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Success Story: Environmental DNA (eDNA) is a Potent Technique for Aquatic Biodiversity Conservation

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Environmental DNA (eDNA), is a cutting-edge technique for researching biodiversity in any kind of habitat. Trawls, seines, tissue samples, and ocular surveys are the mainstays of traditional methods of assessing fish stocks. These techniques are expensive, time-consuming, intrusive, damaging to the environment, and prone to misidentification. Enhancing the baseline of ecological data and utilizing more economical, sensitive, non-invasive, and efficient techniques for evaluating ecosystems are crucial. eDNA metabarcoding is a non-invasive technique that uses the genetic traces that animals release into the environment to find and identify uncommon and endangered species in a range of habitats, including aquatic ones. Over the last ten years, there has been an increase in the number of studies using environmental DNA, especially in freshwater and marine environments, which has led to a surge in the popularity of environmental (e) DNA research. We can argue that extracted DNA (eDNA) from the environment is changing the rules of diversification patterns. The eDNA methodology is completely non-invasive; it never affects ecosystems or vulnerable species, not even during the sampling process

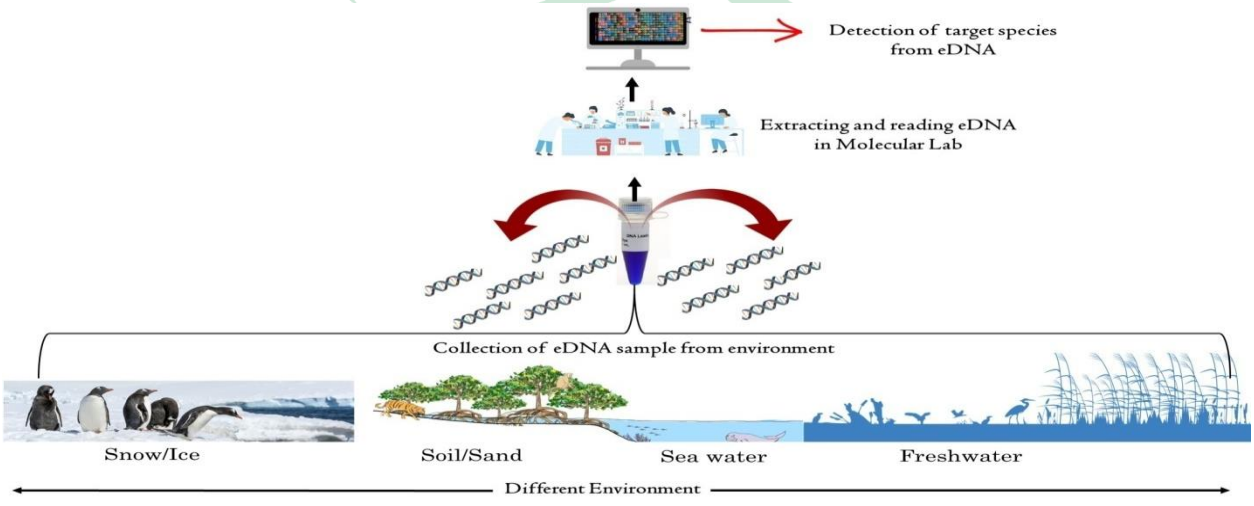

Fig. The major workflow of environmental DNA (eDNA)

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. It has no negative effects on the species sampling environments being studied. During the sampling process, this innovative molecular approach never harms any ecosystems or endangered animals. Freshwater and marine fish, as well as other aquatic macrofauna, may now be detected via environmental DNA analysis, which is becoming more and more common. No one in India is concentrating on this new technique, even though many scientists have utilized eDNA to study the global biodiversity of aquatic habitats. We draw the conclusion that the eDNA method has the potential to develop into a cutting-edge instrument for studying biodiversity and protecting aquatic environments.

Investigations utilizing PCR and qPCR assays for focused species detection as well as community (i.e., multi-species) investigations employing metabarcoding have both made use of environmental DNA analysis. When it comes to community and ecosystem biodiversity, functional diversity, wildlife, conservation biology, and the identification of uncommon or vulnerable species, eDNA has the potential to play a major role. The consequences of the fast advancement of sequencing technology in recent years for eDNA research are just now starting to become apparent. eDNA metabarcoding has been extensively studied since 2012 and is used to fish biomass/abundance estimates, fish community identification, fisheries management, invasive species detection, and biodiversity conservation. The study of microbial biodiversity from food, soil, and deep-sea sediments is the primary focus of a total of 25 research publications on eDNA metabarcoding/metagenomics written by Indian academics. From the Indian context and criteria for eDNA research, not a single article pertaining to such a study in fish has been mentioned. A growing number of applications for eDNA are being developed, including monitoring benthic organic enrichment, community assessment in microcosm research to identify anthropogenic contamination, studying the most diverse ecosystems, monitoring biodiversity, and improving environmental probabilities to possibilities. We anticipate that this success story will serve as a valuable resource for scientists and researchers in India who are interested in estimating the biodiversity of species. Further research and expanding the scope of species monitoring will also be beneficial for the sustainable use of resources and the long-term preservation of the ecosystem.