

Changes in the macrozoobenthic community across coastal lagoons in the Po River Delta (Northern Adriatic Sea, Italy) during the outbreak years of the blue crab *Callinectes sapidus* (Rathbun, 1896)

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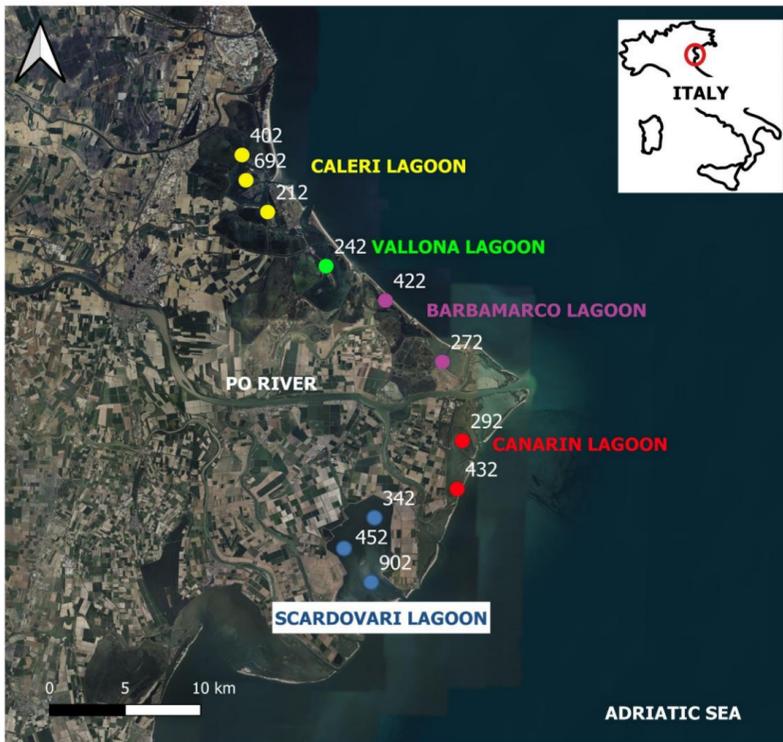
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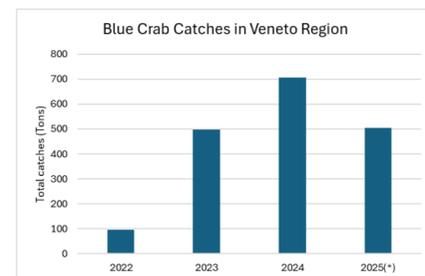
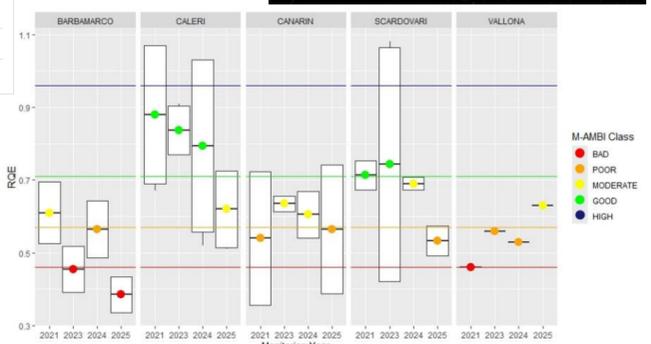
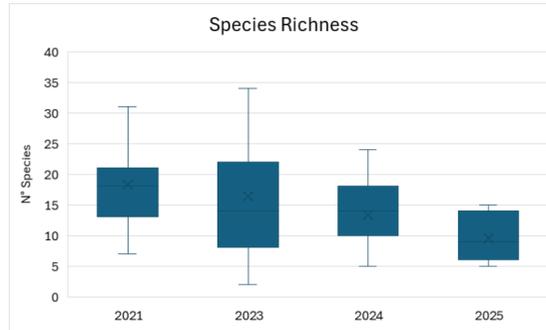
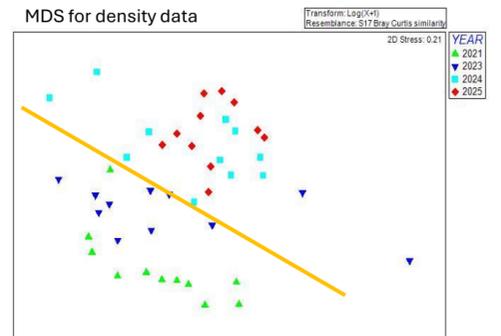
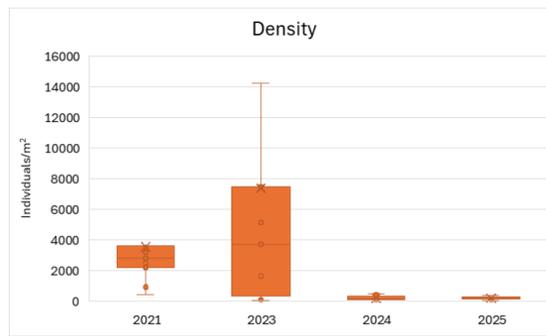
Background

- Macrozoobenthos is one of the biological quality elements used for the ecological classification of transitional waters under the Water Framework Directive (2000/60/EC);
- Starting in the summer of 2023, the Po Delta witnessed the invasion of the non-native species *Callinectes sapidus* (Chiesa et al., 2025);
- The blue crab is an opportunistic predator known to feed on macrozoobenthic organisms;
- Monitoring macrozoobenthos is essential for assessing the potential impacts of the blue crab invasion, including shifts in benthic community composition and declines in biodiversity.

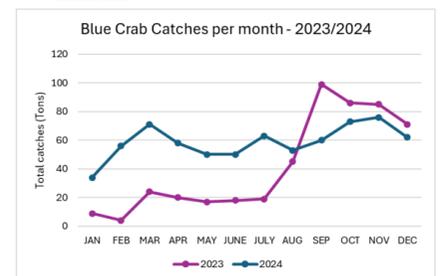


Results

- 2024-2025 lower densities than 2021-2023 (Kruskal-Wallis $H=20.98$; $p<0.001$);
- Differences confirmed by ANOSIM analysis (Global R: 0.43; $p<0.5$) and graphically displayed by the MDS ordination;
- 2025 lowest number of species (Kruskal-Wallis $H=8.5$; $p<0.5$), no significant differences for the other ecological indices (Shannon, Margalef, and Pielou indices);
- SIMPER → Representative species: *Heteromastus filiformis*, genus *Streblospio*, *Gammarus insensibilis* and *Nephtys hombergii*;
- M-AMBI: decline in values in some lagoons: Caleri, Barbamarco and Scardovari.



Blue crab catches data: Source Veneto Agricoltura



* Data available only for January-June 2025

Materials and Methods

Study Area

Po Delta River (Northern Adriatic Sea)

- 11 stations in 5 different lagoons
- Macrozoobenthos surveys:
 - 2021- 2023 (before the blue crab invasion) (Data sources: ARPAV)
 - 2024 - 2025 (after the blue crab invasion)

Data analysis

- Macrodescriptors: density, number of species;
- Ecological indices: Shannon, Margalef, and Pielou indices, M-AMBI;
- Univariate analysis: Kruskal-Wallis ANOVA and Post-hoc;
- Multivariate Analysis: MDS, ANOSIM, SIMPER;
- Analysis of blue crab catches (Data sources: Veneto Agricoltura).

Discussion and conclusions

- The Po Delta lagoons are influenced by multiple anthropogenic pressures and strong interannual variability, both of which affect macrozoobenthic communities (Cibic et al., 2019).
- Over the four-year sampling period, the study documented a pronounced decline and a marked structural simplification of the macrozoobenthic community.
- The demographic outbreak of the blue crab since summer 2023, corroborated by catch data from Veneto Agricoltura, indicates a potential association between its rapid increase and the observed decline in macrozoobenthos.
- To clarify these interactions an integrated and long-term assessment is required, incorporating biological community dynamics, environmental drivers, anthropogenic stressors, and the occurrence of non-indigenous species, such as the blue crab.

References

- ARPAV – Open data on macrozoobenthos: <https://www.arpa.veneto.it/dati-ambientali/open-data/file-e-allegati/soam/dati-macrozoobenthos/transizione;>
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- Chiesa, S., Petoichi, T., Boscolo Brusà, R., Raicevich, S., Cacciatore, F., Franceschini, G., Antonini, C., Vallini, C., Bernarello, V., Oselladore, F., Ciani, M., Di Blasio, L., Campolunghi, M.P., Baldessin, F., Boldrin, L., Marino, G. Impacts of the blue crab invasion on Manila clam aquaculture in Po Delta coastal lagoons (Northern Adriatic Sea, Italy). *Estuar. Coast. Shelf Sci.* **2025**, *312*, 109037.
- Veneto Agricoltura - Reports on the fishing industry in Veneto, available on the portal: <https://www.venetoagricoltura.org/publicazionireport/pescaeaacquacoltura>