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Effect of substrate architecture on aquatic gastropod-substrate associations

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Abstract. In a laboratory experiment, we tested how substrate shape influenced snail-substrate associations by measuring colonization by one large species (*Lymnaea stagnalis*) and one small species (*Amnicola* sp.) on five substrates (presented separately) constructed of balsa wood, coated with dried creamed spinach. All five substrates (a prostrate square, standing inverted triangle, standing rectangle, standing 1 cm wide strips, and standing 1 mm wide strips) had equal surface area, but differed in shape and degree of contact with the bottom. Substrates were designed to mimic natural substrates (e.g., 1 mm strips mimic dissected macrophyte leaf morphologies, prostrate square mimics prostrate growth forms or rocks). For both snail species, colonization differed among substrates, with the following rank order of colonization for each species: *L. stagnalis* ($p < 0.006$), 1 mm strips > prostrate square > 1 cm strips > rectangle > triangle; *Amnicola* ($p < 0.0001$), prostrate square > 1 mm strips > 1 cm strips > triangle > rectangle. Colonization by both species was related positively to degree of contact with the bottom. For *L. stagnalis*, colonization also was related positively to usable area, which, for the 1 mm strips, was greater than surface area because the foot of *L. stagnalis* could span the gap between strips, whereas the foot of *Amnicola* could not. Two predictions emerging from these results are tested with previously published data: 1) numbers of invertebrates should be greater on prostrate than on upright, single-stemmed macrophytes, and 2) numbers of invertebrates should be greater on dissected-leaved than on broad-leaved plants. Published data were equivocal regarding prediction 1). In contrast, prediction 2) was supported strongly, but the data suggest that the relationship between macrophyte dissection and invertebrate density may be strongly affected by species-specific morphology and behavior of invertebrates.

Key words: invertebrate-substrate associations, architecture, macrophyte, laboratory experiments, *Lymnaea stagnalis*, *Amnicola*.