

Disentangling true shape differences and experimenter bias : Are dextral and sinistral snail shells exact mirror images?

Abstract

In theory, snails can come in two enantiomorphs: either dextral (coiling clockwise) or sinistral (coiling counter-clockwise). In snail species where both forms are actually present, coiling direction is determined by a single gene with delayed maternal inheritance; there is no predictable relationship between a snail's own coiling genotype and its actual coiling direction. Because of this genetic decoupling, it might be expected that dextral and sinistral individuals would be exact mirror images of one another. However, indications exist that there is a subtle but detectable shape difference between dextral and sinistral individuals that derive from the same gene pool. In this paper, we attempt to detect such differences in 50 dextral and 50 sinistral individuals of *Amphidromus inversus*, a species of land snail that is consistently chirally dimorphic. Four out of 18 volunteers who measured the shells with Vernier calipers found that sinistrals are stouter to a significant degree. A similar result was found by one out of five volunteers who measured the shells from photographs. These results do not allow distinguishing between real shape differences and a handling bias of sinistral as compared with dextral shells. However, when the same set of shells was subjected to a geometric morphometric analysis, we were able to show that sinistrals indeed exhibit a slight but significant widening and twisting of the shell near the palatal and parietal apertural areas. This result is surprising because species of the subgenus *Amphidromus* s. str. share a long history of chiral dimorphism, and the species would be expected to have been purged from disadvantageous interactions between direction of coil and general shell shape. We conclude that selection on the shape differences is either very weak or constrained by the fact that the pleiotropic effects of the chirality gene are of importance very early in development only. © 2010 The Authors. *Journal of Zoology* © 2010 The Zoological Society of London.