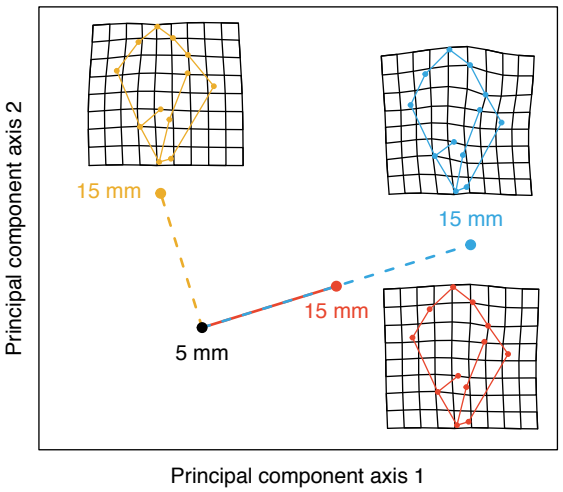
2. Supplementary methods 2

Allometric patterns

Allometric patterns among groups of snail were assessed using the vectors of shell length. Patterns were compared on two distinct points. Firstly, the distance among shell length vectors was calculated. This distance corresponds to the amount of change in shell shape per unit of shell growth. Secondly, the correlation among shell length vectors was calculated. The correlation among vectors is related to the direction of change in shell shape with increasing shell length. A low correlation among vectors represents a difference in direction of change.

As an example, consider three groups of hypothetical snails characterized by different allometric patterns (see figure). While at small sizes (e.g., a shell length of 5 mm), the shell shapes are indistinguishable among groups, larger shells (e.g., a shell length of 15 mm) have different shapes because of differences in the allometric patterns. Red and blue snails differ in the distance between shell length vectors. With increasing shell length, both follow the same path in the principal component plot. The correlation between vectors is therefore high, and the direction of shell shape change does not differ between the blue and red snails. However, compared to the red snails, the shell shape of blue snails changes more with an equal increase in shell length. The amount of change per unit of growth in shell length differs therefore between the red and blue snails, which is reflected in the distance between shell length vectors. The allometric pattern of the third group of snails differs from both the blue and red snails in the direction of change in shell shape. In the principal component space, the yellow snails follow a different path than the blue and yellow snails. Besides a large distance among vectors (i.e., the amount of change per unit of growth differs between the yellow and both red and blue snails), the correlation between the shell length vector of the yellow snails on one hand and the blue and red snails on the other hand is therefore low, signifying a difference in direction of shell shape change with growth.



Allometric patterns of three groups of hypothetical snails in principal component space. Three colours represent the three groups, allometric patterns are represented by the dashed lines, with shell shapes of snails within the three groups changing from the black point (i.e., snails with a shell length of 5 mm) to the coloured point (i.e., snails with a shell length of 15 mm). Shell shapes of 15 mm snails are visualized by the three grids, warped against the shell shape of 5 mm snails.

All morphometric analyses were done in R, using the package Geomorph 2.1.5 (Adams and Otárola-Castillo, 2013; Adams *et al.*, 2015; R Core Team, 2015).

References

Adams DC, Otárola-Castillo E. 2013. Geomorph: an R package for the collection and analysis of geometric morphometric shape data. *Methods in Ecology and Evolution* 4: 393–399.

Adams DC, Collyer ML, Sherrat E. 2015. geomorph: Software for geometric morphometric analyses. R package version 2.1.5. Available at: https://cran.r-project.org/web/packages/geomorph/index.html.

R Core Team. 2015. R: A language and environment for statistical computing.