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Combined Effects of Microplastics and Trace Metals on Stress-Response Gene Expression in the Mediterranean Mussel *Mytilus galloprovincialis*

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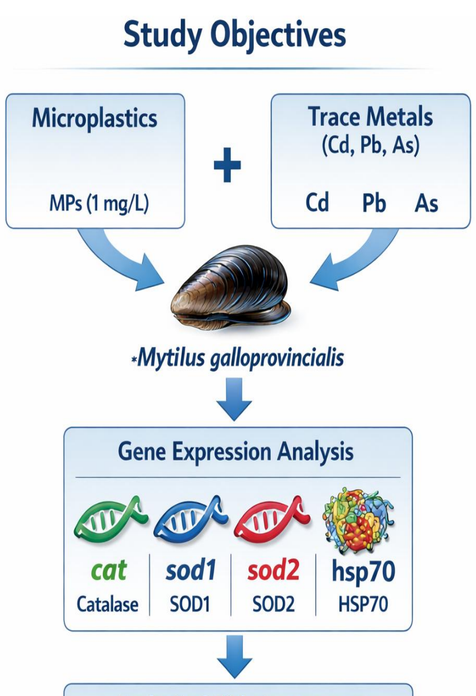
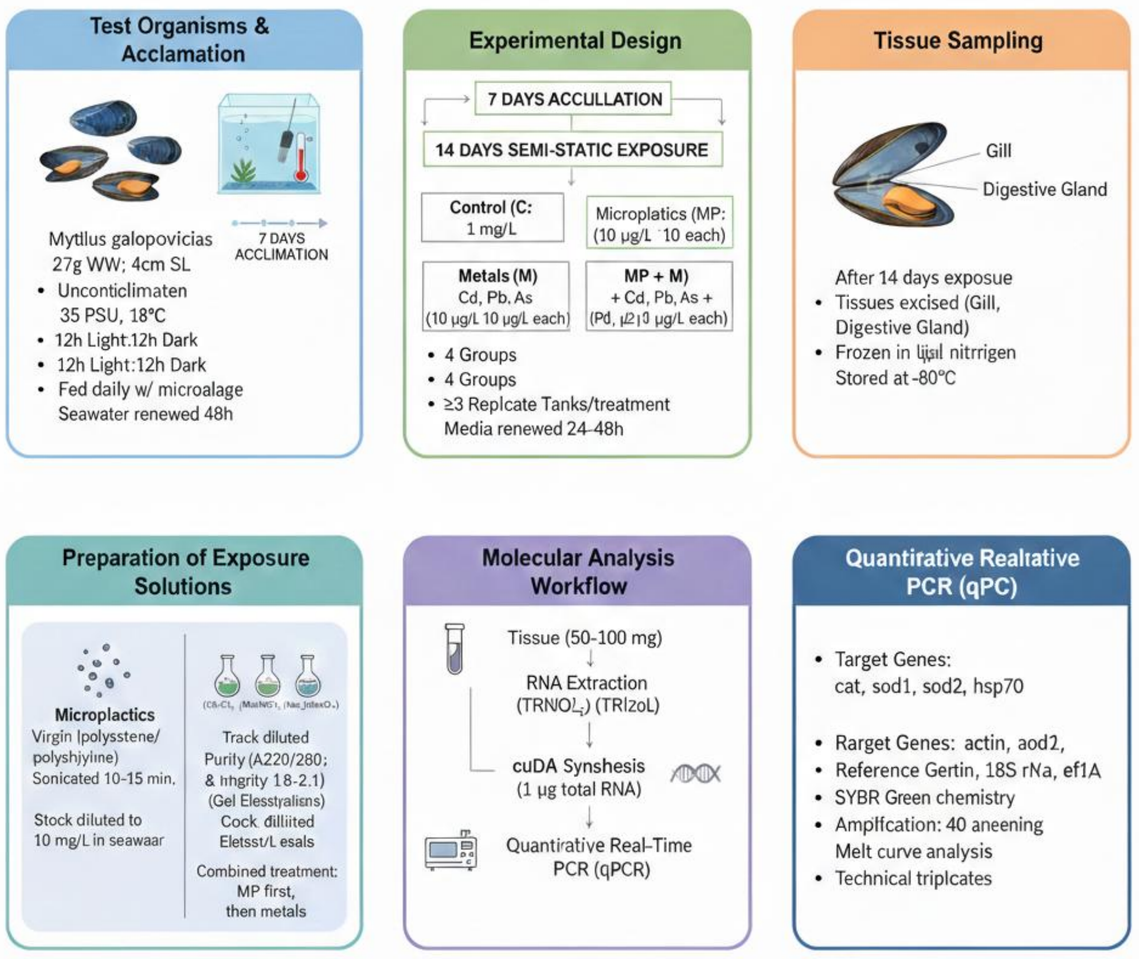
INTRODUCTION & AIM

The Mediterranean Sea is widely recognized as one of the most contaminated semi-enclosed marine basins and constitutes a major hotspot for microplastic and trace metal contamination.Microplastics (MPs) are widely distributed in Mediterranean surface waters and sediments, where their concentrations rank among the highest reported globally (Terzi et al., 2024). Beyond their direct physical impacts, MPs can adsorb trace metals onto their surfaces, thereby potentially modifying metal bioavailability and toxicity (Rasool et al., 2025)

The Mediterranean mussel, *Mytilus galloprovincialis*, is an ecologically and economically important species in Mediterranean coastal ecosystems and is extensively used as a bioindicator in marine monitoring programs. Due to their filter-feeding activity and pollutant bioaccumulation capacity, bivalves are frequently exposed to complex mixtures of contaminants rather than individual stressors. Although the effects of MPs and trace metals have been investigated separately, their combined influence on molecular stress responses in *M. galloprovincialis* remains insufficiently understood, particularly under environmentally relevant Mediterranean conditions.

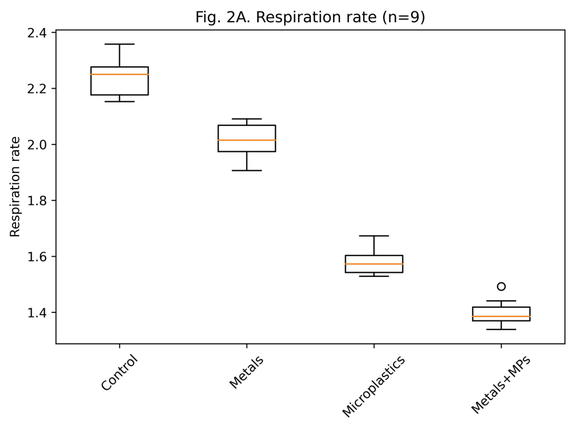


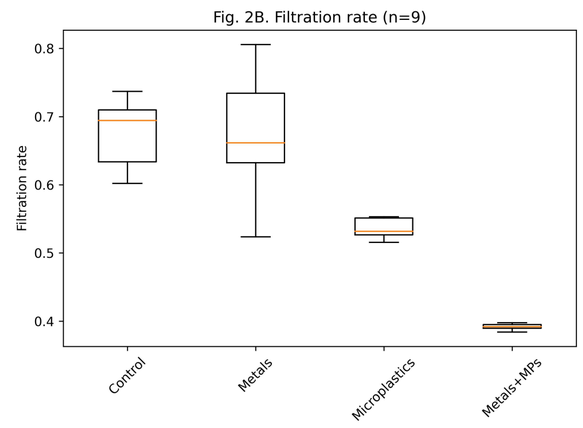
METHOD



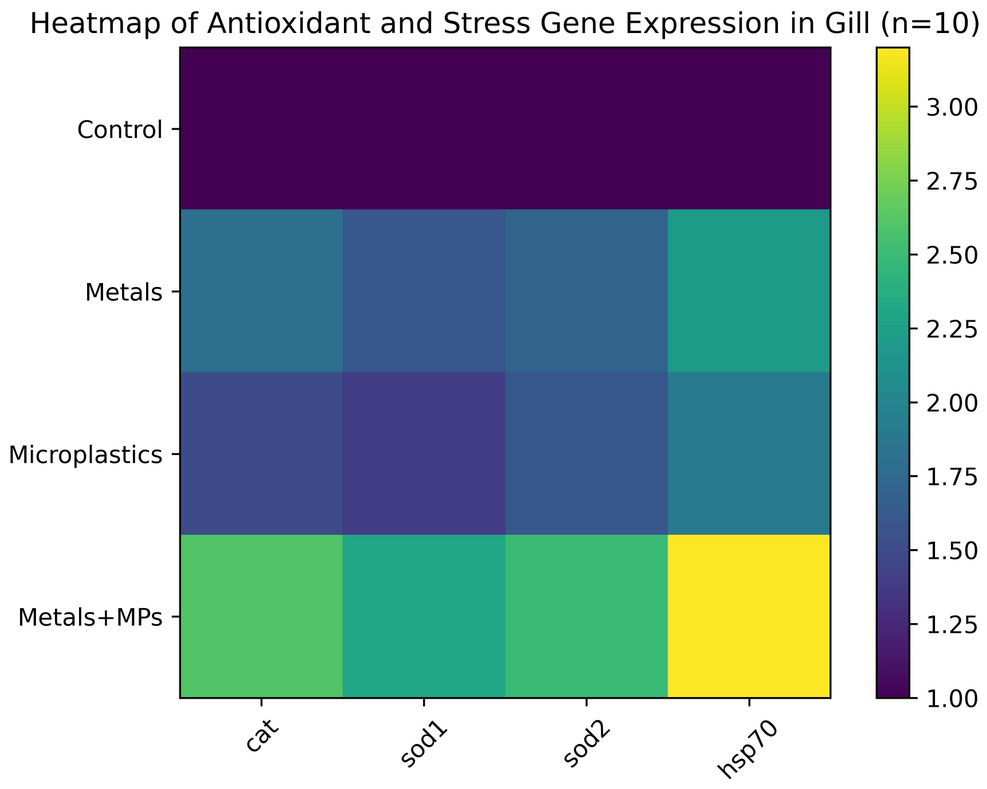
RESULTS & DISCUSSION

1. Changes in filtration and respiration rates





2. Pathway genes expression in mussel gill



CONCLUSION

Microplastics and trace metals, both common in the Mediterranean Sea, can disrupt key stress and antioxidant genes in Mytilus galloprovincialis. While each pollutant alone triggered a response, their combination caused the strongest upregulation of gene expression and molecular stress signals. This suggests that microplastics may enhance metal toxicity, increasing risks for coastal marine life. Our findings highlight the need to consider pollutant mixtures in environmental monitoring.

Future translocation and epigenomic studies are needed to determine whether these stress responses persist across environments and potentially across generations.

FUTURE WORK / REFERENCES

1-Terzi, Y., Gündoğdu, S., Tekman, M. B., Gedik, K., Ustaoğlu, D., Ismail, N. P., ... & Aydın, İ. (2024). How much do we know about the microplastic distribution in the Mediterranean Sea: a comprehensive review. *Marine Pollution Bulletin*, *208*, 117049.
2-Rasool, A., Halfar, J., Brožová, K., Čabanová, K., Chromíková, J., Malíková, P., ... & Heviánková, S. (2025). Interactions of microplastics with heavy metals in the aquatic environment: Mechanisms and mitigation. Journal of Hazardous Materials Advances, 100984.

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