Predation induced changes in behavior and growth rate in three populations of the intertidal snail, *Littorina sitkana* (Philippi)

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Abstract

We investigated the sublethal effects of a predatory crab, *Cancer productus* (Randall), on the behavior and growth of its snail prey, *Littorina sitkana*, by setting up controlled rearing and prey-size selection experiments. *L. sitkana* were collected from three sites on San Juan Island, WA, USA. These sites varied in snail size, abundance, and vertical distribution, and in the abundance of the crab predator *C. productus*. Snails from all three populations were raised for 34 days under the following treatments: no-crab control, a non-feeding *C. productus* encased in mesh box, and an encased *C. productus* feeding on *L. sitkana*. The non-feeding crab treatment did not affect snail foraging behavior or growth rate in comparison with the no-crab control. In contrast, the presence of a feeding crab elicited escape behavior in the snails, halted grazing, and consequently reduced growth rates. A population difference in escape behavior was observed: upward migration in snails from rocky shores and hiding in crevices in snails from a mud flat. It thus appears that chemicals leaching from crushed conspecific snails, rather than the presence of the crab predator, act as the "alarm substance" to which *L. sitkana* react. The magnitude of the growth depression in the presence of feeding crabs was 85%, with no difference among the three populations. Once the feeding crab stimulus was removed, snails in all populations resumed normal growth, suggesting that this response to feeding predators is reversible with changing environmental conditions. Laboratory experiments were set up to determine if all size classes of *L. sitkana* are equally susceptible to *C. productus* predation. *C. productus* consistently selected the largest of three size classes of *L. sitkana.* These results suggest that slow growth rate and small size in *L. sitkana* may actually be an adaptation for coexisting with high *C. productus* abundance, rather than simply a cost of escape behavior.