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Editorial: Adaptive evolution of organs size in cold-blooded animals

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Editorial on the Research Topic
Adaptive evolution of organs size in cold-blooded animals

Organs are viewed as differentiated structures, which perform specific physiological and biochemical functions (Penzo-Méndez and Stanger, 2015). For animals, especially for cold-blooded animals, organ size, shape, and structure are the most fundamental morphological characteristics, which play important roles in regulating all kinds of activities (Jiang et al., 2022a). The morphological characteristics of the organs can be influenced by external environments (Penzo-Méndez and Stanger, 2015; Munoz-munoz et al., 2021; Liang et al., 2022; Liao et al., 2022). As stated by Bergmann's and/or Allen's rule (Bergmann, 1847; Allen, 1877), the environmental conditions (e.g., temperature) affect the morphological characteristics in some cold-blooded animals (Liao et al., 2015; Jiang et al., 2022b). However, the underlying mechanisms of organ size changes are still unclear, and more extensive studies on how organ size become influenced by climate conditions are needed to gain a panorama of adaptive evolution of species (Liao et al., 2015).

Amphibians are important indicator species that are highly sensitive to environmental changes (Stuart et al., 2004). As the global environment changes, cold-blooded animals habituated to high-altitude environment are experiencing unprecedented challenges such as population decline and species extinctions (Stuart et al., 2004; Jiang et al., 2021). Undoubtedly, the organs of these species are also consequently affected by the rapidly changing climate conditions since climatic change can affect food availability, energy absorption, and accordingly affect the size of gut, fat bodies, livers, and evern brain (Liao et al., 2015; Jiang et al., 2022b). Extensive and in-depth studies of morphological characteristics and functions of organs can contribute to our understanding of the responses of organs to environmental changes, and consequently contribute to species conservation. This Research Topic aims to gather the latest advances of morphological characteristics and functions of organs and to improve scientific understanding of adaptive evolution of organs size in poikilothermal animals in the context of environmental changes.

In our Research Topic, we published several manuscripts with regards to sexual dimorphism and geographical variation of organs. Yang et al. endeavored to study the limb muscles mass of 64 anuran species and found that there was no sexual dimorphism in limb muscle among species and that the variations in limb muscles among anuran species may not be explained by environmental harshness, natural, and sexual selection. Zhu et al. studied the relative size of organs of Andrew's toads (*Bufo andrewsi*) from 14 populations and found that organ size of most anuran species did not change with altitude and latitude. Interestingly, they found that the relative size of heart decreased with latitudes whereas livers increased with latitude, implying

these two organs were sensitive to climatic changes. Fu et al. used 125 *Feirana quadranus* individuals as study model to investigate the relationship between two important organs (brain size and digestive tract length) and altitudes. They found a postive correlation between brain size and altitudes but a negative correlation between digestive tract length and altitudes. They found that two environmental factors (annual mean temperature and annual precipitation) are associated with the evolution of brain size and digestive tract length.

Generally, their research provides valuable resources for further studies, and improved our understanding of adaptive evolution of organs size within the context of global environmental and climate changes (Lyu et al.). These macro-level studies reveal that the size of some organs changes with the environment, yet the mechanisms behind these changes remains unclear. In future, more studies on organs size in cold-blooded animals are need to explore the underlying molecular mechanisms of organ-size variation with these environmental and climate changes.

Author contributions

WC and WL wrote the manuscript. CW and JJ improved the manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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References

Allen, J. A. (1877). The influence of physical conditions in the genesis of species. *Radic. Rev.* 1, 108–140.

Bergmann, K. (1847). Über die Verhältnisse der wärmeökonomie der Thiere zu ihrer Grösse. *Göttinger Studien* 3, 595–708.

Jiang, J. P., Xie, F., Li, C., and Wang, B. (2021). *China's Red List of Biodiversity: Vertebrates Vol. IV, Amphibians (I, II)*. Beijing: Science Press, 1–1052.

Jiang, Y., Chen, C., and Liao, W. B. (2022a). Anuran interorbital distance variation: the role of ecological and behavioral factors. *Integr. Zool.* 17, 777–786. doi: 10.1111/1749-4877.12653

Jiang, Y., Luan, X. F., and Liao, W. B. (2022b). Geographical variation in body size and the Bergmann's rule in Andrew's toad (*Bufo andrewsi*). *Biology* 11, 1766. doi: 10.3390/biology11121766

Liang, T., Meiri, S., and Shi, L. (2022). Sexual size dimorphism in lizards: Rensch's rule, reproductive mode, clutch size, and line fitting method effects. *Integr. Zool.* 17, 787–803. doi: 10.1111/1749-4877.12569

Liao, W. B., Jiang, Y., Li, D. Y., Jin, L., Zhong, M. J., Qi, Y., et al. (2022). Cognition contra camouflage: how the brain mediates predator–driven crypsis evolution. *Sci. Adv.* 8, eabq1878. doi: 10.1126/sciadv.abq1878

Liao, W. B., Lou, S. L., Zeng, Y., and Merilä, J. (2015). Evolution of anuran brains: disentangling ecological and phylogenetic sources of variation. *J. Evol. Biol.* 28, 1986–1996. doi: 10.1111/jeb.12714

Munoz-munoz, F., Pages, N., Durao, A. F., England, M., Werner, D., and Talavera, S. (2021). Narrow versus broad: Sexual dimorphism in the wing form of western European species of the subgenus Avaritia (Culicoides, Ceratopogonidae). *Integr. Zool.* 16, 769–784. doi: 10.1111/1749-4877.12516

Penzo-Méndez, A. I., and Stanger, B. Z. (2015). Organ-size regulation in mammals. *Cold Spring Harb. Perspect. Biol.* 7, a019240. doi: 10.1101/cshperspect.a019240

Stuart, S. N., Chanson, J. S., Cox, N. A., Young, B. E., Rodrigues, A. S., Fischman, D. L., et al. (2004). Status and trends of amphibian declines and extinctions worldwide. *Science* 306 1783–1786. doi: 10.1126/science.1103538