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«Care4Seals»: a Citizen Science project for the conservation of the endangered Mediterranean monk seal



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Introduction

The **Mediterranean monk seal** (*Monachus monachus*) is an endangered marine mammal (Fig. 1).

Endangered species **conservation** is an interdisciplinary field:

- **Ecological aspect:** monitoring to better understand the distribution and target conservation efforts.
- **Social aspect:** build human-seal coexistence by improving people's conservation attitudes and behaviours.

The project **Care4Seals** by Gruppo Foca Monaca APS integrated with the campaign SpotTheMonk by the University of Milan - Bicocca uses **Citizen Science (CS) coupled with environmental DNA (eDNA)** to improve the ecological and social aspects of monk seal conservation.



Fig. 1: The Mediterranean monk seal (E. Coppola - GFM) with the «endangered» IUCN label.

Methods

- **Study area:** 10 sampling locations with 13 sampling spots in the southern Adriatic and northern Ionian Seas (Fig. 2).
- **Citizen science:** 19 people (kayakers, sailors, divers) trained to collect, filter and store eDNA samples.
- **Monitoring campaign with eDNA** for studying distribution ☑ ecological aspect
- **Retrospective questionnaire** for evaluation of cognitive, affective and behavioural outcomes ☑ social aspect

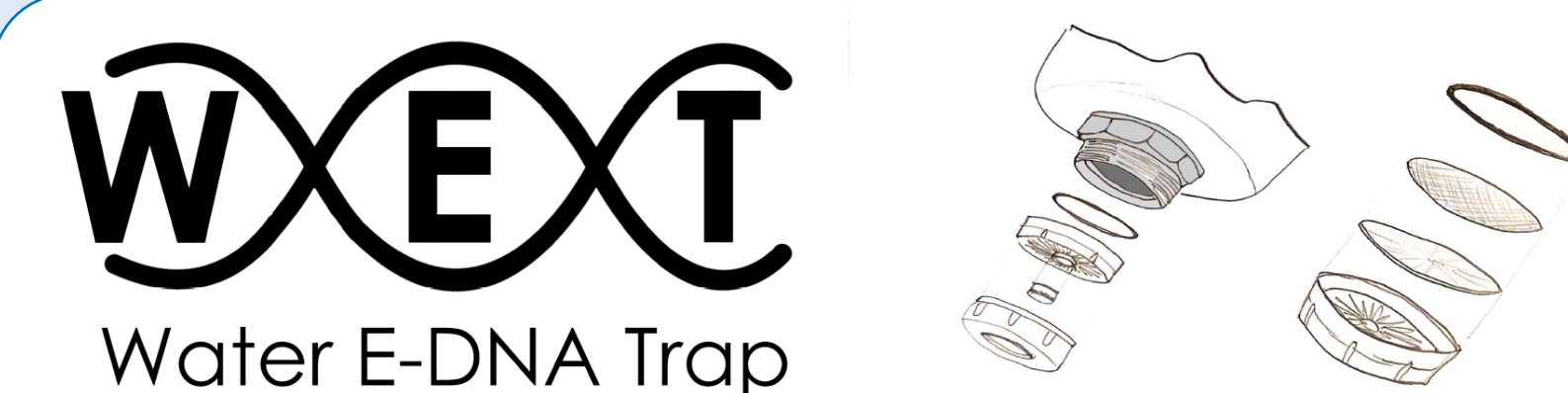


Fig. 3: The WET system used to filter eDNA in the field without electricity. Designed by E. Coppola

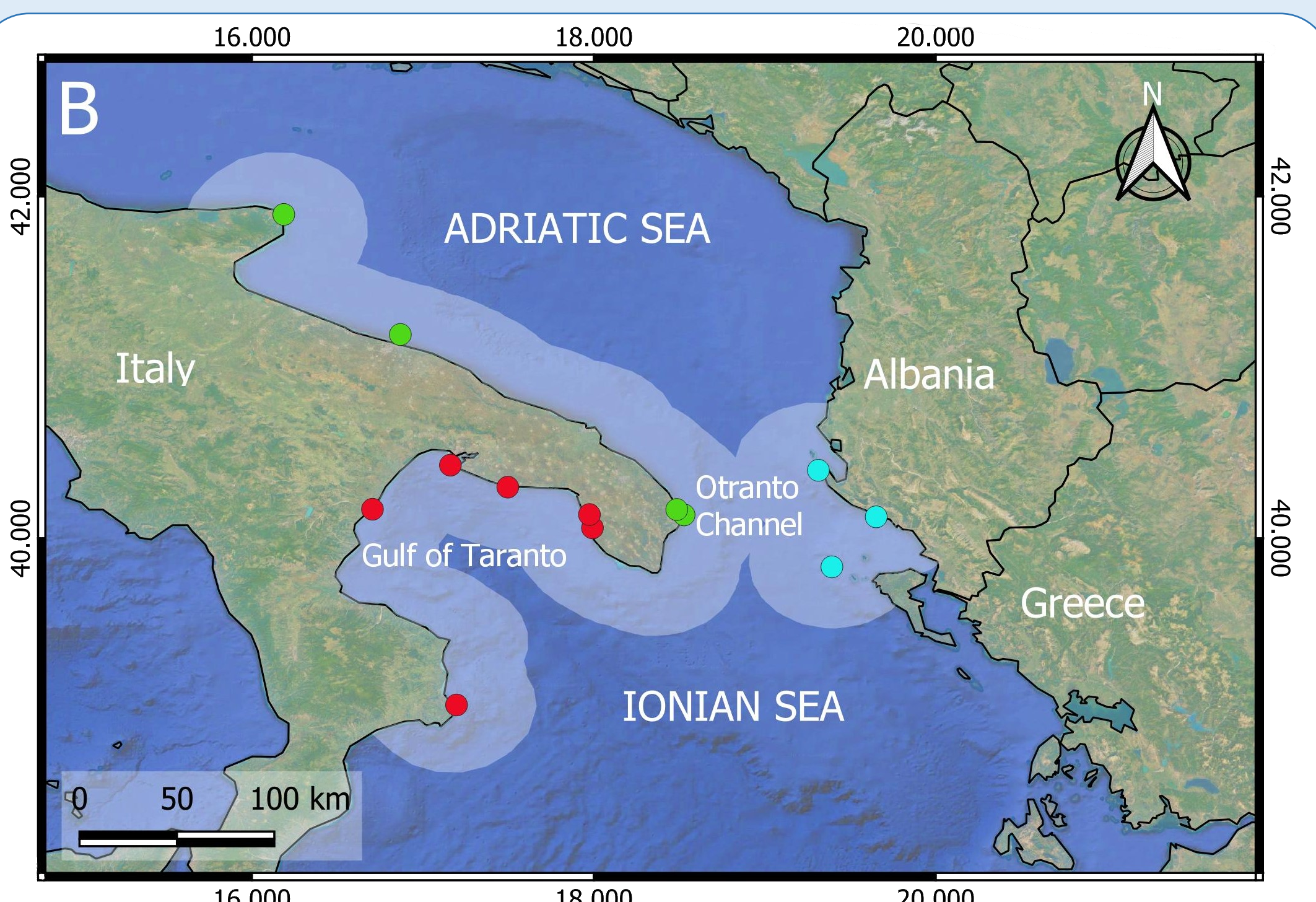
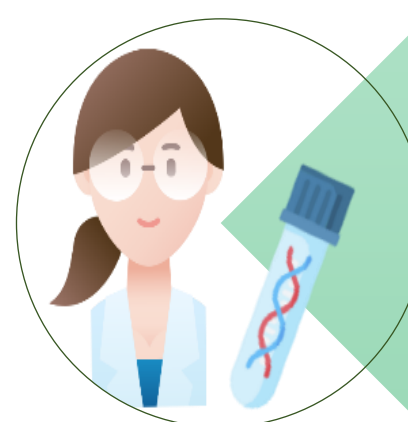


Fig. 2: Study area with sampling spots (blue: East Adriatic Sea, green: West Adriatic Sea, red: Ionian Sea)

Monitoring campaign with eDNA



In the field: sampling and filtering in 5 different periods in different locations at the same time → citizen scientists using the WET system (Fig. 3)



In the lab: DNA extraction and qPCR → researchers of the University of Milan – Bicocca within the campaign “SpotTheMonk”

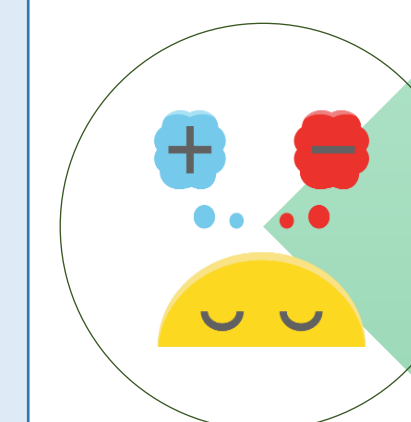


On the computer: spatiotemporal analysis in geographical clusters to identify the number of seal groups in the study area

Retrospective questionnaire



Perceived knowledge (10 items): including seal biology, conservation, eDNA monitoring.



Affective attitudes (12 items): including caring value, interest feeling, and self-efficacy beliefs.



Conservation behaviours (8 items): including behaviours promoting coexistence with the local community.

Outcomes

- **Ecological outcomes:** CS has some limitations but can successfully support large-scale monitoring of monk seals with eDNA after providing appropriate training to participants ☑ eDNA monitoring suggests the presence of different seal groups in the study area.
- **Social outcomes:** citizen scientists significantly improved their perceived knowledge, attitudes, and conservation behaviours towards monk seals, including those affecting conservation on a community level (Fig. 4).

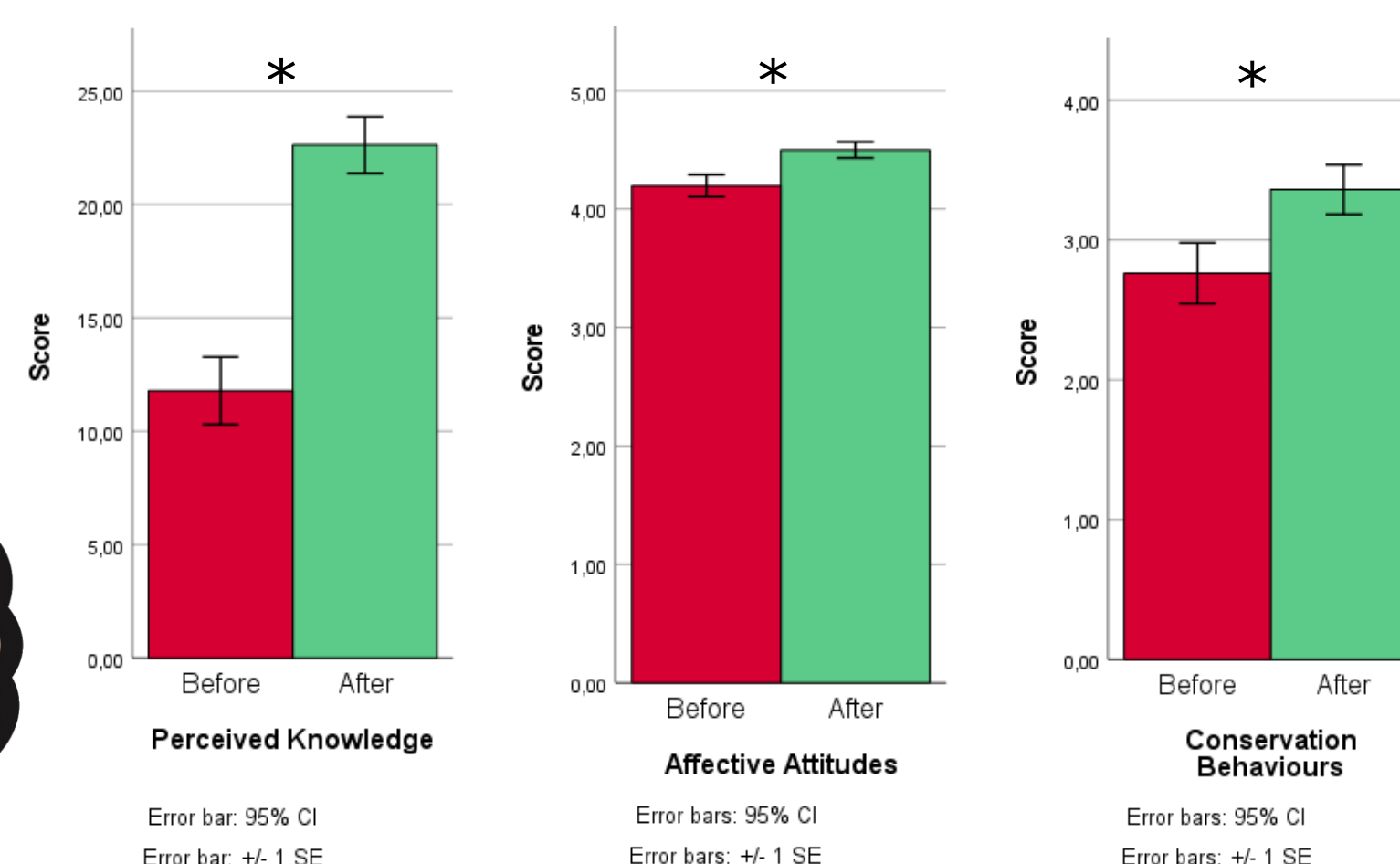
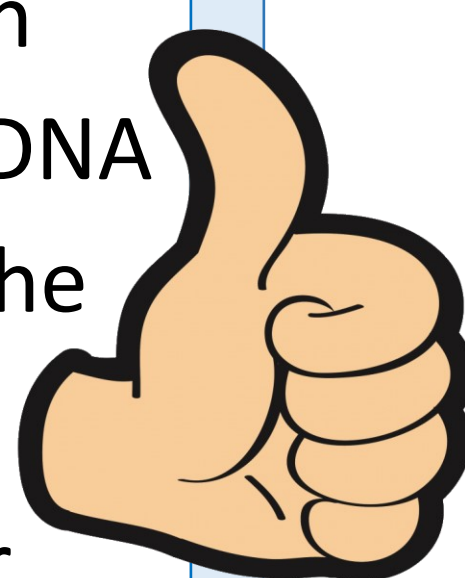


Fig. 4: Results of the retrospective questionnaire before (red) and after (green) taking part in Care4Seals project. Asterisks indicate a significant difference (t-test). Made with SPSS.

Conclusion

Citizen Science coupled with eDNA can address both ecological and social aspects of the endangered Mediterranean monk seal conservation. New eDNA monitoring projects and studies on conservation attitudes and behaviours should involve other stakeholders relevant to monk seal conservation such as fishermen.

