



Female-female Amplexus and Extremely Female-skewed Operational Sex Ratio in the Toad *Duttaphrynus cyphosus* During Breeding Seasons

Hongzhou CHEN¹, Jinyu XIA¹, Tuo LI¹, Buddhi DAYANANDA² and Wei CHEN^{1*}

¹ School of Resources and Environmental Engineering, Anhui University, Hefei 230601, Anhui, China

² School of Agriculture and Food Sciences, The University of Queensland, Brisbane QLD 4072, Queensland, Australia

Dear Editor,

Amplexus, a reproductive behavior in which the male clasps the female dorsally, is a characteristic of amphibians (Wells, 2007). Most species exhibit either inguinal or axillary amplexus, although some reproduce without it (Wells, 2007). While male-female amplexus is predominant, other forms such as male-male and multiple-male amplexus have also been documented (Soni *et al.*, 2025). Release calls are typically produced by amplexed males to signal mating mismatches and mitigate the costs of inappropriate clasping (Kelehear and Shine, 2019). Female-female amplexus, however, is rare and considered maladaptive, as it does not lead to fertilization (Chuang *et al.*, 2019).

Here we describe a rare observation of female-female amplexus in the toad *Duttaphrynus cyphosus* during the breeding season in Xizang Autonomous Region, China, and discuss potential demographic and ecological factors contributing to this unusual behavior.

D. cyphosus reproduces from late April to early May in Xiaayu Town, Chayu County (28°29'15.60" N, 97°00'15.12" E; elevation 1 805 m). During the breeding season, males exhibit a nocturnal yellow coloration, whereas females retain brown (Figure. 1). Body size dimorphism is also apparent, with males typically smaller than females—a trait that facilitates sex identification.

Over a five-year field survey (Table 1), we documented four

cases of female-female amplexus, accounting for approximately 0.6% (4/668) of all amplexus events recorded. In one case, we observed a gravid female being clasped by another female while expelling eggs (see Supplementary video). The operational sex ratio (OSR, the ratio of receptive males to females at a given time and place; Dillon *et al.*, 2017) typically ranges from 0.17 to 1.5 under normal conditions (Zhang *et al.*, 2021). However, during nights in the latter part of the breeding season, the OSR could reach extreme values of 15–20 females per male due to local Deng people collecting males for consumption and sale (author's personal observation). All four cases of female-female amplexus events occurred exclusively under these highly female-biased conditions.

Our observations indicate that female-female amplexus in *D. cyphosus* is rare but occurs when the OSR is strongly female-skewed. Although a causal relationship cannot be established, this demographic imbalance may increase the likelihood of atypical reproduction behaviors.

One hypothesis is that mechanical stimulation during amplexus induces gravid females to release eggs that can not be retained (Wells, 2007). Another possibility is that sperm released by nearby males fertilized some of the eggs, although we found no direct evidence to support this. Alternative explanations should also be considered: same-sex amplexus may represent misdirected mating attempts under mate scarcity, or it may function as a competitive strategy in which clasping reduces a rival female's access to males. These hypotheses require further empirical testing.

The slightly yellowish pigmentation of one female raises the possibility that ambiguous color cues may trigger mistaken clasping attempts. Coloration often plays a role in mate recognition (Wells, 2007), and intermediate or atypical pigmentation can increase recognition errors (Stuart-Fox and Moussalli, 2009). Although our post-hoc morphological examination confirmed both individuals as female, acknowledging this uncertainty allows for a more balanced

* Corresponding author: Prof. Wei CHEN, from Anhui University, Hefei, Anhui, China, with his research focusing on ecology and evolution of amphibians.

E-mail: wchen1949@163.com

Received: 28 October 2025 Accepted: 29 January 2026

Published Online: 27 February 2026

2095-0357/© 2026 Asian Herpetological Research Editorial Office and Science Press. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

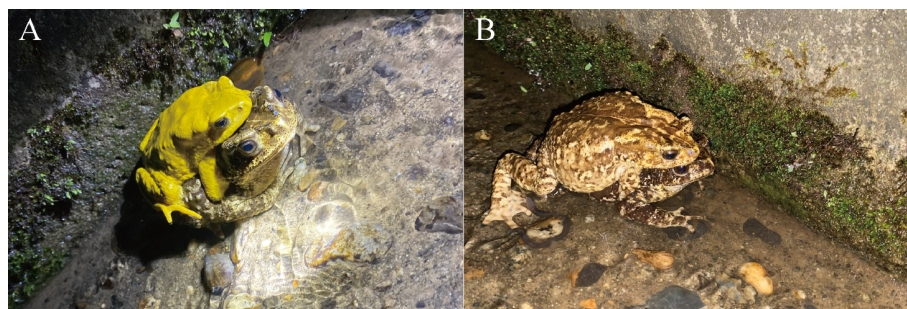


Figure 1 The amplexus of *Duttaphrynus cyphosus*. A: Male-female amplexus; B: Female-female amplexus.

Table 1 Quantitative statistics of amplexus in the toad *Duttaphrynus cyphosus* during breeding seasons.

Year	No. of male-female amplexus	No. of female-female amplexus
2019	65	0
2021	123	1
2023	132	1
2024	148	2
2025	200	0
Total	668	4

interpretation of the observed behavior. It should be clarified that females are gravid, not pregnant, as fertilization in toads is external. Our data can not determine whether eggs laid during female-female amplexus were fertilized.

Finally, although the taxonomy of *D. cyphosus* has undergone revisions (Che *et al.*, 2020; Zhang *et al.*, 2021), detailed nomenclatural history is not central to this report and is therefore only briefly summarized here.

Acknowledgements We are grateful to Mr. Silang XIAO for their field support. This work was supported by the National Natural Science Foundation of China (Grant Nos. 32571739, 32270457, 31872216, and 31670392). In addition, this study received approval from the Experimental Animal Ethics and Management Committee of Anhui University (IACUC(AHU)-2024-050).

Supplementary information Supplementary information is available at <https://doi.org/10.3724/ahr.2095-0357.2025.0061>

References

- Che J., Jiang K., Yan F., Zhang Y. P. 2020. The Xizang Amphibians and Reptiles Diversity and Evolution. Beijing: Science Press (In Chinese)
- Chuang M. F., Borzee A., Kam Y. C. 2019. Female-female amplexus in *Nidirana adenopleura* (Ranidae, *Nidirana*) in Taiwan. Herpetol Notes, 12: 617–618
- Dillon H. M., Adair L. E., Brase G. L. 2017. Operational sex ratio and female competition: Scarcity breeds intensity. In Fisher M. L. (Eds.), The Oxford Handbook of Women and Competition (pp. 265–280). Oxford: Oxford University Press
- Kelehear C., Shine R. 2019. Non-reproductive male cane toads (*Rhinella marina*) withhold sex-identifying information from their rivals. Biol Lett, 15(8): 20190462
- Soni S. P., Apte V., Joshi P., Cyriac V. P. 2025. Barking up the wrong frog: Global prevalence of misdirected amplexus in anuran amphibians. Biol J Linn Soc, 145(1): blae062
- Stuart-Fox D., Moussalli A. 2009. Camouflage, communication and thermoregulation: Lessons from colour changing organisms. Philos Trans R Soc Lond B Biol Sci, 364(1516): 463–470
- Wells K. D. 2007. The Ecology and Behavior of Amphibians. Chicago: University of Chicago Press
- Zhang L. X., Sheng Y. S., Yuan X.Y., Yu F., Zhong X. T., Liao J. H., Liu Z. H., Chen W. 2021. Proximate mechanisms responsible for random mating by size in the Himalayan toad *Duttaphrynus himalayanus*. Anim Biol, 71(2): 183–19

Scientific Editor: Zhuo CHEN

How to cite this article:

Chen H. Z., Xia J. Y., Li T., Dayananda B., Chen W. 2026. Female-female amplexus and extremely female-skewed operational sex ratio in the toad *Duttaphrynus cyphosus* during breeding seasons. Asian Herpetol Res, 17(1): 45–46. DOI: 10.3724/ahr.2095-0357.2025.0061. CSTR: 32242.14.ahr.2095-0357.2025.0061