

RESULTS FROM THE ADDITIONAL 1997 METHODS

Environmental Measurements

Further analysis of substrate quality in Hot Creek (Site 1).

The excavated materials from the three trenches in Hot Creek were described qualitatively and analyzed for an estimated percent size-composition (Fig. 15). A cobble-dominated substrate was not found in the excavations (Fig. 15). At trenches 1 and 3 (50 m upstream and downstream from Hot Creek, respectively), 60-90% of the substrate materials (by volume) were sand and clay. The rest of the materials in these trenches had particle diameters between 2 and 5 cm. Both of these trenches were located approximately 15 m from a talus slope. Trench 2 was located within Site 1 (Mladenka 1992; Fig. 1) and was 1 m from a talus slope. This slope probably contributed large of rock to the streambed in this location (including the only piece of substrate that was > 10 cm in all of the excavations). The top 15 cm of streambed at Trench 2 was composed primarily of sand and silt (40%) and substrate in the 2 to 5 cm size class (60%). The 15-35 cm depth region was 20% silt/sand, 50% in the 2 to 5 cm size class, and 30% in the 5-10 cm size class. According to Mladenka's (1992) description of Site 1 at the beginning of his study, the streambed he described appears to be currently at least 15 cm below the streambed surface.

Discharge monitoring at the rockface seeps.

Discharge measurements at all of the weirs increased between October and November in 1997. Site 3-NS had the lowest weir readings (0.34 - 0.39 L/min), Site 3-OS had the greatest range of readings (2.17 - 5.20 L/min), and Site 2 Right Seep had the highest weir readings (5.28 - 6.10 L/min) (Fig. 16). Additional measurements are needed before making any interpretations of the data.

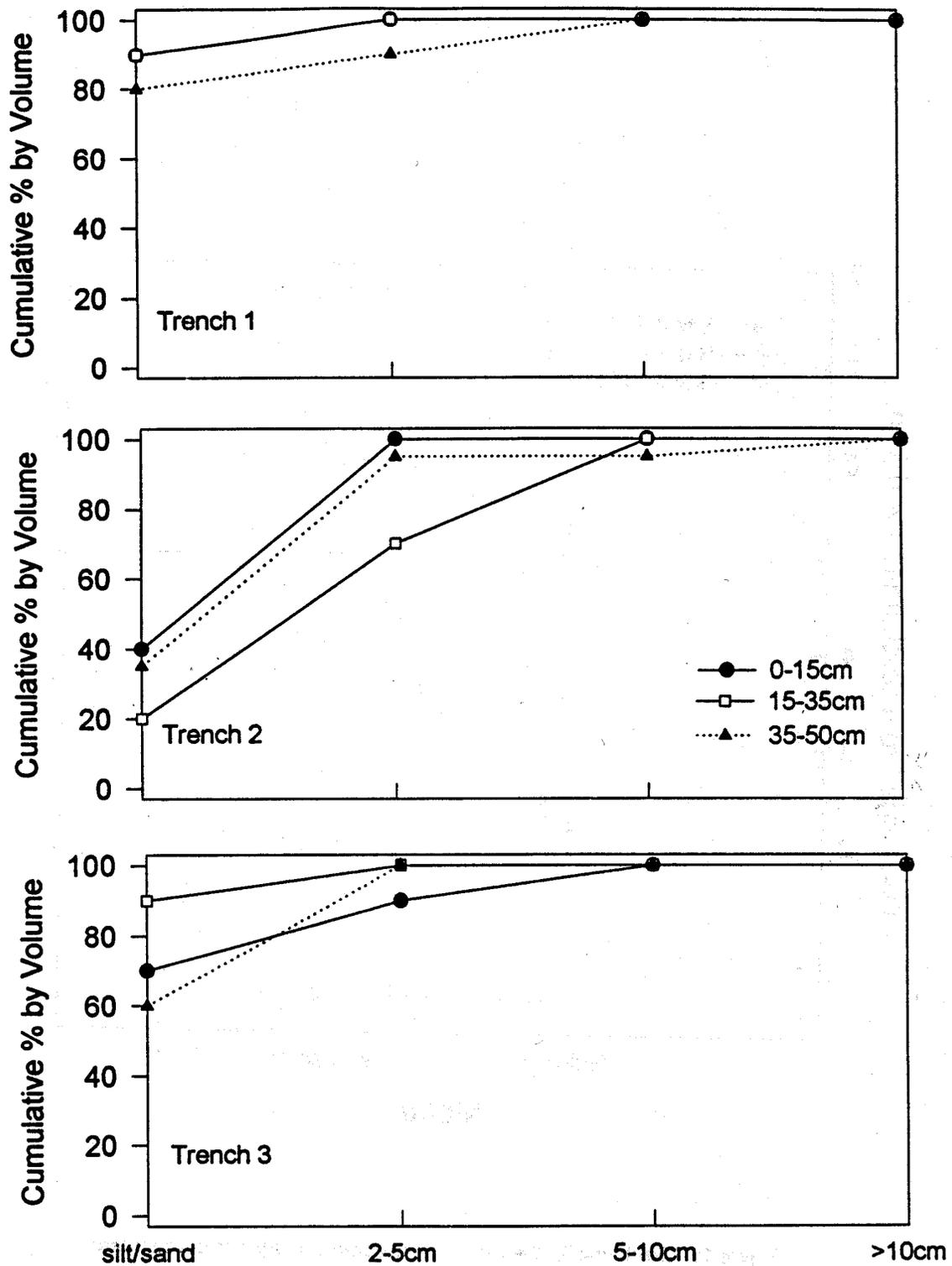


Figure 15. Estimated composition of substrate at different depths for three trenches in Hot Creek. Numbers are expressed in terms of cumulative percent by volume. Trenches 1 and 3 were located approximately 15 m from a talus slope, while trench 3 was located 1 m from a talus slope.

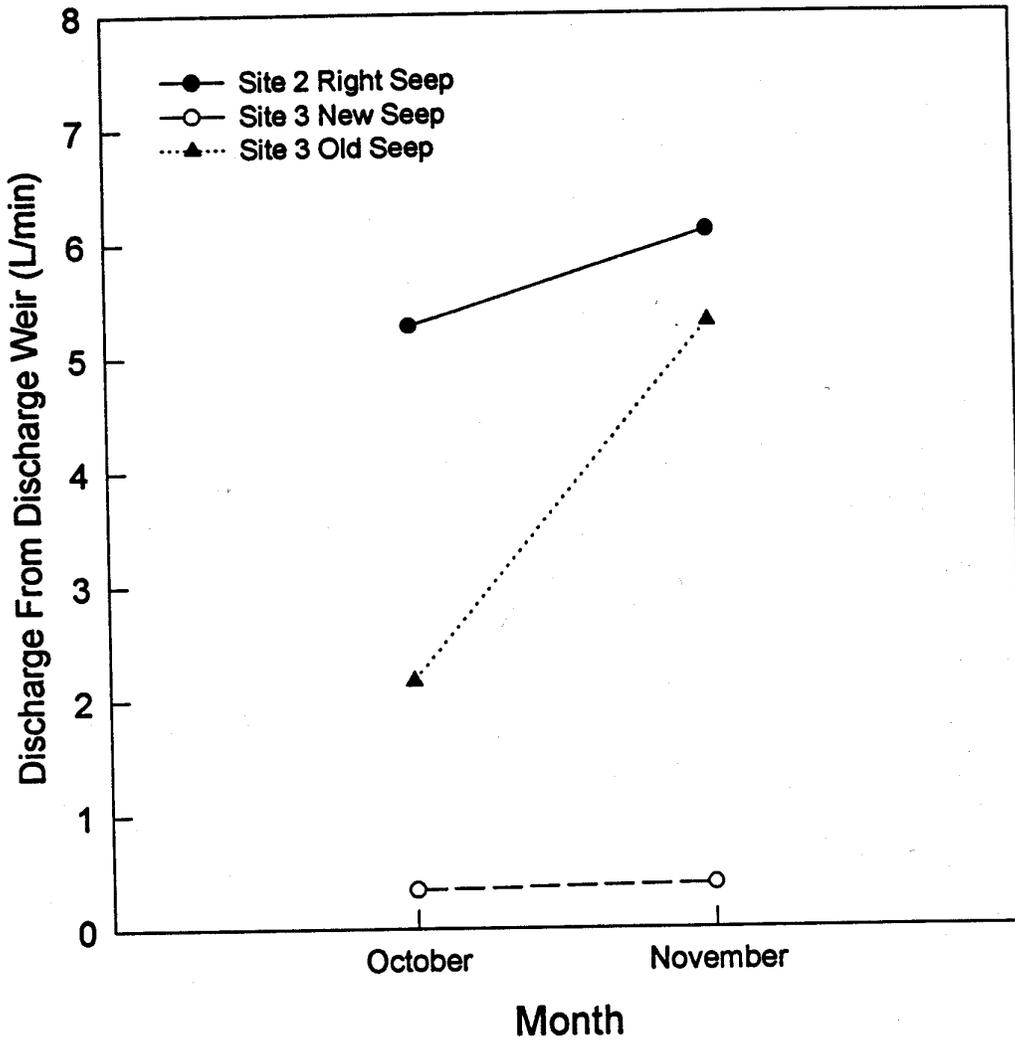


Figure 16. Discharge for the weirs placed approximately 1 m downstream from the rockface seep sites (2, 3-OS, and 3-NS). Values are expressed in L/min.

Rockface habitat mapping at Sites 2, 3-OS, and 3-NS.

Results from the rockface mapping efforts are discussed within the next section.

Biological Measurements and Experiments

Total Springsnail counts at the rockface study sites.

Measurements estimated Springsnail numbers to be greater than 238,000 within the 18.25 m² of rockface sampled at Site 2 (Fig. 17) and greater than 84,000 within the 18.25 m² of rockface sampled at Site 3 (Fig. 18; including both 3-OS and 3-NS). Their distribution was quite patchy and was probably a result of the heterogenous habitat conditions on the rockfaces (Figs. 2, 17, 18). Analyses of variance on log(x+1)-transformed density data indicated that significantly different number's of Springsnails were found among moist and flowing-water rockface habitats (Fig. 19a) and among varying levels of thick periphyton growth on the rockfaces (Tukey's test; Fig. 19b). Springsnail densities were higher in a flowing-water regime than in a moist-only (extremely low flow) habitat condition (Fig. 19a; $p < 0.01$). Springsnail densities decreased with an increase in the presence of thick, orange periphyton complex (composed of diatoms and, most likely, various forms of hot-spring-adapted bacteria) on the rockface (Fig. 19b).

Intensive search for relict populations of *P. bruneauensis* in and around Hot Creek.

An intensive search along the length of Hot Creek revealed that there was still an apparent absence of Springsnails in Hot Creek. A small rockface seep, approximately 1.80 m out from Hot Creek and approximately 2.00 m in the downstream direction from Site 1 on Hot Creek, is in the same location as that described by Robinson et al. (1992). For the months of August, September, and November 1997, the mean number of Springsnails at the seepage/rockface portion of this outflow was 36.7 ± 20.8 (per 10 cm²) (Fig. 20a). These numbers declined with distance from the rockface (described by the equation $y = 35.92e^{(-0.102x)}$; $r^2 = 0.72$)

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.61 F,25	0.00
0 V,0	0.00	5.54 M,25	1.85 M,50	0 M,100	0.00	0 M,100	3.70 M,100	0 M,100	0.00	0.00	0 V,0	0.92 M,100	0 M,100	0.00	0.92 M,25	6.46 F,0	0.00
2.77 M,50	4.61 M,50	0.92 M,25	0 V,0	1.85 M,100	0 V,0	0 M,100	0 M,100	2.77 M,100	0 M,100	0.92 M,100	0.00	0 M,100	2.77 M,100	0 MV,0	1.85 M,25	4.61 F,75	0 V,0
5.54 F,50	3.70 M,50	0 M,100	3.70 M,25	1.85 M,25	4.61 M,50	1.85 M,25	0 M,100	8.31 M,100	0 M,100	0.00	0.00	0 M,100	0.92 M,75	5.54 MV,75	BASELINE		
							0.92 M,75	0.92 M,100									
							0 M,75	0 M,100									

^ 0 m

New Seep

Original Seep

9 m ^

scale : ——— = 0.50 m

nail @ 7.4 m (0.40 m below baseline) ^

Figure 18. Springsnail density estimates and rockface habitat descriptions for Site 3 (including Original and New Seep). Springsnail estimates are shown first, followed by rockface moisture ("D" = dry, "M" = moist, and "F" = flowing water), and then percent thick algal-cover. Springsnail densities are expressed as (number x 1000)/m². "OH" indicates that the rockface is shaped as an overhang and "V" indicates that the area is dominated by vegetation overlying a layer of soil on top of the rockface. Shading indicates zero Springsnails present, dry rockface, and an absence of living algae. On 15 November 1997, the estimate of total number of Springsnails was 84,930 within a rockface area of 18.25 m².

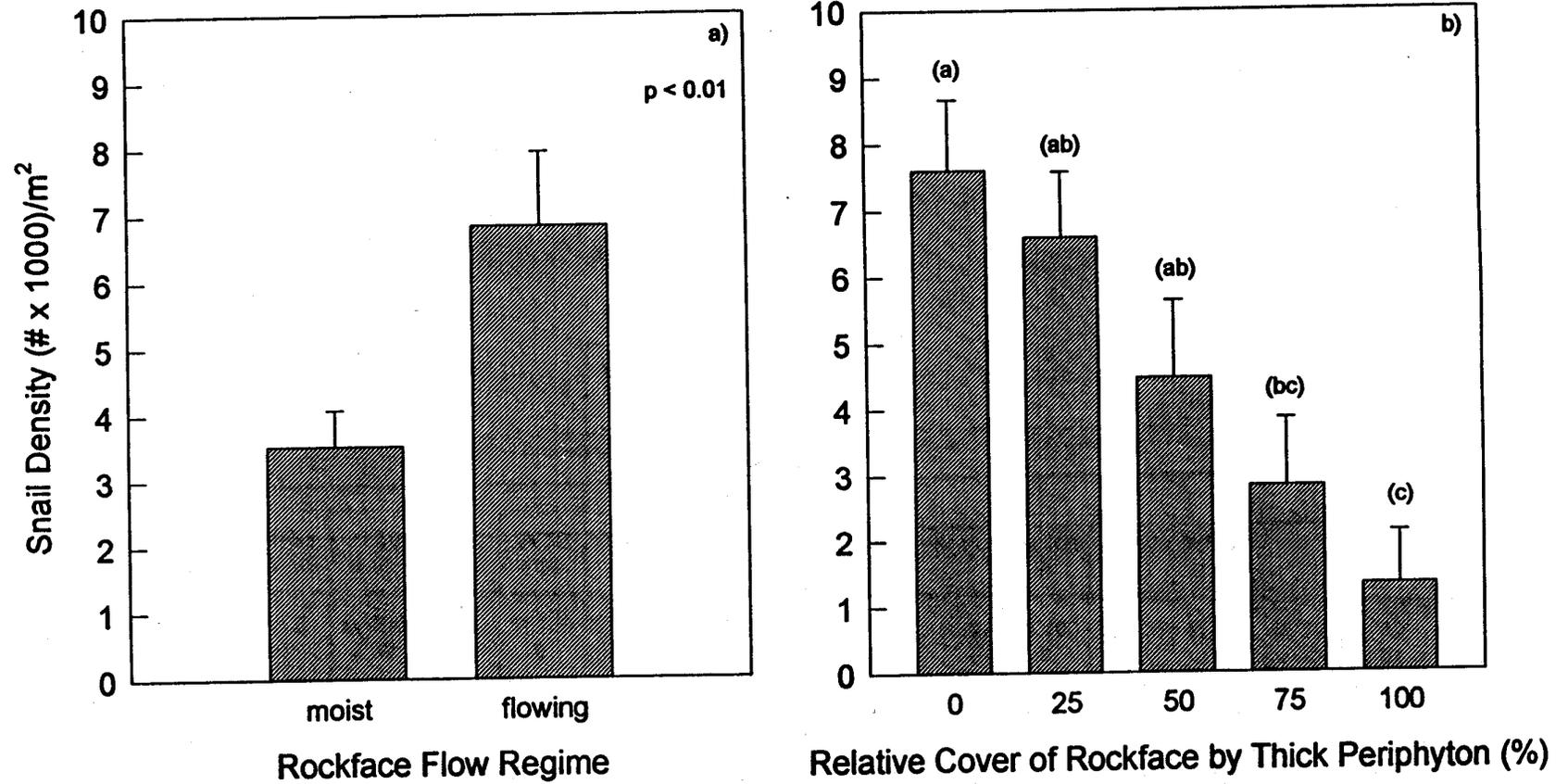


Figure 19. Distribution of Springsnails at rockface seep study sites (2, 3-OS, 3-NS) in relation to a) rockface flow regime and b) percent rockface covered by thick, orange periphyton. Flow regime and periphyton cover estimates were made qualitatively and are presented in Figs. 17 and 18. Rockface units (Figs. 17, 18) that either were dry or dominated by vascular plant vegetation were not used in these analyses. Statistical analyses were performed on $\log(x+1)$ transformed Springsnail densities. Different lower-case letters over bars in b) denote significantly different means ($p < 0.05$), as determined by Tukey's test.