From shell to whorling shell: morphological shape change in *Tegula funebrale* along a known energy and predation gradient.

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Predation is an important process within most ecosystems and has been argued to be a driving force in natural selection and evolution. Prey species, through a variety of strategies, strive to either avoid predators or survive their attacks. Predators, by means of prey selection and success, alter the diversity of prey populations. But just how influential are predators on prey populations? Can predators drastically alter prey populations in terms of morphology? In the most general sense, prey can promote their own survivorship from predators by two methods, altering their form or function. Alteration of form (morphology) can limit a predator's ability to successfully remove prey from the population, creating a sort of "refuge morphospace". Given enough time and constant unmodified predation, prey morphology should be pushed towards the "refuge morphospace" by differential mortality. Such a shift in morphology could be selection, given enough time and change.

To determine if and how predation alters the morphology of prey species, the black turban snail (*Tegula funebrale*) was morphometrically examined along a known energy and predation gradient near Bamfield, British Columbia. Specimens of *T. funebrale* from six localities with varying wave energies and predation intensities were morphometrically examined and their number of *Caedichnus* repair scars, a common predatory crab trace, recorded. First and second relative warp scores (accounting for > 61 % of all observed shape variation) indicate that the majority of shape variation results from changes in the shells aperture size and shape in relation to the rest of the shell. Mapping of locality information for all specimens onto their first and second relative warp axes depicts that gastropods from lower energy and higher predation intensity localities have shells with smaller and more ovoid aperture than gastropods from higher energy and lower predation intensity localities. In addition, gastropods with high numbers of repair scars significantly differ in shape from those with few or no repair scars (ANOVA $p = 1.179 \times 10^{-12}$). These findings suggest that *T. funebrale* shell morphology is strongly associated with both wave energy and predation intensity. Furthermore, given the fact that shells with increasing repair numbers differed in morphology from those with fewer repairs, selection pressure imposed on *T. funebrale* by crabs is generating a "refuge morphospace" and possibly promoting a change in shell shape over time.

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