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From Africa to Andamans: Invasion Ecology of *Achatina fulica*, Bowdich, 1822 in Island Ecosystem:

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***Abstract*— The rapid spread of the highly invasive gastropod Achatina fulica, Bowdich, 1822, has caused significant ecological disruption, agricultural losses, and public health concerns. This study examines its introduction, impact, and management strategies, emphasising the urgent need for integrated control measures.**

***Index Terms:* Invasive species, Land Gastropod, Achatina fulica.**

I. INTRODUCTION

Biological invasions are a widespread and significant aspect of human-induced global environmental change, leading to the breakdown of the regional distinctiveness of the Earth's flora and fauna (Rajan and Pramod 2013). Substantial evidence shows that biological invasions contribute significantly to extinction (Vitousek 1994; Vitousek *et al.* 1997; Simberloff 2003). In 1992, the Convention on Biological Diversity recognised that biological invasion is the second most serious threat to biodiversity after habitat destruction (Jenkins 1999). Most of the introduced species have the potential to establish themselves in an alien environment, acting as agents of change in species equilibrium and leading to the extinction of native species in the areas where they are introduced (Fritts & Rodda, 1998; Donkan et al., 2003; Ali, 2004). Invasive alien species are those introduced by human agency to areas where they did not previously occur, from which they can establish and spread. They can also cause ecological or economic damage, making their control necessary (Rauf Ali, 2010). The Andaman and Nicobar Islands are exposed to high levels of human-mediated introduction of non-native plant and animal species. In total, 566 plants, 3 snails, 4 insects, 12 mammals, 13 marine fish species, and one virus have been introduced to these islands (Mohanraj *et al*., 1999). Among these, the Giant African Snail, Achatina fulica, stands out as one of the 100 worst invasive species globally. The giant African snail *Achatina (Lissachatina) fulica* Bowdich is the largest of various land snail species. (Choubasia, 2025). The shell length of the giant African snail *Achatina (Lissachatina) fulica*, Bowdich, is the largest of the various land snail species. The shell length of these snails ranges from 5cm to 10cm, although some adult snails have been observed to exceed 20cm in length. The average weight of snails of this species is about 32g. These creatures are boneless or invertebrates belonging to the family Achatinidae of the order Stylommatophora of the class Gastropoda of the phylum Mollusca of the animal kingdom. They are native to East Africa, especially Kenya and Tanzania (G K *et al*., 1988). This snail species can be easily identified by its ovoid-conical shell, which is pale yellow in colour with brown transverse stripes (Figure 1). The stripes are irregularly crisscrossed with fine spirals except for the last whorl. The shell has slightly convex whorls, the last whorl being approximately equal to half of the entire length of the shell. The aperture of the shell is elliptical to oval. This land species has been included in the list of the world's top 100 most invasive alien species (Lowe S et al., 2000), posing a major threat to forests, native plants, and agricultural and horticultural crops. In India, this exotic snail species was introduced by British malacologist William Benson. A pair of snails was introduced from Mauritius to Kolkata (Calcutta) in 1847 (GK *et al*., 1988; Naggs and Benson, 1997). The species is now widely distributed in several states of the eastern (Assam, Bihar, Manipur, Meghalaya, Nagaland, Odisha, Tripura, and West Bengal), southern (Karnataka, Kerala, and Tamil Nadu), western (Maharashtra), northern (Uttar Pradesh) India and even in islands like Andaman and (G K etal., 1988, Reddy and Shreedharan K (2006); SK *et al*.,2018;). The Giant African Snail, Achatina fulica, was introduced as a food supplement by the Japanese during World War II and has spread throughout the Andaman and Nicobar Islands (Shyam Prasad *et al*., 2004). Given the islands' geographical isolation and ecological sensitivity, the unchecked spread of this invasive species demands urgent attention. This paper examines the historical context, ecological impacts, and management strategies of Achatina fulica in the Andaman and Nicobar Islands.

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Figure 1. Achatina fulica, Bowdich, 1822 (in natural habitat)

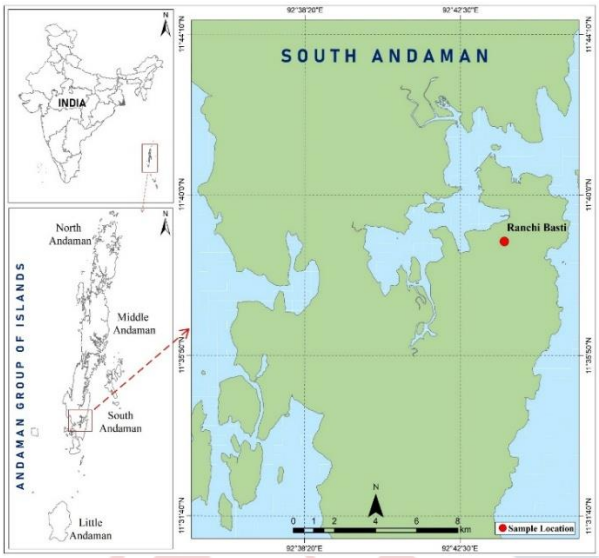


Figure 2. Map showing the Survey Location

II. MATERIALS & METHODS

Study Area: The samples were collected from the Ranchi Basti area of the South Andaman district of the Andaman & Nicobar Islands. The GPS point of the study area is 11.646565˚N & 92.728018˚E.

Collection of Specimens: The collection of samples was done in December 2024. During the sampling, the search for the samples was carried out in the soils, leaf litter under the tree, on the leaves and branches of the trees and plants where they could take refuge. The specimens were collected using gloves and forceps and transported in a sample bottle to the laboratory of the Zoological Survey of India, Andaman and Nicobar Regional Centre, Sri Vijayapuram, Andaman and Nicobar Islands, where the samples were preserved in 70% ethanol. The identification of the samples was done by referring to the paper of Vogler and Beltramino (2013).

Material examined: Ranchi Basti, Sri Vijay Puram, South Andaman (6 ex.), Date: 7. xii.2024,

Coll: Aditi Raj, Reg. No.: ZSI/ANRC/T-23431.

III. RESULTS

The invasive success of Achatina fulica in the Andaman & Nicobar Islands can be attributed to several biological and environmental factors. The tropical, humid climate of the Islands and absence of natural predators offers ideal conditions for its survival and reproduction. Its generalist feeding habits enable it to exploit various food sources, increasing its adaptability to different ecosystems. Being nocturnal, they easily move from one place to another in search of food, reproduction, and safe shelter, and also avoid being hunted by their enemies. These creatures are homosexual, but for reproduction, they need a partner of their age, and if they do not find a partner for breeding, these snails can also self-fertilise, which can save their species from extinction. Its high reproductive capacity, with each individual capable of laying hundreds of eggs multiple times a year, facilitates rapid population growth and spread (Sarma et al., 2015). Their mortality rate is also minimal. These creatures can continuously eat leaves, vegetables, and fruits of different species of trees and plants throughout the night. They are highly voracious. Farmers in the Andaman Islands report significant crop losses during the monsoon season, when snail populations peak. This not only affects food security in a geographically isolated region but also undermines local livelihoods dependent on subsistence agriculture (Jayaraj, 2013). Sharma and Agarwal (1989) have recommended control measures, including field sanitation by removing possible hiding places such as bushes and debris from fields to manage the snail menace. Ravikumara *et al*. (2007) recorded the highest number of snails attracted to papaya stem waste, followed by vegetable waste, fishmeal waste, areca leaf waste, banana sheath waste, sugarcane bagasse, leaf litter, and farmyard manure. Handpicking, was found to be very effective in commercial nurseries in Bangalore South taluk. Sharma and Agarwal (1989) reported using 5% metaldehyde pellets at 25kg/ha to manage the snails, and Basavaraju *et al*. (2001) reported using 2.5% metaldehyde pellets to control the snails on betel vine (Piper betel) in Karnataka during Kharif. Under lab conditions, Basavaraju *et al*. (2001) found metaldehyde pellets to be most effective against *A. fulica* compared to methomyl and carbofuran. Rao and Singh (2002) found cypermethrin to be effective against *A. fulica*. Kakoty and Das (1988) recorded 100% mortality using copper sulphate to manage the snails infesting tea states. Sajeev (2011) adopted a control method of initially baiting the snail using cabbage leaves, followed by spraying with Tobacco decoction, made with Copper sulphate (TDCS mixture). Karnatak *et al*. (1998) recorded 100% mortality after 96 hours at a 5% spray of sodium chloride.

IV. DISCUSSION

The introduction and proliferation of *Achatina fulica* in the Andaman and Nicobar Islands have led to significant

ecological, agricultural, and health-related challenges. Its rapid spread is facilitated by a favourable climate, the absence of natural predators, and human-mediated dispersal. Once established, *A. fulica* exhibits remarkable ecological resilience. .The feeding habits of this land snail allow it to exploit highly diverse ecosystems. This highly voracious feeding behaviour leads to aggressive competition with native malacofauna. This competitive displacement threatens local biodiversity and native ecosystems. Farmers in the Andaman Islands report devastating crop losses during the peak monsoon season, when snail populations reach their peak. The species targets a wide array of high-value crops, including bananas, papayas, okra, beans, and ornamental plants. Unchecked population growth poses a massive threat to native vegetation, agricultural fields and forest trees. This ongoing destruction hampers the livelihood of local tribal communities. To mitigate this threat, a well-structured integrated pest management framework is needed. Manual handpicking during evening hours provides an effective physical control measure (Ravikumara et al., 2007). Organic systems can use cabbage leaf baits followed by targeted tobacco decoction or copper sulphate sprays (Sajeev, 2011). Applying a 5% sodium chloride spray triggers rapid osmotic desiccation, resulting in a 100% mortality rate within 96 hours (Karnatak et al., 1998). In conclusion, Achatina fulica poses a severe biological threat to the agricultural stability and native biodiversity of the Andaman and Nicobar Islands. If left unmanaged, its high reproductive rate, environmental plasticity, and polyphagous nature will continue to destabilise fragile island ecosystems and harm local farming communities. Long-term eradication cannot rely on a single treatment plan. Instead, sustainable containment requires an integrated strategy that balances community-driven mechanical harvesting, strict quarantine measures for nursery transport, and the targeted use of eco-friendly chemical controls.

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