



Domestication Leads to Lower Dorsal Crypsis in Black-spotted Frogs (*Pelophylax nigromaculatus*)

Chaoyu SU^{1,2#}, Lingsen CAO^{1,2#}, Yiming WU^{1,2,4}, Keshan Ken MAHABIR^{1,2}, Yanbo SUN³, Long JIN^{1,2,4*} and Wenbo LIAO^{1,2,4*}

¹ Key Laboratory of Southwest China Wildlife Resources Conservation (Ministry of Education), China West Normal University, Nanchong 637009, Sichuan, China

² Key Laboratory of Ecological Adaptation in Amphibian in Sichuan Province, China West Normal University, Nanchong 637009, Sichuan, China

³ Ministry of Education Key Laboratory for Transboundary Ecoscience of Southwest China, Yunnan University, Kunming 650500, Yunnan, China

⁴ Key Laboratory of Artificial Propagation and Utilization in Anurans of Nanchong City, China West Normal University, Nanchong 637009, Sichuan, China

Abstract A primary anti-predator adaptation is crypsis, in which animals reduce their visibility to predators, often through camouflage, to lower the risk of predation. Alternatively, prey species may employ strategies such as aposematism, which advertises unpalatability, or mimicry, which involves imitating other organisms. Because domestic animals typically experience reduced predation pressure compared with their wild counterparts, they are expected to exhibit less developed cryptic coloration. To test this prediction, we compared dorsal and ventral crypsis between domestic and wild black-spotted frogs (*Pelophylax nigromaculatus*) using reflectance-measurement methods. Our results showed that domestic males displayed significantly weaker dorsal crypsis than wild males. In contrast, no statistically significant difference in dorsal crypsis was observed between domestic and wild females. These findings

suggest that the reduction in dorsal crypsis among domestic males may be attributable to relaxed predation pressure and shifts in dietary resources within human-modified environments.

Keywords black-spotted frogs, crypsis, domestication, reflectance spectra

1. Introduction

Animals employ various defensive strategies such as camouflage, aposematism, and mimicry, respectively, helping them hide from predators, warn of their unpalatability, or deceive through resemblance to other organisms (Endler, 1988). Two primary forms of camouflage have been proposed: crypsis, in which animals blend into their background, and disruptive coloration, which involves markings that reduce the likelihood of detection (Cott, 1940). All of these strategies are thought to have evolved to decrease predation risk. While camouflage achieves this by minimizing an animal's conspicuousness, aposematic species employ bright contrasting colors or structural adaptations to advertise their unpalatability or toxicity, thereby deterring predators (Forcina *et al.*, 2024; Mappes *et al.*, 2005).

Crypsis represents an anti-predator adaptation that reduces predation risk by decreasing the conspicuousness of cryptic animals to predators (Estes *et al.*, 1998; Liao *et al.*, 2022; Magnhagen, 1991; Ruxton *et al.*, 2004; Whittingham and Evans, 2004). Domestication leads to variation in the physical traits, behavior, and health of animals, enabling them to better

Both authors contributed equally to this paper.

* Corresponding authors: Dr. Long JIN, from China West Normal University, Nanchong, Sichuan, China, with his research focusing on life history traits of amphibians; Prof. Wenbo LIAO, from China West Normal University, Nanchong, Sichuan, China, with his research focusing on evolutionary ecology of amphibians.

E-mail: longjin07@126.com (Long JIN); liaobo_0_0@126.com (Wenbo LIAO)

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adapt to human-created environments; however, it may also weaken their ability to survive when released into the wild (Nehemy *et al.*, 2025; Wirobski *et al.*, 2023). In particular, domestic animals experience reduced predation pressure compared with their wild counterparts. Consequently, domestic animals are expected to exhibit less pronounced crypsis.

Anurans exhibit a wide range of cryptic and non-cryptic species, as well as considerable variation in crypsis under different conditions (Liao *et al.*, 2022). Only recently have interspecific and intraspecific studies of anuran crypsis begun to elucidate the role of predation risk in the evolution of crypsis (Cao *et al.*, 2025; Liao *et al.*, 2022; Weitzman *et al.*, 2025). Surprisingly, studies comparing differences in crypsis between domestic and wild anurans remain lacking. Here, we investigated differences in crypsis between domestic and wild black-spotted frogs (*Pelophylax nigromaculatus*).

2. Materials and Methods

2.1. Study sites From March to May during 2020 and 2023, field sampling and artificial propagation were carried out in Dashi, Zhongjiang County (104.70°E, 30.81°N, 300 m), Zishen, Yingshan County (106.61°E, 31.10°N, 420 m), and Wangjiawan, Pengxi County (106.42°E, 31.25°N, 380 m). Dashi Village has a mean annual temperature of 16–18 °C and an annual precipitation of 900–1 100 mm. Zishen Village experiences temperatures ranging from 15–20 °C and receives 1 000–1 500 mm of precipitation annually, whereas Wangjiawan Village has a mean annual temperature of 17–17.5 °C and an annual precipitation of 900–1 000 mm. Compared with wild populations, captive-bred frogs have access to more abundant food and are maintained under more stable temperature and humidity conditions, along with higher population densities (Ning *et al.*, 2025).

2.2. Study species The black-spotted frog (*P. nigromaculatus*), native to East Asian wetlands, is recognized by the distinctive mating call of males. Its meat holds considerable culinary value in several Asian cuisines, leading to its official designation in China in 2001 as a species for specialized economic development (Fei *et al.*, 2010). As a result, commercial farming of this species has expanded significantly. To date, its captive breeding history spans 24 years and 15 generations.

In farming operations, healthy individuals with no signs of common amphibian diseases, such as chytridiomycosis or red leg syndrome, are selected. Frogs are typically chosen at subadult or adult stages within a defined weight range, for example, 25–50 g, and snout vent length, for example, 5–8 cm, to ensure uniformity. They are reared in semi-aquatic

enclosures with both land areas and shallow, dechlorinated water. Stocking density is maintained at 10 to 15 frogs per square meter of land space. Environmental conditions are kept at 22–28 °C and 70%–85% relative humidity (Zhu, 2024). Environmental enrichment includes shelters such as clay pots and aquatic plants, along with proper water filtration. Frogs are fed high-quality ranaculture feed daily, while clean water for soaking is provided continuously through filtration or daily renewal.

2.3. Sampling collection From March to May 2022, we surveyed sexually mature frogs along designated transects (2.5 km × 5 m) using 12 V flashlights. Captured individuals were counted and sexed based on secondary sexual characteristics (nuptial pads in males; visible eggs in females). The snout-vent length (SVL) of each was then measured using digital calipers, accurate to 0.01 mm. A total of 76 sexually mature males and 38 females of *P. nigromaculatus* were collected from 12 field transects across the three sites during the breeding season. In addition, 64 sexually mature males and 66 females were collected from the three breeding bases. It is noteworthy that in domestic breeding bases, this species is typically selected for larger body size and faster growth rates due to its commercial value as a food source. All procedures for the collection and handling of anurans were reviewed and approved by the Ethical Committee for Animal Experiments from China West Normal University (No. CWNU2021D001).

2.4. Crypsis estimation To evaluate the visual conspicuousness of domesticated and wild frogs against their natural substrates for both conspecific and heterospecific viewers, we collected reflectance measurements during the peak activity period from 20:00 to 01:00. We measured the spectral reflectance of the skin of 140 males and 104 females, as well as the specific substrates on which each individual was captured in the field, such as leaves and trunks, and the substrates on which individuals were collected in frog farms, such as grass and soil. Reflectance spectra for both skin and substrates were quantified using an Ocean Optics HR2000+ spectrometer equipped with a bifurcated optical fiber (QP400-7-UV-VIS). A fixed outer sleeve maintained a consistent measurement distance of 2 mm, and illumination was provided by a deuterium tungsten lamp (HL-2000-CAL). The instrument was calibrated with a white reference standard (WS-1) after every other frog to correct for lamp drift. Ambient habitat illumination, or irradiance, was measured using an optical fiber (QP400-2-VIS-NIR) fitted with a cosine corrected adaptor (CC-3UV), and periodic recalibration against a Spectralon white standard was used to

account for lamp drift between measurements.

We computed the average reflectance spectra for the dorsal and ventral surfaces of each frog. The dorsal spectrum was based on nine measurements, including one on the head between the eyes, six along the mid dorsum, and two on the posterior dorsum (Figure 1A, C). Similarly, the ventral spectrum was derived from six measurements, including one on the throat, three on the mid belly, and two on the posterior belly (Figure 1B, D). No overall sexual dichromatism was observed in *P. nigromaculatus*.

We calculated chromatic and achromatic contrasts between frog body regions and their corresponding substrates to evaluate overall visual conspicuousness to potential observers. These calculations were performed for three representative visual systems using the receptor noise-limited (RNL) model (Vorobyev *et al.*, 2001). A key strength of the RNL model is that it incorporates a discrimination threshold based on the constraint that an animal's ability to distinguish stimuli is limited by photoreceptor noise. Discrimination thresholds in this model are expressed in units of Just Noticeable Differences (JNDs), such that 1 JND corresponds to a perceptual difference of one standard deviation in receptor noise. A noted limitation is that the model does not account for higher-order cognitive processes, such as spatial or temporal summation, which can influence color discrimination (Dyer and Neumeyer, 2005). Despite its limitations, the RNL model remains a valuable tool and has

been successfully used to predict behavioral responses to visual stimuli in a wide range of species (Schultz and Fincke, 2013). To evaluate how frogs are perceived by predators, we modeled the visual contrasts of individual frog body regions within the visual systems of two representative predator groups, namely an average trichromatic snake and an ultraviolet-sensitive tetrachromatic bird.

All visual modeling was conducted using the pavo package (v.2.1.0; Maia *et al.*, 2019) in R v.3.6. Smoothed reflectance curves with a span of 0.2 were processed using the vismodel function with the avg. uv, avg. v, bluetit, and ctenophorus visual systems, and subsequently analyzed with the coldist function. For each individual on its specific substrate, we quantified both achromatic contrast (ΔL) and chromatic contrast (ΔS) for the relevant observers. Negative ΔL values indicate that the frog is darker than its background. However, because our focus was on overall conspicuousness rather than the direction of brightness differences, we used the absolute values of ΔL .

Finally, we estimated the overall dorsal and ventral conspicuousness of frogs against their substrates. Following Cummings and Crothers (2013), overall conspicuousness (OC) was calculated as the Euclidean distance, where OC^2 equals ΔL^2 plus ΔS^2 , based on the mean color and brightness contrasts for each species. The inverse of this value, 1 divided by OC, was used as our measure of crypsis.

3. Results

All wild and domestic black-spotted frogs were collected from three sites between March and May from 2020 to 2022. In the Wangjiawan population, domestic males exhibited a lower degree of ventral crypsis than wild males under both the ultraviolet-sensitive avian tetrachromatic model ($F_{1,52} = 16.489$, $P < 0.001$) and the snake trichromatic model ($F_{1,52} = 9.773$, $P = 0.003$). In the Dashi population, this difference between domestic and wild males was evident only under the snake model ($F_{1,43} = 5.475$, $P = 0.024$) and not under the avian model ($F_{1,43} = 1.488$, $P = 0.229$), whereas no significant difference was observed in the Zishen population (Supplementary Table S1). Comparisons of dorsal crypsis between domestic and wild males were not statistically significant across the three populations (Supplementary Table S1).

In contrast to the overall patterns observed, female frogs showed no significant difference in dorsal crypsis between domestic and wild individuals across all three study sites (Supplementary Table S2). This pattern was consistent under both the snake trichromatic and the ultraviolet-sensitive avian tetrachromatic visual models. Ventral crypsis, however,

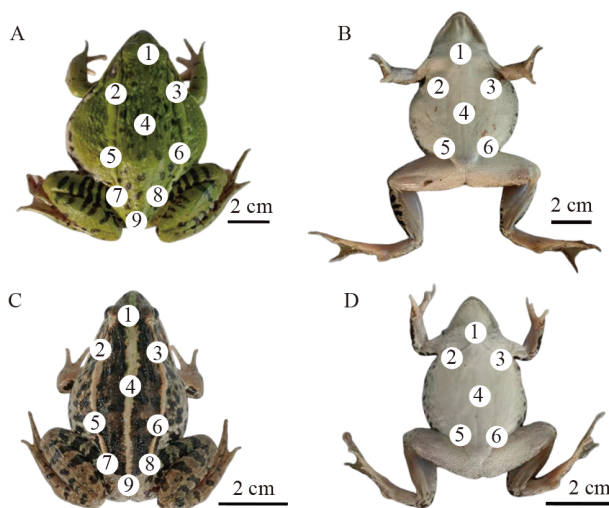


Figure 1 Schematic diagram showing the spectral measurement points on the dorsal and ventral regions of domestic and wild black-spotted frogs (*Pelophylax nigromaculatus*). Panels A and B illustrate the dorsal and ventral measurement regions of a domestic frog, respectively, whereas panels C and D show the corresponding regions in a wild frog. Numeric labels indicate the locations of individual reflectance measurements.

differed significantly between domestic and wild females (Supplementary Table S2).

After controlling for the effects of sex and population, the ANCOVA revealed a consistent difference in crypsis between domestic and wild frogs (Supplementary Tables S3–S4).

Specifically, domestic frogs exhibited reduced dorsal crypsis but enhanced ventral crypsis compared with wild frogs. This pattern was observed under both the ultraviolet-sensitive avian tetrachromatic model and the snake trichromatic model, despite the presence of notable population-level effects (Figure 2A–D).

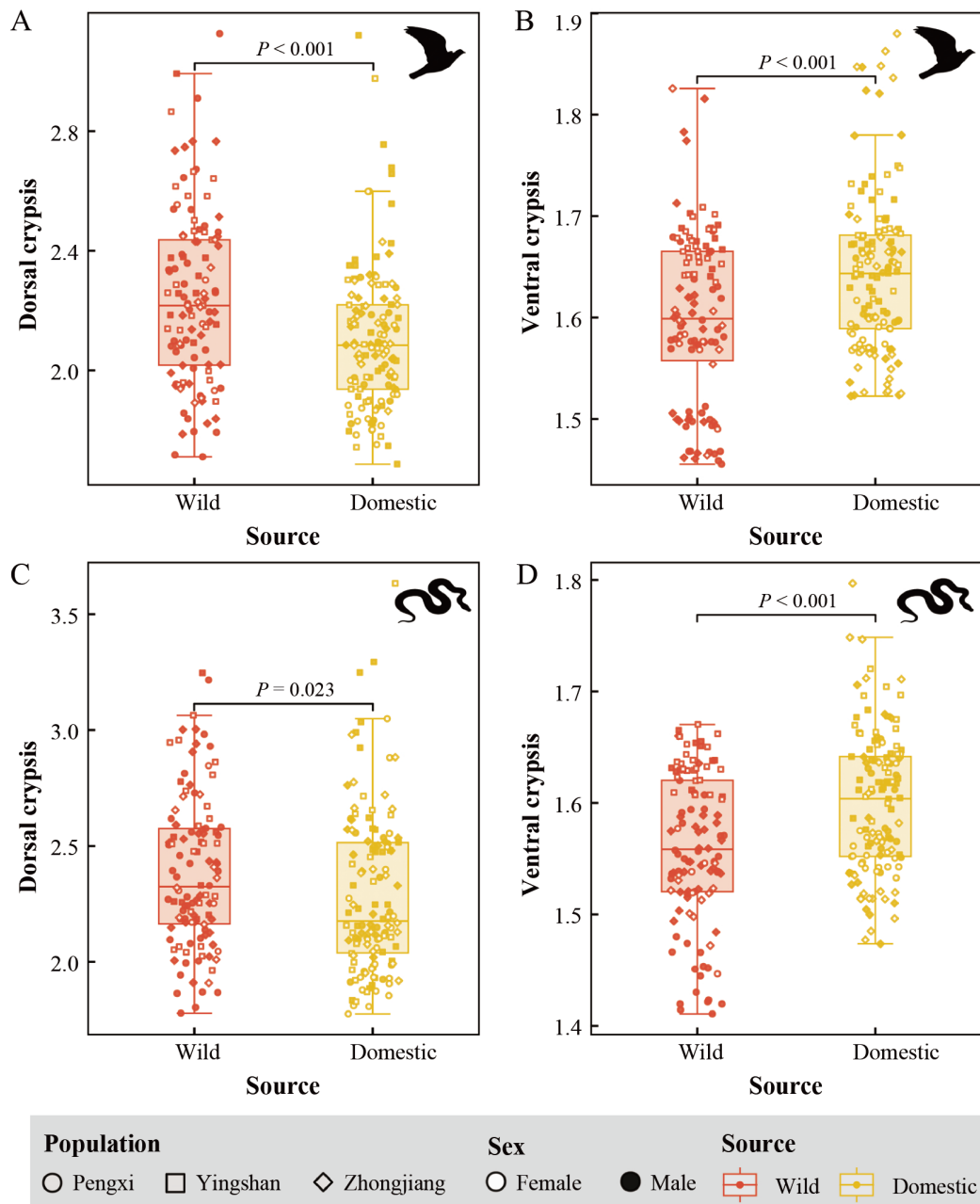


Figure 2 Dorsal and ventral crypsis of wild and domestic black-spotted frogs (*Pelophylax nigromaculatus*) under two predator visual models, with P values from analyses of variance (ANCOVA). Panels A and B show crypsis estimated under an average ultraviolet sensitive avian tetrachromatic visual model, whereas panels C and D show crypsis estimated under an average snake trichromatic visual model. Each panel presents boxplots for Wild (red) and Domestic (yellow) populations. Point shape indicates population, with circles representing Pengxi, squares representing Yingshan, and diamonds representing Zhongjiang. Point fill indicates sex, with open symbols representing females and filled symbols representing males. Panels A and C depict dorsal crypsis, and panels B and D depict ventral crypsis.

4. Discussion

The cognitive buffer hypothesis argues that relatively large brains evolve to enhance cognition, which facilitates coping with environmental challenges (Białas *et al.*, 2024; Jin *et al.*, 2025; Liao *et al.*, 2025; Liu *et al.*, 2023; Sol *et al.*, 2008; Wu *et al.*, 2025). Greater environmental variability is associated with increased brain size, supporting the prediction of the cognitive buffer hypothesis that larger brains facilitate more flexible survival behavior (Li *et al.*, 2024; Taylor *et al.*, 2024; Xie *et al.*, 2025; Yavas and Fanselow, 2025). Selection for tameness has been proposed as an important factor contributing to declines in cognitive abilities among domestic taxa (Hemmer, 1990). Consequently, domestic male frogs with reduced cognitive abilities may have evolved a lower degree of crypsis as a result of experiencing reduced predation pressure (Ning *et al.*, 2025). Our findings contrast with a previous study suggesting that large-brained species with higher cognitive abilities exhibit a reduced degree of crypsis to better cope with increased predation risk (Liao *et al.*, 2022).

More conspicuous species are expected to experience stronger selection for cognitively demanding predator evasion strategies (Dawkins and Krebs, 1979; Gazzola *et al.*, 2025). Domestic males experience lower predation pressure than wild males. As a result, domestic males are expected to exhibit a lower degree of dorsal crypsis than wild males. In particular, wild male *P. nigromaculatus* use vocalizations to attract mates, which exposes them to higher predation risk during the breeding season and may necessitate enhanced cognitive abilities for effective anti-predator responses. In contrast, both domestic and wild females do not exhibit calling behavior and likely experience similar levels of predation pressure, resulting in comparable cognitive abilities and, consequently, similar cryptic coloration patterns.

When increased predation pressure selects for enhanced cognitive abilities, reduced predation risk in human-managed environments can explain the decline in cognitive abilities observed in domestic animals (Garamszegi and Kolm, 2024). Wild anuran species with stronger defenses and higher cognitive abilities are more capable of avoiding predators and therefore achieve greater survival success (Jiang *et al.*, 2023; Jiang *et al.*, 2024). Indeed, under natural conditions, wild individuals of this species possess greater cognitive abilities and are more adept at avoiding predation than their domestic conspecifics (Xu *et al.*, 2025; Zhu, 2024). In the present study, we found that wild frogs displayed a higher degree of dorsal crypsis than domestic individuals. A plausible explanation for this pattern is that individuals with enhanced cognitive abilities in the wild experience stronger selection for improved predator detection and response, which in turn promotes the

evolution of higher dorsal crypsis. However, we did not find direct evidence linking cognitive abilities to differences in crypsis, and additional experiments are needed to determine whether reduced cognitive abilities causally lead to decreased crypsis.

Additionally, numerous factors can influence dorsal camouflage, and altered predation pressure is not necessarily the sole driver of phenotypic change. Food type, light conditions, stocking density, activity range, and other environmental variables may all contribute to phenotypic variation and, consequently, to changes in dorsal crypsis (Stevens, 2007). Indeed, there are substantial differences in living environments between domestic and wild populations. Compared with wild frogs, domestic frogs experience a more uniform food type, more stable environmental temperature and humidity, a smaller activity range, and higher population density. As a result, domestic frogs are expected to exhibit reduced phenotypic variation relative to wild frogs, which may contribute to their lower degree of dorsal crypsis.

In conclusion, we report a reduced degree of crypsis in domestic black-spotted frogs compared with their wild conspecifics. This reduction appears to be associated with the absence of predators in domestic environments. Selection for enhanced cognitive abilities related to predator detection likely contributes to the higher degree of crypsis observed in wild frogs. Moreover, the effects of multiple environmental factors, including food type, light conditions, stocking density, activity range, and environmental temperature and humidity, should also be considered when interpreting differences in crypsis between domestic and wild populations.

Supplementary information Supplementary information is available at <https://doi.org/10.3724/ahr.2095-0357.2025.0062>

References

- Białas J. T., Dylewski Ł., Tobolka M. 2024. Brain size mediates the choice of breeding strategy in the red-backed shrike *Lanius collurio*. *Integr Zool*, 19(4): 683–693
- Cao L. S., Liao W. B., Yuan L. J., Sun Y. B., Yan C. Z. 2025. Adaptation of skin structures to environmental variations in anurans from southern and southwestern China. *Integr Zool*, 20(6): 1204–1214
- Cott H. B. 1940. *Adaptive Coloration in Animals*. New York: Oxford University Press
- Cummings M. E., Crothers L. R. 2013. Interacting selection diversifies warning signals in a polytypic frog: An examination with the strawberry poison frog. *Evol Ecol*, 27(4): 693–710
- Dawkins R., Krebs J. R. 1979. Arms races between and within species. *Proc R Soc B Biol Sci*, 205(1161): 489–511
- Dyer A. G., Neumeyer C. 2005. Simultaneous and successive colour discrimination in the honeybee (*Apis mellifera*). *J Comp Physiol A*, 191(6): 547–557

- Endler J. A. 1988. Frequency-dependent predation, crypsis and aposematic coloration. *Philos Trans R Soc Lond B Biol Sci*, 319(1196): 505–523
- Estes J. A., Tinker M. T., Williams T. M., Doak D. F. 1998. Killer whale predation on sea otters linking oceanic and nearshore ecosystems. *Science*, 282(5388): 473–476
- Fei L., Ye C. Y., Jiang J. P. 2010. *Colored Atlas of Chinese Amphibians*. Chengdu: Sichuan Publishing House of Science and Technology (In Chinese)
- Forcina G., Clavero M., Meister M., Barilaro C., Guerrini M., Barbanera F. 2024. Introduced and extinct: Neglected archival specimens shed new light on the historical biogeography of an iconic avian species in the Mediterranean. *Integr Zool*, 19(5): 887–897
- Garamszegi L. Z., Kolm N. 2024. The reduction in relative brain size in the domesticated dog is not an evolutionary singularity among the canids. *Biol Lett*, 20(8): 20240336
- Gazzola A., Balestrieri A., Schulte L. M., Cogoni M., Mancuso G., Pellitteri-Rosa D. 2025. Variation in defensive strategies of brown frogs against conspecific and heterospecific alarm cues. *Evol Biol*, 52(1): 61–70
- Hemmer H. 1990. *Domestication: The Decline of Environmental Appreciation*. Cambridge: Cambridge University Press
- Jiang Y., Luan X. F., Liao W. B. 2023. Anuran brain size predicts food availability-driven population density. *Sci China Life Sci*, 66(2): 415–417
- Jiang Y., Yuan L. J., Liao W. B. 2024. Chemical defense mediates population density-driven selection on anuran brain size evolution. *Sci China Life Sci*, 67(5): 1076–1078
- Jin L., Jiang Y., Han L. X., Luan X. F., Liu X., Liao W. B. 2025. Big-brained alien birds tend to occur climatic niche shifts through enhanced behavioral innovation. *Integr Zool*, 20(2): 407–418
- Li S. B., Liu Y. X., Du X. L., Li G. P., Liao W. B. 2024. Nest complexity correlates with larger brain size but smaller body mass across bird species. *Integr Zool*, 19(3): 496–504
- Liao W. B., Jiang Y., Li D. Y., Jin L., Zhong M. J., Qi Y., Lüpold S., Kotrschal A. 2022. Cognition contra camouflage: How the brain mediates predator-driven Crypsis evolution. *Sci Adv*, 8(33): eabq1878
- Liao W. B., Ma D. L., Jiang A., Cao L. S., Wu H. 2025. Males with greater mating success during male-male competition have larger brain size in the Andrew's toad (*Bufo andrewsi*). *Asian Herpetol Res*, 16(2): 227–235
- Liu Y. T., Wu Z. J., Liao W. B. 2023. Large-brained birds display lower extra-pair paternity. *Integr Zool*, 18(2): 278–288
- Magnhagen C. 1991. Predation risk as a cost of reproduction. *Trends Ecol Evol*, 6(6): 183–186
- Maia R., Gruson H., Endler J. A., White T. E. 2019. pavo 2: New tools for the spectral and spatial analysis of colour in R. *Methods Ecol Evol*, 10(7): 1097–1107
- Mappes J., Marples N. M., Endler J. A. 2005. The complex business of survival by aposematism. *Trends Ecol Evol*, 20(11): 598–603
- Nehemy I. K. R., Camurugi F., Santana D. J. 2025. Pleistocene climatic changes drove genetic variation in Southern Atlantic Forest treefrogs *Boana polytaenia* (Anura, Hylidae). *Evol Biol*, 52(3): 161–181
- Ning Z. Y., Cao L. S., Wu Y. M., Sun Y. B., Jin L., Liao W. B. 2025. Brain reduction in domestic frog species. *Evol Biol*, doi: 10.1007/s11692-025-09664-9
- Ruxton G. D., Sherratt T. N., Speed M. P. 2004. *Avoiding Attack: The Evolutionary Ecology of Crypsis, Warning Signals and Mimicry*. Oxford: Oxford University Press
- Schultz T. D., Fincke O. M. 2013. Lost in the crowd or hidden in the grass: Signal apparency of female polymorphic damselflies in alternative habitats. *Anim Behav*, 86(5): 923–931
- Sol D., Bacher S., Reader S. M., Lefebvre L. 2008. Brain size predicts the success of mammal species introduced into novel environments. *Am Nat*, 172(S1): S63–S71
- Stevens M. 2007. Predator perception and the interrelation between different forms of protective coloration. *Proc R Soc B Biol Sci*, 274(1617): 1457–1464
- Taylor P. J., Nengovhela A., Denys C., Scott G. R., Ivy C. M. 2024. Adaptation in brain structure and respiratory and olfactory structures across environmental gradients in African and North American muroid rodents. *Integr Zool*, 19(1): 165–181
- Vorobyev M., Marshall J., Osorio D., Hempel de Ibarra N., Menzel R. 2001. Colourful objects through animal eyes. *Color Res Appl*, 26(S1): S214–S217
- Weitzman C. L., Brown G. P., Gibb K., Christian K. 2025. Cutaneous shedding in amphibians causes shifts in bacterial microbiomes. *Integr Zool*, 20(4): 807–816
- Whittingham M. J., Evans K. L. 2004. The effects of habitat structure on predation risk of birds in agricultural landscapes. *Ibis*, 146(s2): 210–220
- Wirobski G., Range F., Graat E. A. R., Palme R., Deschner T., Marshall-Pescini S. 2023. Similar behavioral but different endocrine responses to conspecific interactions in hand-raised wolves and dogs. *iScience*, 26(2): 105978
- Wu H., Su C. Y., Cao L. S., Liao W. B. 2025. Sex recognition and mate choice are positively correlated with relative brain size in male *Bufo andrewsi*. *Integr Zool*, doi: 10.1111/1749-4877.12964
- Xie J. L., Li B. L., Zhou T. J., Wang X. J. 2025. The water content, apoptosis, and proliferation of the brain in marine medaka affected by seawater acidification. *Integr Zool*, 20(6): 1306–1318
- Xu K., Xiao W., Hu D. Z., Holyoak M., Ji C. P., Zhang J. T., Ma D. F., Xiao Z. S. 2025. Effects of livestock grazing on spatiotemporal interactions between snow leopards and ungulate prey. *Integr Zool*, 20(5): 1012–1027
- Yavas E., Fanselow M. S. 2025. Defensive behaviors and *c-fos* expression in the midbrain. *Integr Zool*, 20(2): 394–406
- Zhu X. 2024. *Comparative Study on Brain Size and Cryptic Coloration of Cultured and Wild Pelophylax nigromaculatus*. Master Thesis. China West Normal University (In Chinese)

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