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Prioritizing conservation of overlooked land snails

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Abstract
Land snails, are ecologically important due to their low dispersal abilities. They are threatened because of various factors. Conservation efforts are not initiated for the land molluscs like other taxa. This review discusses the conservation strategies aiding in sustainable management. The use of molecular phylogenetic techniques for their protection are recommended.

Keywords: Land snails, conservation, molluscs, sustainable management, molecular phylogenetics

Introduction

Land snails are ecological indicators because of their low dispersal abilities. Their diversity is at risk due to manmade disturbances leading to their habitat loss, urbanization, climate change and introduction of invasive species. Considering the lack of data on species description, phylogeny and taxonomic revision, increasing anthropogenic threats, especially in urban areas, information on species requirements for particular habitat is essential for land snail conservation and sustenance.

Conservation requirements

Research on systematics and evolutionary biology, genetics, and ecological interactions of land molluscs should be prioritized. Monitoring snail populations and habitats helps in tracking the effectiveness of conservation measures. Knowledge on the ecological corridors and responses to the snail invasions is desirable to prevent the encroachment of invasive species (Rem *et al*. 2024). Understanding unique climatic conditions, calcium availability, humidity and precipitation in forested and non-forested regions helps in development of effective conservation management strategies for terrestrial ecosystems.

DNA barcoding has proven to be effective in evaluation of the cryptic and endangered species to decide on future protection measures. This method has been employed to study the species belonging to the families Helicide, Oxichilidae, Orculidae etc (Mohammadi and Ahmadzadeh, 2024) [2]. Conservation efforts should focus on mapping snail habitats using Remote sensing and GIS, Drone technology, and implementing habitat restoration projects. Determining land use changes to mark the altered habitats that are affected by urbanisation and climate change is advantageous. Besides, incorporating distribution modelling techniques to know the species dispersal due to increased anthropogenic pressures.

Adopting organic farming techniques in agroforests would minimise the use of pesticides that declines their population. The plantations although disturbed, some land molluscs common to forests are known to inhabit in these ecosystems. The presence of genera *Glessula, Cyclophorous, Kaliella* etc are observed in the plantations (D'Souza and Shenoy, 2024) [1]. Introduced (*Mariaella dussumeiri, Allopeas gracile*) and native land snail species tolerant to high levels of disturbance are reported from the plantations. Due to the high reproductive potential and tolerance to harsh climate, *Mariaella dussumieri* is found in all habitats. Restoring the native habitats by the conversion of abandoned plantations into forests facilitates colonization of species in these sites (D'Souza and Shenoy, 2024) [1].

Constructing dense plantations and agroforests bordering primary forests might restrict the entry of introduced species. Improving the canopy cover and retaining leaf litter, deadwood in plantations would relocate the native land snail species (Nurinsiyah *et al*. 2016) [3]. Locating the plantations away from the sea would enable more species richness due to lesser desiccation, however, amphibious snail *Succinea* spp. are found to thrive well in coastal sites. Creating public awareness on the ecological importance of land snails and retaining the regions of land snail hotspots such as sacred groves, national parks, biosphere reserves is required for their sustainable management.

Moreover, I recommend conversion of highly disturbed open areas to mini forests to provide heterogenous habitats for land snail colonization. Constructing snailariums for the endangered species, understanding survival strategies and hot spots of snails is very important before going to plan and implement any conservation strategy. Considering the factors influencing the distribution and composition of land snail communities, we can make informed decisions to protect the land snails to maintain their habitats in balance.

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