Environmental DNA, camera traps and citizen science app for biodiversity monitoring

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Wildlife monitoring is crucial for conservation and sustainable management of populations. The combination of environmental DNA (eDNA) analysis, monitoring by camera traps and inclusion of citizen science provides a novel and more comprehensive approach to wildlife monitoring. Both eDNA and camera traps are not dependent on direct sightings of animals, are non-invasive and enhance verifiable records of the presence of various species. Additionally, determination of eDNA enhances wildlife monitoring as well as biodiversity and risk assessment, since identification can be obtained directly through different samples that can be found in environment (*e.g.* faecal samples for determining nutrition; water or soil samples for determining species presence, including pathogens, reservoirs and vectors of diseases).

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By sampling water from several sources, such as rivers, streams, ponds and puddles in forest ecosystem, we aimed to estimate mammalian biodiversity, *i.e.* species either using or crossing these water sources, in south-eastern part of Slovenia, by using a metabarcoding approach. In our study, we compared the accuracy and ability to detect mammalian species with different methods: eDNA sampling, camera traps and through the citizen science app SRNA (developed by our team in collaboration with the Hunting Association of Slovenia and three other Slovenian research institutions). The app, launched in July 2022, aims to monitor wildlife by collecting metadata on wildlife species presence, reproductive potential, and health status. All eDNA sampling and camera trapping was done in the Rižana hunting ground (near Koper, Slovenia), in the warmer months of 2023 (*i.e.*, from May to October). There we also deployed camera traps to autonomously record images and videos of wildlife present in the area in proximity to the water bodies for a period of six months.

Camera traps were successful in identifying large vertebrate species, such as European roe deer and wild boar; on the contrary, they underestimated the diversity of small mammals. Metabarcoding of eDNA from water sources yields higher identification of mammal species; however, it does not enable data collection about individuals and populations, such as health status and abundance, which can be achieved by using camera traps and/or citizen science app. For this reason, it is important to combine different methods to obtain more accurate and relevant results about mammals present in the area.