

## Citizen scientists *versus* malacologists: comparing schistosome snail collections in Lake Albert, Uganda

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### Abstract

Snail-borne diseases like schistosomiasis and fasciolosis have proven a major challenge in their control with some scholars referring to them as ‘wicked problems’. For instance, traditional control strategies like mass drug administration (MDA) have not yielded to expectations with the disease re-emerging soon after the intervention. The WHO recommends therefore to (add a) focus on sustainable snail control, but this relies on the availability of high-quality snail distribution data, a major gap in developing countries like Uganda. As such, the citizen science approach, which has proven its worth in other fields, has been proposed in this project as a possible solution to the data gap. To what extent can we rely on data collected by citizen scientists in snail-borne disease control? In this study, a cohort of 25 community members were selected and trained in snail sampling and identification. Each one of them monitors 2 to 4 water contact sites on a weekly basis, covering 82 sites over a total area of ~750 km<sup>2</sup>. Data on the presence and abundance of the genera *Biomphalaria*, *Bulinus* and *Lymnaea* (*Radix*) are entered using the mobile phone app KoboCollect, while an experienced malacologist monitors the same sites on a monthly basis using the same sampling effort of 30 minutes per site. Here we report the results for data collected over an 8 month period. Pairwise comparison of the data, based on closeness of sampling date, was done to estimate the extent of agreement between the data sets in presence/absence of snails, and their counts using binomial probability tests and Pearsons  $\chi^2$  tests respectively. For the 375 paired observations, we could not detect significant differences in presence or absence of snails at a site between the citizen scientist and expert collected data ( $p < 0.001$ ). The extent of agreement varied for different snail species, with 85.7% for *Bulinus*, 80.1% for *Biomphalaria*, and 70% for *Radix*. The extent of disagreement is largely dependent on the site, with sites at the lake (lower abundance) more likely to disagree in snail occupancy between the datasets. Overall, a higher snail abundance is reported by the expert malacologists compared to the citizen scientists, when the data agree in presence of snails at a site ( $p < 0.001$ ). Data mostly disagreed in presence when snail abundance was low, being at least four times lower than when both datasets agreed in snail presence. Thus, citizen collected data can be reliable for detecting presence of snails at a potential snail-borne disease transmission site. Based on the current data we conclude that malacological surveys by experts provide more reliable data for studying freshwater snail abundances.

Key words: *Snail-borne diseases; citizen science; Lake Albert; schistosomiasis; fasciolosis*