Impact of life cycle variation on lower jaw diversity in salamander and newts

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Complex life cycles, involving fundamental morpho-functional and physiological changes during development, are widespread in the animal kingdom and are observed in most invertebrates and half of the known vertebrate species. These changes can induce significant selection pressures that may lead to divergent evolutionary trajectories, and thus promote the morphological diversification of organisms. In this study, we investigated how life cycle strategies foster morphological diversity among caudata using geometric morphometric analyses of the lower jaw in 218 species, covering the breadth of developmental strategies and ecological diversity across the group.

We investigated the influence of life cycle strategies on: 1) the variation in allometric patterns between the different species using multivariate analyses of covariance taking into account phylogeny; 2) the disparity in shape for each of the three bones of the mandible; 3) the morphological variation among and between life cycle strategies using classification algorithms.

Congruently with previous study of the cranium our results show that life cycle strategy significantly influences mandible shape. Paedomorphic species display a more disparate mandible shape, overlapping most of the morphospace displayed in biphasic, direct developing, and viviparous species. This high disparity in paedomorphs is mainly expressed in the dentary, while biphasic and direct-developers show higher disparity of the articular-angular complex. Overall, lower jaw morphologies appear more differentiated and phylogenetically structured in paedomorphs than in species undergoing complete metamorphosis, possibly resulting from the physical constraints linked to the aquatic environment in which all paedomorphic species live.

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