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Meta-Analysis: A Preliminary Study on the Microplastic Patterns in Amphibians from Türkiye

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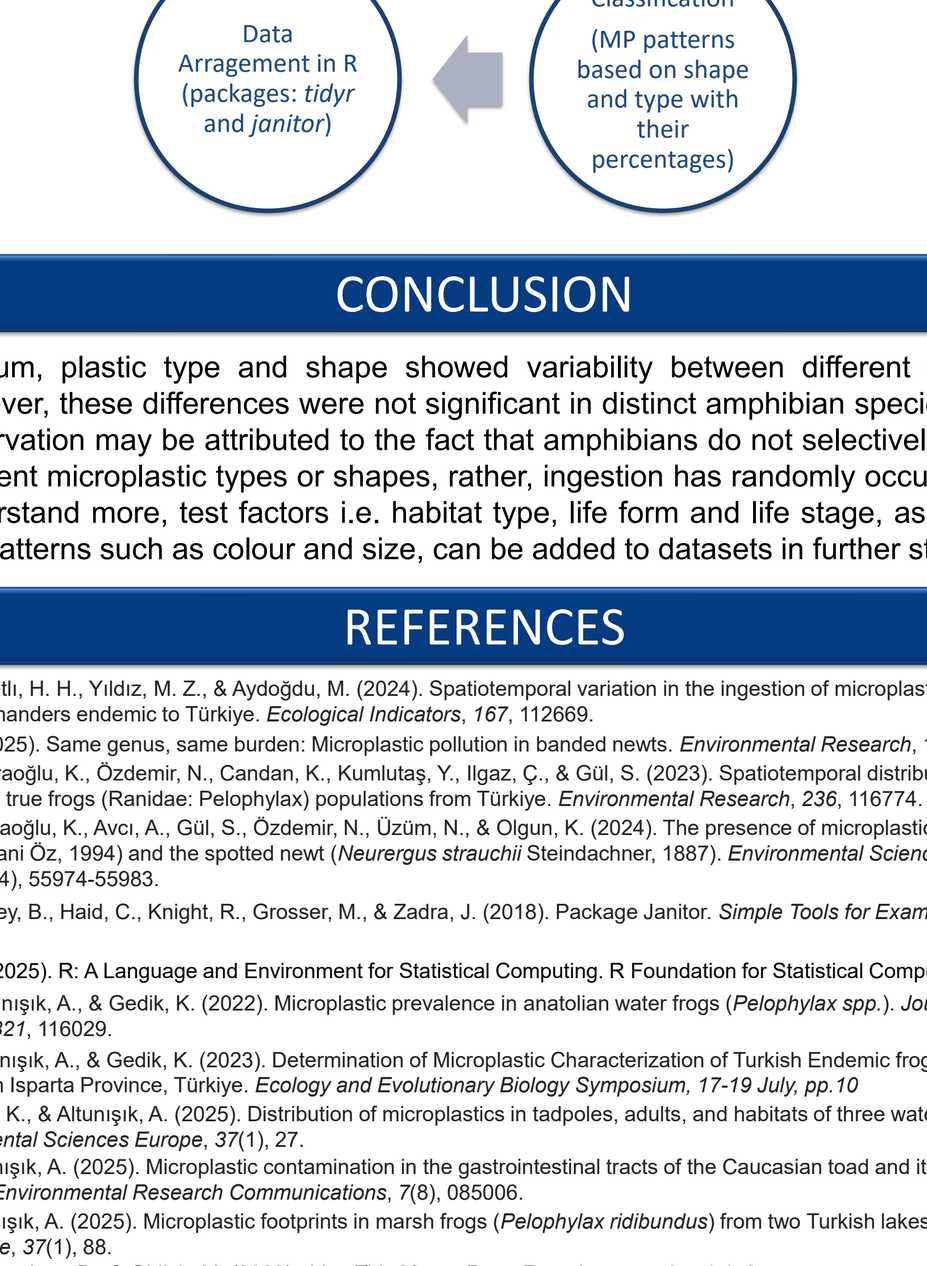
INTRODUCTION & AIM

- Meta-analysis is allowing us to combine results from different studies and is advantageous due to its ability to enhance statistical power with larger data. In biological studies, meta-analysis improves the generalizability of conclusions, offering a broader perspective across taxa or experimental conditions.
- Microplastic pollution became a global environmental concern that occurs across ecosystems within both living organisms and abiotic environments. Recently, a rapidly growing number of scientific studies on microplastics in amphibians has been published. The studies produced a substantial body of data suitable for meta-analytical evaluation.
- In this study, a meta-analytical framework was constructed to understand microplastic contamination and its patterns in seven amphibians from Türkiye.

METHOD



CONCLUSION

- To sum, plastic type and shape showed variability between different studies; however, these differences were not significant in distinct amphibian species. This observation may be attributed to the fact that amphibians do not selectively ingest different microplastic types or shapes, rather, ingestion has randomly occurred. To understand more, test factors i.e. habitat type, life form and life stage, as well as MP patterns such as colour and size, can be added to datasets in further studies.

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RESULTS & DISCUSSION

- Microplastic occurrence pointed to a significant overall effect on amphibians ($p<0.001$), with great heterogeneity ($I^2=91.7\%$; $tau^2=0.61$), indicating substantial variability among studies. The forest plot demonstrated the variability among studies for ingested microplastics (Figure 1). The funnel plot showed asymmetry but less skewed dispersion of effect sizes, which was supported by Egger's regression test ($z= -1.97$; $p<0.05$), indicating the presence of small-study effects and/or publication bias.

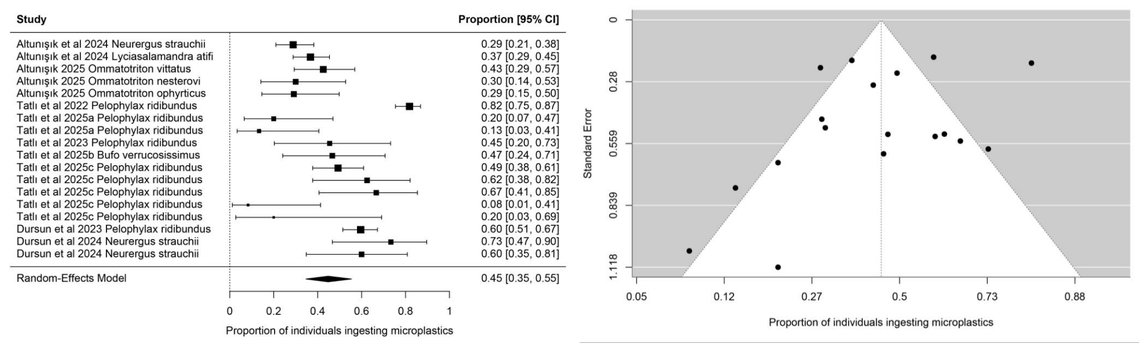

Figure 1. Forest plot (left) and funnel plot (right) representing the effect size of examined studies

- Plastic type significantly influenced effect sizes ($p<0.001$), with less abundant MP types showing strong negative effects (Figure 2), while PET and EVA had smaller effects, but non-significant differences were observed among species ($p>0.05$).

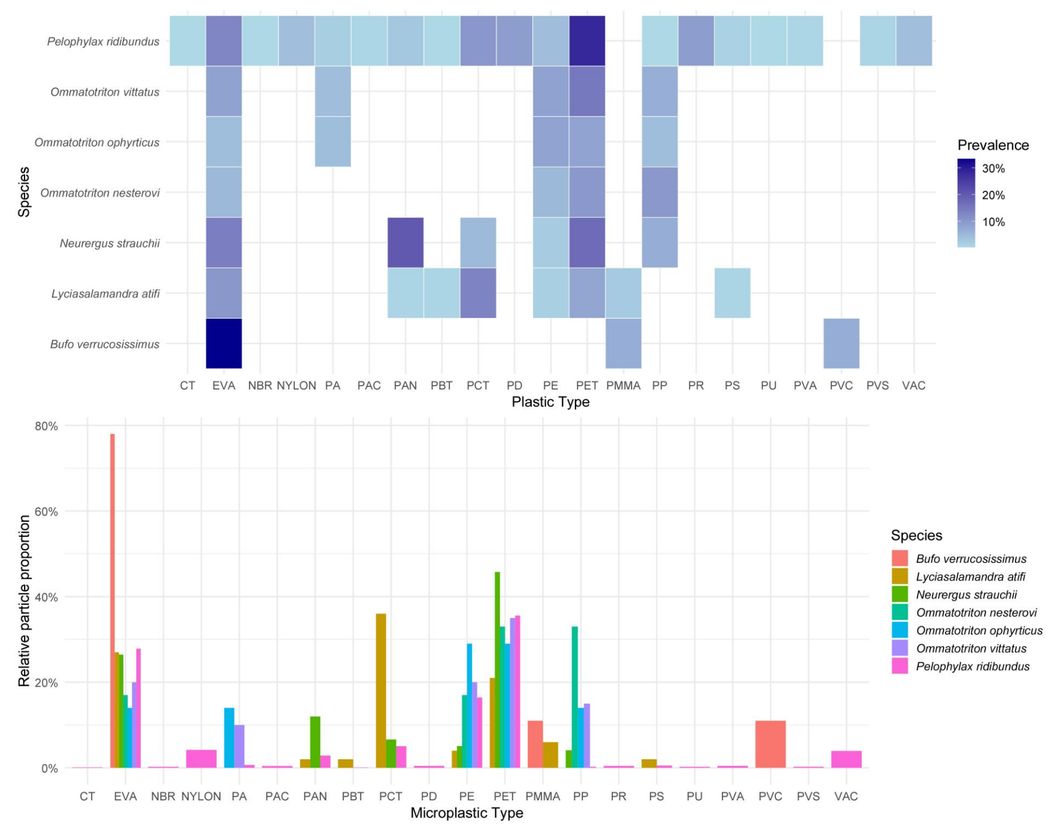

Figure 2. The prevalence of MP types in examined studies (top) and proportions for each species (bottom)

- Plastic shape also strongly affected outcomes ($p<0.001$), with less abundant MP shapes exhibiting large negative effects, and fibers showing a marginal positive effect (Figure 3); at the species level, differences were non-significant ($p>0.05$).

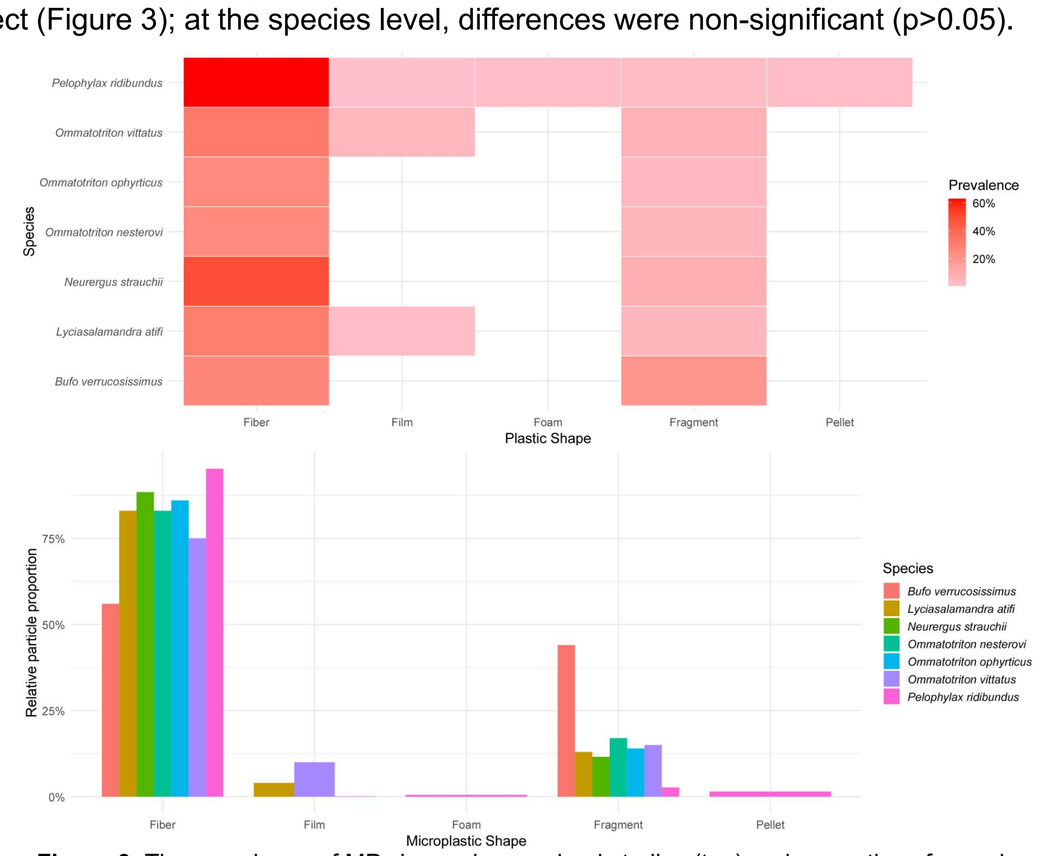

Figure 3. The prevalence of MP shapes in examined studies (top) and proportions for each species (bottom)