Student 2: High Merit

NZQA Intended for teacher use only

Purpose: To investigate the distribution of *Potamopyrgus antipodarum* in the Waihopai River.

Hypothesis: The distribution pattern of the fresh water snail *Potamopyrgus antipodarum* population will be greater on the south edge of the Waihopai River than in the middle or north edge because there is more light on this side for its food source, the periphyton (slime and algae found on the beds of streams and rivers).

Number of *Potamopyrgus antipodarum* in the Waihopai River

	South Side (30cm in from the south bank)	Middle (4m form the South Bank)	North Side (30cm in from the north bank)
Water velocity (m/s)	0.8	1.10	0.8
Substrate	Pebbles/gravel, algae present (most algae present, more than middle and north side)	Mud, very fine gravel	Pebbles/gravel, algae present
Average no. in 6250cm^3 of top layer substrate	19	2	13

1

Conclusion:

The data shows a pattern, that there was a far greater *Potamopyrgus antipodarum* population on the edges of the river than in the middle. 2 The average population on the north side of the river was 13, on the south side 19, while the average population in the middle of the river was only 2. The pattern also shows that the greater the velocity of the water in the middle of the river, the smaller the snail population. On average, there were also more fresh 3 water snails on the south edges in all sites sampled, which get more light than the north edges.

Discussion

The current of the stream is necessary for the respiration of many benthic invertebrates and reproduction of some fish species (Hynes 1970). 4 Water currents distribute nutrients and food down a river system. This includes detritus for invertebrates and drifting insects for fish and birds.

The substrate in the middle of the river was mainly mud and gravel, whereas on the edges it was consistently pebbles and gravel/small stones. This affects the periphyton (algal growth) which grows on the small stones and slower moving water. The algae cannot survive in mud because this doesn't provide enough nutrients for the algae to carry out its life processes, 3 especially photosynthesis.

Potamopyrgus antipodarum mainly feed on the periphyton, and this shows in the pattern of distribution found across the width of the Waihopai River between the Waihopai Dam and the Queens Drive Bridge.

Periphyton is essential for the function of healthy river ecosystems (Quinn and Hickey, 1990). It is composed predominantly of algae and cyanobacteria (previously called 'blue-green algae'). These algae capture the energy of sunlight via their chlorophyll molecules, absorb carbon dioxide and other nutrients such as phosphorus and nitrogen from the surrounding water, and then synthesise organic carbon in the form of new or enlarged cells. The algae can live in fresh waters between 0°C - 30°C, so the Waihopai River is a perfect place for it to live as I tested the water temperature at 7.3°C. A change in benthic invertebrate community structure with increasing periphyton biomass has been a common observation in New Zealand streams (Towns, 1981; Quinn and Hickey, 1990; Quinn et al, 1996, 1997). 4

Quinn and Hickey (1990) state that is the quality of the habitat that is provided by the flow that is important to stream life, not the magnitude of the flow per se. The flows that provide good habitat will vary with the requirements of the species and with the morphology of the stream; water velocity is probably the most important characteristic. Without it, the stream becomes a lake or pond. An average velocity of 0.3 m/s tends to provide for most stream life and will prevent the accumulation of fine sediment. Velocities lower than these are unsuitable for a number of fish species and stream insects and allow the development of nuisance growths of periphyton. Generally, minimum flow increases with stream size, because stream width increases with stream size. However, the relationship is not linear. Small streams require a higher proportion of the natural stream flow to maintain minimum habitat than do large streams. 4

My findings are similar to those of student X, who had average counts of 23 snails in the north edge, 15 in the middle and 27 in the south edge. More light is available on the south side which increases the biomass of the periphyton, and thus provides a habitat with more food source for the snails. Quinn and Hickey (1990) also found that the relative abundance of invertebrate snail groups were found more commonly and abundantly in eutrophic gravel/cobble NZ streams. These streams have a high value of chlorophyll *a*/m^2 which contributes to a high periphyton biomass, and ultimately the food source of the snails. 4

Potamopyrgus antipodarum is an algae grazer (stated on the Landcareresearch.co.nz website), so it is more likely to live in an area with a higher amount of its desired food source. On the south side there is no restriction of sunlight and therefore more algae can carry out photosynthesis, grow and reproduce, leading to more snails in the area because of the plentiful food source.

Factors such as sampling bias and sources of errors were considered by collecting samples across the river over the 4 sites, which were then averaged to show the pattern. Other factors considered were that the river between the Waihopai Damn and the Queens Drive Bridge was artificially straightened by farmers in 1949. I did not collect any samples (e.g. place any of my samples sites) in this area. Also, the river's depth was on average between 0.4m – 0.6m across all areas between the Waihopai Damn and the North Road Bridge, so depth was unlikely as a factor that could have had an influence on results. The temperature was measured using the same thermometer at the same time of day. The data was reliable. because other students in the class found similar results in their investigations and the data fitted trends from sites such as the NZ Periphyton Guideline. 5