

On growth and form of irregular coiled shell of a terrestrial snail: *Plectostoma concinnum*(Fulton,1901) (Mollusca:Caenogastropoda: Diplommatinidae)

Abstract

The molluscan shell can be viewed as a petrified representation of the organism's ontogeny and thus can be used as a record of changes in form during growth. However, little empirical data is available on the actual growth and form of shells, as these are hard to quantify and examine simultaneously. To address these issues, we studied the growth and form of a land snail that has an irregularly coiled and heavily ornamented shell—*Plectostoma concinnum*. The growth data were collected in a natural growth experiment and the actual form changes of the aperture during shell ontogeny were quantified. We used an ontogeny axis that allows data of growth and form to be analysed simultaneously. Then, we examined the association between the growth and the form during three different whorl growing phases, namely, the regular coiled spire phase, the transitional constriction phase, and the distortedly-coiled tuba phase. In addition, we also explored the association between growth rate and the switching between whorl growing mode and rib growing mode. As a result, we show how the changes in the aperture ontogeny profiles in terms of aperture shape, size and growth trajectory, and the changes in growth rates, are associated with the different shell forms at different parts of the shell ontogeny. These associations suggest plausible constraints that underlie the three different shell ontogeny phases and the two different growth modes. We found that the mechanism behind the irregularly coiled-shell is the rotational changes of the animal's body and mantle edge with respect to the previously secreted shell. Overall, we propose that future study should focus on the role of the mantle and the columellar muscular system in the determination of shell form.