

Invasion of Giant African Snail Species (*Achatina fulica*) in Scheduled Area of Rajasthan, India: Threat to Forestry, Agriculture and Horticulture

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Abstract

Rajasthan is the largest state in India with 50 districts. Out of these, nine districts namely Banswara, Chittorgarh, Dungarpur, Pali, Pratapgarh, Rajsamand, Sirohi, Salumber and Udaipur are included in the special tribal area called "Scheduled Area". It is the most backward, uneducated, underdeveloped and deprived area where >70% of the tribal people live. These people are economically dependent on forest produce, agricultural and horticultural crops and animal husbandry. Many of these people suffer from many types of infectious and non-infectious diseases. Dracunculiasis, a disease caused by infection with the human nematode parasite *Dracunculus medinensis*, was also very prevalent in the region a few decades ago. Though the disease has now been eradicated from the country, it has been replaced by a new threat, the fluoride-induced health problem called fluorosis disease, which is very prevalent in the scheduled area. In recent years, another threat has also emerged in the region and that is the "Giant African Land Snail Species (*Achatina fulica*)" which is highly invasive, voracious, and a pest to forest biodiversity or native plants, agricultural and horticultural crops and disrupts the livelihood of the tribals. Earlier this species was restricted to Udaipur city of Rajasthan (India). Now this species is rapidly spreading and flourishing in the villages, forests, and agricultural fields of the scheduled area around this city as this exotic species of snails has developed tremendous reproductive capacity, due to which it increases its population rapidly in a short period of time. If this species continues to spread and flourish in the scheduled area, then in the coming few years it will become another big threat to the tribals. Because this species rapidly destroys the forest vegetation/plants and agricultural and horticultural crops on which the tribal people depend on economics and food. Hence, before this problem becomes more serious and uncontrolled, the tribal, agriculture, horticulture and forest departments of the state and central governments need to be alert. The main purpose of the present editorial is to draw the attention of these departments concerned towards this problem and its solution.

Keywords: Agricultural and horticultural crops; Forestry; Giant African snail (*Achatina fulica*); Invasive; Pest; Rajasthan; Scheduled area; Threat; Tribals; India

Introduction

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 Stylonatophora of the class Gastropoda of the phylum Mollusca of animal kingdom and are native to East Africa, especially Kenya and Tanzania [1]. This snail species can be easily identified by its ovoid-conical shell of pale-yellow colour with brown transverse stripes (Figure 1). The stripes are irregularly crisscrossed with fine spirals except 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 top 100 most invasive alien species of the world [2], and it is a major threat to forest or native

plants and agricultural and horticultural crops. This species is spread in the tropical and subtropical region of the world [3].



Figure 1: Juvenile, adult and well mature giant African land snails (*A. fulica*) collected from one of the gardens of Udaipur city, Rajasthan (a), they can also be found stuck in the cracks of rocks (b), they also eat the vegetation growing on the rocks (c) and the leaves of the trees in the gardens (d). Copulation in individuals in agriculture field (e).

In India, this exotic snail species was introduced by British malacologist William Benson. A pair of the snail was introduced from Mauritius to Kolkata (Calcutta) in 1847 [1,4]. Owing to its extremely high fecundity, the species is now widely distributed in several states of 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 Car Nicobar [1,5-7]. From central India (Chhattisgarh and Madhya Pradesh), the presence of the snail has not been reported yet.

Rajasthan is the largest state in India and is naturally divided into two eco-geographically distinct regions. The western region has a desert environment while the eastern region has a humid environment [8]. The latter region also includes the city of Udaipur, where the Giant African Land Snails were first observed by a few individuals around the canal banks in 1996. The report on this was published in a research journal [9]. In the following years, reports of the gradually increasing population of these snails in many tribal villages, gardens, parks, forests and agricultural fields (Figure 1) in and around the city have been reported from time to time in local newspapers as well as scientific research journals [10-12]. However, now the species has started spreading in the agricultural and forest areas of the tribal or scheduled area located in Udaipur district, where mainly tribals live. These creatures are seen in

thousands during the rainy season. The rapid growth of such a large population in this area shows that the species is well adapted to this humid environment. In such an ideal environment, the species becomes more active and develops rapidly. The increasing number of these snails is another new threat to the forest biodiversity or native plants and agricultural and horticultural crops in the scheduled area of Rajasthan, which will become more challenging in the coming time. Hence, before this problem becomes more serious and uncontrolled, the tribal, agriculture, horticulture and forest departments of the state and central governments need to be alert. The main purpose of the present editorial is to draw the attention of these departments concerned towards this problem and its solution.

Scheduled area and invasion of giant African snails

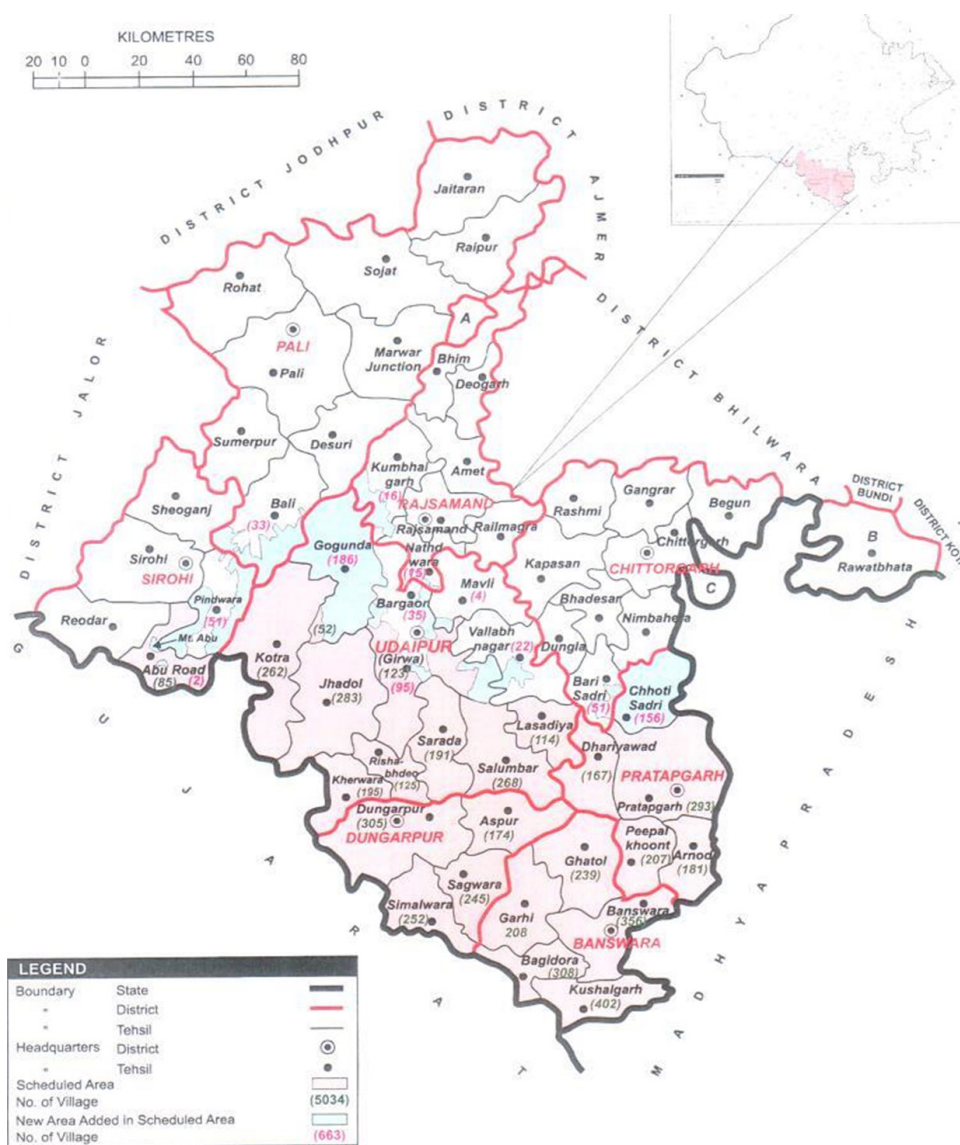


Figure 2: Map showing scheduled area of Rajasthan (as per notification of Government of India, 2018).

In India, Rajasthan is the largest state and has a total of 50 districts. Out of these, nine namely Banswara, Chittaurgarh,

Dungarpur, Pali, Pratapgarh, Rajsamand, Sirohi, Salumber and Udaipur districts are situated in its southeastern part, which are

included in the "Scheduled Area" of Rajasthan (Figure 2). It is the most backward, underdeveloped and deprived region of Rajasthan, dominated by diverse tribal communities. According to the 2011 census, the total population of the Scheduled Area is 64,63,353, out of which the scheduled tribe population is 45,57,917, which is 70.43% of the total population of the Scheduled Area. Three districts of this region, namely Banswara, Dungarpur and Pratapgarh are known as fully tribal districts and the rest are partially tribal districts. Economically these people are mainly dependent on animal husbandry, agriculture, horticulture and forest produce. Many infectious and non-communicable diseases are prevalent among these people [13-31]. Four decades ago, this entire region was plagued by an infestation of a dangerous human nematode parasite, the *Dracunculus*-worm (*Dracunculus medinensis*), and the disease caused by this worm, dracunculiasis, was found in almost every household. Thousands of tribal and non-tribal people, men and women of all ages, were suffering from this disease [32-34]. Though the disease has been eradicated in India, it has been replaced by a new threat, the water-borne fluorosis disease, which is highly prevalent in this scheduled area [35-45]. Now, in recent years, another new threat has entered this tribal region and that is the "Giant African Snail Species (*A. fulica*)" which is highly invasive, voracious and a pest of forest or native plants and agricultural and horticultural crops [46-53] on which the tribal people depend for income and food. Whatever the case, this species ultimately hampers the livelihood of the region. Recently, thousands of snails have been found in several tribal villages and agricultural fields located in the scheduled area. This area is more suitable and ideal for the species as it is humid where the species becomes more active than in dry environments [47]. The rapid invasion of *A. fulica* in this region can also be attributed to its high reproductive capacity and the tendency of people to release the snails into the forest and agriculture areas [46,47].

How did this species become invasive and pest?

This land snail species has developed many such characteristics over time, due to which it has become an invasive and pest species. The International Union for Conservation of Nature (IUCN) has also included this species in the list of invasive and pest species. These snails have developed an amazing ability to survive even in adverse conditions. These snails are relatively large in size, calm in nature, attractive, strange and colorful, due to which people often take them with them and drop or throw them at other places due to which these creatures reach from one area to another. 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. During the day, they remain hidden and lethargic in safe places (Figure 1b). Due to this, they remain safe and do not easily become prey to anyone. These creatures are homosexual, but for reproduction they need a partner of their own age. Due to the amazing ability of these snails to reproduce two to three times a year, they create a large population in a short time. If they do not find a partner for breeding, these snails can also self-fertilize, which

can save their species from extinction. They lay round yellow eggs in small clusters of 300 or more, usually surrounded by mucous substances, under dry leaves or soil or any substance. 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. According to available information, these snails consume more than 500 species of plants [54]. This is the reason why their population poses a great threat to the destruction of forest or native vegetation and agricultural and horticultural crops. Interestingly, they eat the leftover food and green waste thrown by people in cities or urban areas with great relish. Therefore, neither do they face any shortage of food in urban areas, nor do they face any problem in living and breeding. This is the reason why their population increases rapidly even in urban areas. Due to these characteristics or key characteristics, this snail species has become invasive and pest to forestry, agriculture and horticulture.

It is a wonder of nature in biological evolution that while on one hand some terrestrial snail species are destructive to biodiversity, on the other hand various species of aquatic snails are responsible for spreading a number of dangerous and life-threatening diseases called trematodiasis not only in humans but also in wild and domestic animals. In the absence of effective treatment, humans and animals often die due to infection with these diseases [55-60].

Conclusion

The most backward area of Rajasthan state is the Scheduled Area in which >70% of the people are tribals. These people in this area have been struggling with many types of problems whether it is health problems or problems caused by nature. Their main source of livelihood is the produce of forests, agriculture and horticulture. But in the last few years, a species of giant African land snail (*A. fulica*) has invaded this area, and its population is increasing rapidly year by year, which has become a big threat to forestry, agriculture and horticulture. Because this species is rapidly destroying native plants and agricultural and horticultural crops and forest trees of this tribal area and is hampering the livelihood of tribals. If the increasing population is not checked now, it will become a big threat to the area in the coming years and will have a profound effect on the livelihood of the tribal people. Therefore, in the near future, the concerned departments like Agriculture, Horticulture, Forest and Tribal need to make coordinated efforts, proper management and concrete action plans to control or eliminate the population of *A. fulica* to prevent further devastation of this invasive species in this scheduled area.

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