

Application of the Geometric Morphometrics to Identify Populations of The Tinfoil Barb (*Barbonymus schwanenfeldii*) from Different Localities



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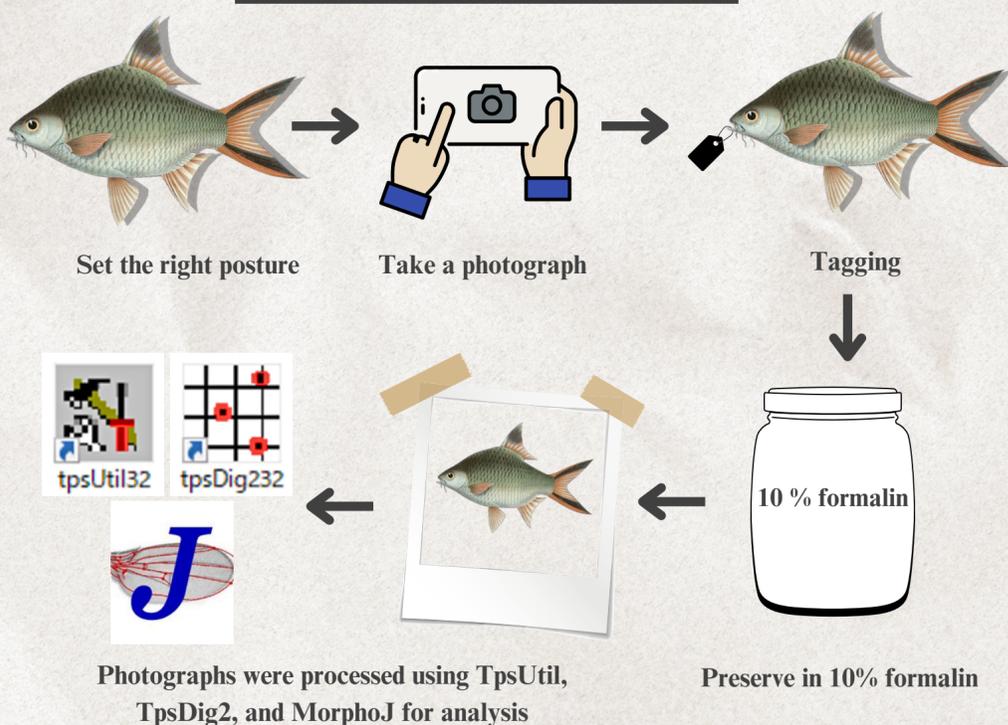
Abstract

This study aims to analyze the morphological differences of the tinfoil barb (*Barbonymus schwanenfeldii*) between two populations in Chiang Mai and Lamphun provinces using TpsUtil, TpsDig2, and MorphoJ for data processing and analysis. A total of 60 fish samples were collected from water bodies in both provinces, and photographs were taken in lateral view using a digital camera. After photography, each fish was tagged for identification before proceeding to the next step. TpsDig2 was used to digitize 18 landmark points for each specimen, and the data were processed using TpsUtil and analyzed in MorphoJ to perform Procrustes Superimposition and Principal Component Analysis (PCA). The results revealed significant morphological differences between the two populations. Specimens from Chiang Mai exhibited broader bodies and longer dorsal fins compared to those from Lamphun. These differences may reflect adaptations to various environmental conditions in each area. The findings of this study enhance the understanding of the morphological diversity of the tinfoil barb in Northern Thailand and can be effectively applied in the management and conservation of fisheries resources in this region.

Introduction and objective

The Tinfoil Barb (*Barbonymus schwanenfeldii*) is a species of freshwater fishes widely distributed across Southeast Asia [1]. Morphological variations within populations can be influenced by environmental factors, genetic diversity, and ecological adaptations [2,3]. Geometric morphometric analysis provides a powerful approach to studying these shape variations with high accuracy [4]. This study applies Principal Component Analysis (PCA) and Procrustes Superimposition to compare the morphology of *B. schwanenfeldii* from two different localities. The findings contribute to a deeper understanding of population differentiation, which is essential for species conservation, fisheries management, and aquaculture development [5,6].

Materials and Methods



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Results

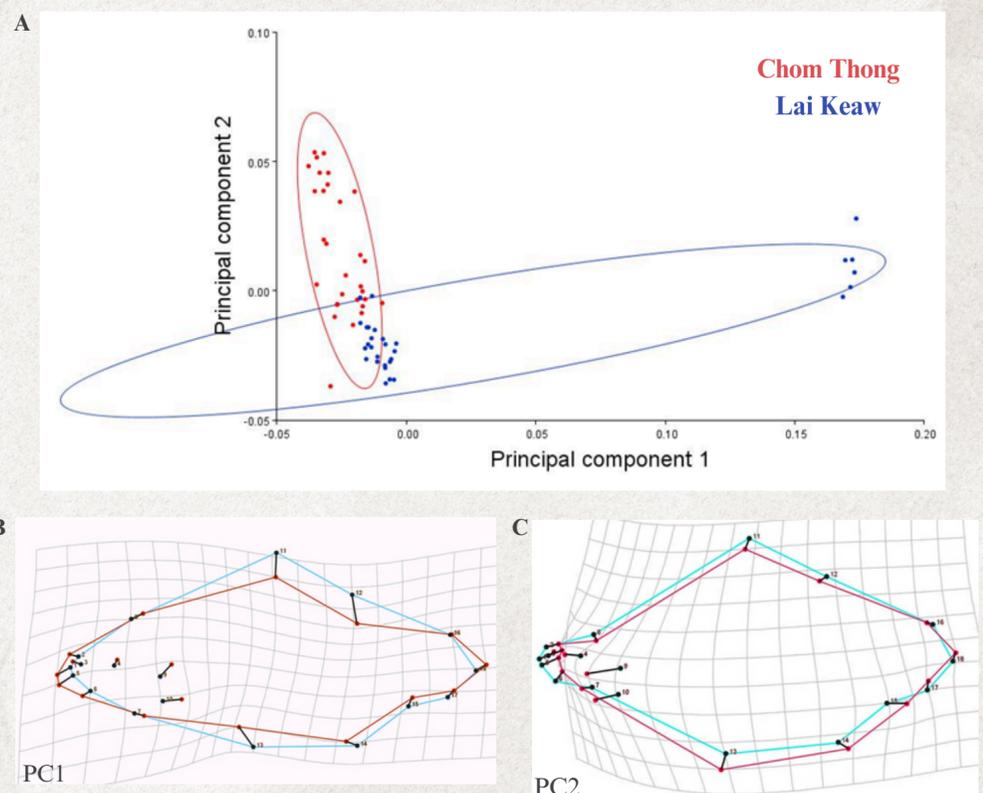


Fig.A illustrates the Principal Component Analysis (PCA), revealing distinct morphological differences between *Barbonymus schwanenfeldii* populations from two locations. Fig.B (PC1) shows that the primary component mainly influences body depth and head shape. Fig.C (PC2) highlighted shape variations primarily in the anterior body region.

These findings suggested that morphological differences may be shaped by environmental and genetic factors affecting body proportions and head structure.

Conclusion

This study revealed the significant morphological differences in *Barbonymus schwanenfeldii* populations, mainly in body depth and head shape. These variations may result from environmental and genetic influences, providing insights for conservation and fisheries management.

References

- [1] Froese, R., & Pauly, D. (Eds.). (2024). FishBase. Retrieved from <https://www.fishbase.org/summary/Barbonymus-schwanenfeldii.html>.
- [2] Luo, Y., Gao, Z., Wang, X., & Zhang, H. (2023). Quantitative Analysis of Fish Morphology Through Landmark and Outline-based Geometric Morphometrics with Free Software. *Frontiers in Marine Science*, 10, 1154005. <https://www.frontiersin.org/articles/10.3389/fmars.2023.1154005/full>.
- [3] Kottelat, M. (2013). The fishes of inland waters of Southeast Asia: A catalogue and core bibliography. *Raffles Bulletin of Zoology, Supplement No. 27*, 1-663.
- [4] Rohlf, F. J. (2015). The tps series of software. *Hystrix, the Italian Journal of Mammalogy*, 26(1), 9-12.
- [5] Zelditch, M. L., Swiderski, D. L., Sheets, H. D., & Fink, W. L. (2012). *Geometric Morphometrics for Biologists: A Primer*. Elsevier.
- [6] Adams, D. C., Rohlf, F. J., & Slice, D. E. (2013). A field guide to geometric morphometrics. *Zoomorphology*, 132(1), 45-59.