. galeata* (right); photos Anita Pearson.

Conclusions

When examining environmental determinants of zooplankton community composition, natural and constructed ponds should be separated as they appear to be structured by different variables. The low frequency of non-native species in the present study suggests that constructed farm dams are not facilitating the spread of non-indigenous species across the landscape. Large-scale movement across the landscape is therefore likely via vectors such as the aquarium trade, in association with construction equipment, and fish stocking.

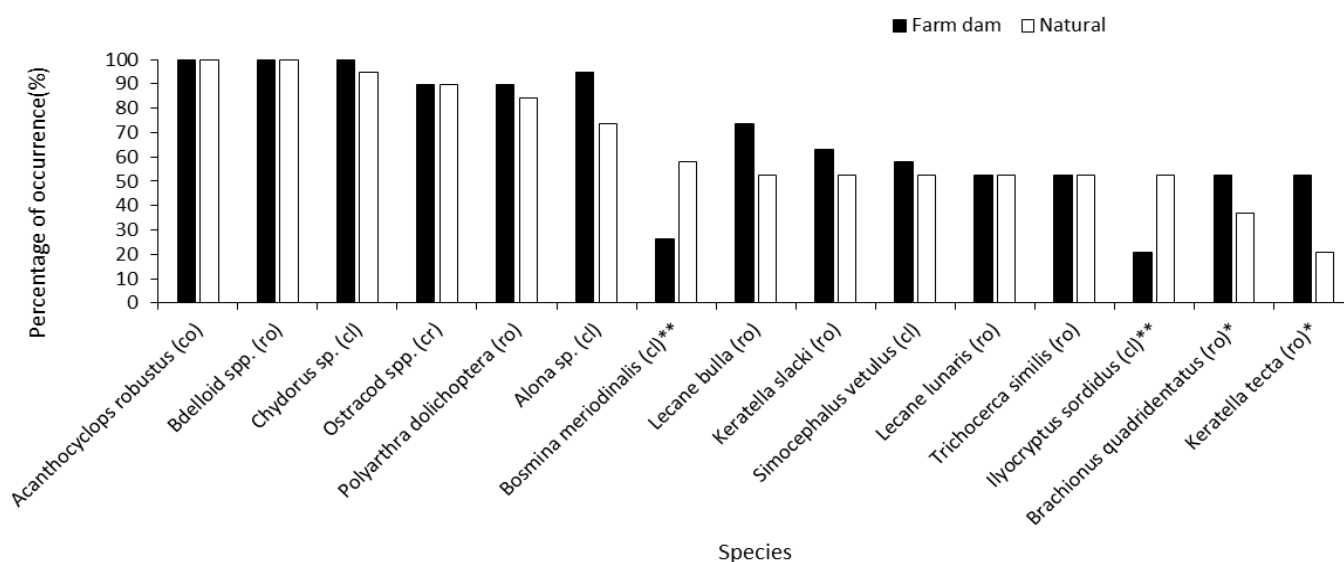


Figure 3: Percentage occurrence of zooplankton species present in 50%, or more, of natural ponds or farm dams sampled during this study. cl = Cladocera, Co = copepoda and ro = Rotifera. A single asterisk (*) denotes species not present in ten or more natural ponds. Double asterisks (**) denote species not present in ten or more farm dams.