BRRI project 3387: Summary of interim report June 2021

The influence of weeds and weed management on invertebrates of the Ashley, Cass & Aparima Rivers

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Image: RTU437 Wolf spider (Lycosidae) collected from pitfall trap in February 2020 on the Ashley River (*Photo credit* Jessica Chen)

Background

This project aims to identify the invertebrate diversity, abundance, and community composition of three braided rivers and to make comparisons between weedy and non-weedy habitat types within and across the Ashley, Cass, and Aparima rivers. Sampling of the Ashley and Cass rivers was jointly funded by the Department of Conservation and Environment Canterbury under the BRRI joint agreement (Project ref. 3387), while the Aparima sampling was funded by DOC (via gravel extraction concessions).

The aims of the study were to:

1. Test the recommended sampling approach and set this up as the best practise technique for identifying braided river terrestrial invertebrate biodiversity values;
2. Gather baseline information on invertebrate biodiversity for three small braided rivers in different geographic locations to learn about the degree of similarity among them; and
3. Identify any variation in the invertebrate community between weedy and non-weedy sites within rivers.

This project runs through to October 2021.

Methods

In October 2019 and 2020, six sampling sites were established up on the Aparima and Ashley rivers, and three on the Cass. Each of the 15 sites consisted of a line of five pitfall traps (with guide arms) and one malaise trap (Fig. 1) Traps were spaced 6 m apart. Sites on each river were placed 100-300 m apart. On the Ashley River, three of the sampling lines were set up in a stretch of river where no weed control was undertaken ('weedy' sites), and three in a stretch previously cleared of weeds using a tractor towing a specifically designed ripper (non-weedy or 'raked' sites). On the Aparima, all six sites were weedy (i.e. no weed management), but three were in an area zoned for future gravel extraction. These sites are intended to provide baseline data for a before-after comparison when the gravel extraction eventually occurs, with the assumption that gravel extraction will have a similar effect on the environment as the mechanical weed removal which has occurred on the Ashley. The Cass River is relatively free from weeds, so only three non-weedy, unmanaged sites were established to provide baseline data from a relatively pristine environment.

Traps were filled with 2-3 cm of 70% propylene glycol preservative and opened for five nights at approximately 6-week internals between late October and late February (2019-2021). This resulted in a total of 600 pitfall and 120 malaise samples over eight sampling sessions. Specimens were subsequently preserved in 70% ethanol and adult specimens ≥2 mm in length were identified to Recognisable Taxonomic Units (RTU) as a proxy for species.

A vegetation assessment was undertaken twice in each of the three rivers in the 2019-20 summer to determine the weed coverage on each of the sampled sites.

Key Results

Invertebrate sampling was successfully conducted on the Ashley, Aparima, and Cass Rivers. A total of 48,942 specimens ≥2 mm in length were identified to 1,046 different RTUs (a proxy for species); 729 from the Aparima, 593 from the Ashley, and 411 from the Cass to date. The lower number from the Cass is expected given only half as many samples were collected. A total of 877 RTUs were collected in malaise traps and 464 in pitfall traps across the three rivers.

Overall invertebrate abundance and diversity was highest on the Aparima, particularly from pitfall trap samples. Malaise catches were less consistent between sites, months, and years but were higher on the Ashley and Cass in late summer. A small number of very common species were found to have a significant influence on the high abundance of invertebrates caught on the Aparima; crickets, ladybirds, southern ants, a common carabid beetle, micro-caddisflies, and several small fly species. A full community composition analysis is being carried out to determine the ecological importance of different species observed on each river and to understand the drivers of the patterns observed within and across rivers.

Figure 1: Examples of malaise (left) and pitfall (right) traps set up on the Ashley **(a)**, Cass **(b)** and Aparima **(c)** Rivers. *Photos*: Jennifer Schori.

Ashley – weed management sites:

Pitfall sampling in the first season detected higher invertebrate diversity and abundance on Ashley River sites that had undergone mechanical weed control, compared to those that had not, but the difference was reduced in the second season (Fig. 2). The same trend was not observed consistently with malaise sampling. An analysis of vegetation cover and invertebrate community composition at the different sites is required to interpret these trends with confidence.

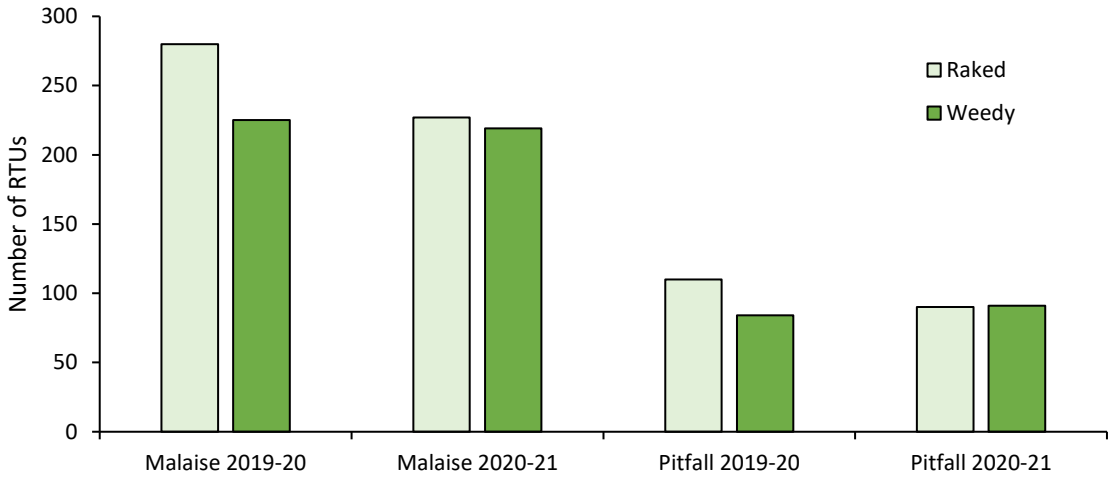

Figure 2: Total invertebrate diversity at 3 weed-controlled (raked) and 3 un-managed (weedy) sites on the Ashley River detected by pitfall and malaise sampling from November – February 2019-20 and 2020-21.

Discussion

A full interpretation of the results from this study will be provided in the final report. Community composition analysis will help to interpret the differences in invertebrate abundance and diversity detected on the three different rivers. Of particular importance will be the relative contribution of different types of invertebrates. For instance, the high catches on the Aparima were strongly influenced by a small number of very common species, and their ecological roles, including importance as a food resource for other taxa, have not yet been determined. It is interesting to note, however, that this group of species includes several herbivores and predators, as well as both terrestrial and aquatic feeders. Further analysis to determine the aquatic and terrestrial origin of the invertebrates caught will also provide a useful assessment of the functional diversity of the invertebrate community.

The number of RTUs detected on the Ashley and Cass rivers are expected to increase as the final February malaise samples are processed. The relatively small number of RTUs collected from the Cass is to be expected as only half the number of samples were collected. There is typically a strong correlation between number of samples and diversity detected, and a much larger sampling effort would be required to detect the full complement of diversity on any of these three rivers.

The comparison of weed-controlled and uncontrolled sites on the Ashley River appears to show a change from higher abundance and diversity in the sites that have undergone mechanical weed control in Year 1, to more similar abundance and diversity in Year 2. This hints that weed control benefits the invertebrate community but that the benefit diminishes over time following control. Incorporating results from the assessment of vegetation cover and the invertebrate community composition at the different sampling sites will help to determine if this is a correct interpretation, or if there are other more important driving factors.