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Report of *Lissachatina fulica* (Bowdich, 1822) (Stylommatophora: Achatinidae) in rubber plantations of Western Ghats, Kerala

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ABSTRACT: The giant African snail *Lissachatina fulica* (Bowdich, 1822) is reported as a pest in rubber plantations adjoining forest fringes in the Western Ghats region of Kerala. The snail was causing damage to rubber (*Hevea brasiliensis)* and nutmeg (*Myristica fragrans)* trees, by feeding on rubber latex and nutmeg twigs and leaves. *L. fulica* infestation on *M. fragrans* is a new record. The snail infestation in rubber plantations is the first report from the Western Ghats region in Kerala.

KEYWORDS: African snail, rubber, nutmeg, Western Ghats, biological invasion

African snail *Lissachatina fulica* (Bowdich, 1822) is one of the largest gastropod molluscs and is considered to be one of the world's worst 100 invasive species (Lowe *et al.,* 2000). Native to coastal East Africa, it has been spreading to new areas since the early1800s (Raut and Barker, 2002). Its success as an invasive species can be attributed to their polyphagous habits, feeding on more than 500 species of plants (Lowe *et al.,* 2000)), adaptability, active dispersion and fecundity (Mead, 1979). The snail is a protandrous simultaneous hermaphroditic (Tomiyama, 1996). It acts as an intermediate host of the rat lung worm *Angiostrongylus cantonensis* causing eosinophilic meningitis in humans, especially children. When untreated, the disease can be fatal (Lv *et al.,* 2011). The snail thrives in warm and humid tropical climates and is active within a temperature range of 9 to 29° C, primarily nocturnal, it is also active throughout the day in wet conditions. They aestivate in extended dry conditions, when they may bury into the soil (Raut and Barker, 2002). Other than Antarctica, *L. fulica* have been recorded in all continents and are highly invasive in at least 52 countries (Global Invasive Species Database, 2019). The first recorded introduction into India was in 1847 into a garden in Calcutta (Naggs, 1997). The snail reached south India during the British period in My Lady Garden in Madras and later spread rapidly into many localities of Tamil Nadu (Raut and Ghose, 1984), reached Kerala during the 1950s. The first invasion in the 1960s as a pest was limited but a second wave of invasion or population explosions was observed during the 1970s. The present wave of invasion or population explosions started in 2005 and *L. fulica* is persisting

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as an agriculture pest in home gardens and in human settlements. Field surveys conducted in the states of Kerala and Tamil Nadu during the years 2016 to 2018, observed the presence of giant African snails (Keerthy *et al*., 2019).

During 2013 to 2019 surveys conducted revealed infestation of *L. fulica* in 269 localities in 13 out of 14 districts in Kerala (Table 1). During October 2019 and June 2020, *L. fulica* was reported feeding on rubber (*Hevea brasiliensis)* and on nutmeg trees (*Myristica fragrans)* in the rubber plantations belonging to the Plantation Corporation of Kerala. The locality is in one of 5 forest ranges in the Athirappilly forest range of the Vazhachal forest division in Western Ghats region of Kerala that adjoins moist deciduous forest. The coordinates of the locality were 76° 31' 22.537" East longitude and 10° 15' 51.948" North latitude at an elevation of 104 meters above mean sea level. The area from which the snails were reported is thick in vegetation with rubber, nutmeg and passion fruit *Passiflora* sp. Rubber and passion fruit trees have been recorded as economically important plants affected by the *L. fulica* (Raut and Barker, 2002). However, out of the hundreds of plant species affected by the snail so far (CABI, 2021), the nutmeg tree *M. fragrans* being damaged by *L. fulica* is reported here for the first time. Nutmeg is an economically important spice crop in Kerala and the potential for *L. fulica* to be a pest of nutmug is a matter of concern.

Table 1. Distribution of *Lissachatina fulica* in Kerala

District	*No.
Kasaragode	6
Kannur	16
Waynad	1
Kozhikode	10
Malappuram	6
Palakkad	61
Thrissur	11
Ernakulam	38
Alappuzha	15
Kottayam	1
Pathanamthitta	15
Kollam	18
Thiruvananthapuram	71
TOTAL	269

*No. of infested localities

Following repeated floods in Kerala in 2018 and 2019, *L. fulica* have appeared in new areas and at much higher density in some locations. In Kasaragode and Kollam districts, the snails were found to be in huge numbers and feeding on latex secreted from rubber trees causing damage. Routine transport of a range of material across plantations provides an unintended mode of transfer of *L. fulica* between plantations. In presenting favourable conditions, protracted rainfall increases both the incidence of dispersal and rapid population growth. The recent massive floods in Kerala will also have increased the opportunity for rapid and wide-ranging dispersal by flood waters. For example, the Chalakkudy River in flood could have transported *L. fulica* to forests in the Vazhachal forest division.

L. fulica was introduced into Sri Lanka in about 1900 (Green, 1911; Naggs, 1997) and was recorded as 'attacking rubber trees' in large numbers in the 1940s. The initial population explosions in Sri Lanka subsequently crashed to lower densities (Cotton, 1940). Nevertheless, *L. fulica* persists, often in large numbers, throughout Sri Lanka from coastal margins to the Central Highlands at over 1,000 m; it occurs in all climate zones and all surveyed habitat types (Naggs *et al*., 2003; Naggs and Raheem, 2005). In south America, *L. fulica* has become established in highly transformed urban areas adjacent to Paranese rainforest (Gregoric *et al.,* 2011) and in Amazonia (Goldyn *et al.,* 2017). In India, *L. fulica* has mainly been reported as a pest in mulberry gardens (Narendrakumar *et al.,* 2011), banana plantations (Padmanaban *et al.,* 2000), vanilla plantations (Vanitha *et al*., 2011) and agriculture gardens (Sridhar *et al*., 2012). Infestations in rubber plantations and the consumption of rubber seedlings have been reported from many places across the globe (Raut and Barker, 2002).

This is the first report of *L. fulica* infesting rubber plantations in Kerala and feeding on rubber latex, and nutmeg twigs and leaves, from plantation forests of the Western Ghats region in Kerala. Two other native molluscan species *Mariaella dussumieri* and *Crypotazona bistrialis* are limited pests to rubber in India (http://www.celkau.in/Crops/Plantation Crops/Rubber/pests.aspx).

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