



◀ Lantana (*Lantana camara*)

Climbing hemp weed
(*Milkania micrantha*) ▶

Congress grass (*Parthenium
hysterophorus*) ▼



Siam Weed (*Chromolaena
odorata*) ▼



PHOTOGRAPHS: THINKSTOCK PHOTOS

Alien among us

For the first time, a citizen science initiative maps risk areas of invasive alien species in India

CITIZEN SCIENCE initiatives are rare in India. But what is unusual about India Biodiversity Portal's Spotting Alien Invasive Species (SPAIS) project is that it is the first one focusing on invasive alien species. Launched in August, 2015, SPAIS' aim was to map the occurrences of 20 common and easily identifiable alien invasive species. The SPAIS campaign received enthusiastic participation, with 473 observations from across the country. A large number of observations came from Maharashtra and states in south India.

About 284 different species were observed, of which 153 were either catego-

rised as "invasive" or "naturalised/invasive". The top 10 species in terms of the total number of observations attests to how ubiquitous they are. Participants used smartphones with cameras to collect photographic evidence of species, thus enabling experts to verify them. Though the results were reported in September 2015, SPAIS is an ongoing effort (see "Tracking the intruder").

The SPAIS project draws inspiration from the Southern African Plant Invaders Atlas (SAPIA), a multi-decade effort to systematically map the occurrence of 600 introduced species with the help of citizen volunteers. It stands out particularly for its comprehensiveness and its scope. The SAPIA database to-

day comprises 60,000 records of species in South Africa and neighbouring Lesotho and Swaziland. SAPIA has now become an important tool for the management of invasive species and an invaluable resource for researchers.

Growing menace

Alien species are spreading rapidly and are having undesirable ecological and societal impacts. With globalisation and increased trade and travel, the rate at which invasive species are now spreading around the world is unprecedented. The rapid spread (and impact) of invasive species is likely to be further compounded by climate change. So



◀ African giant snail (*Achatina fulica*)
Water cabbage (*Pistia stratiotes*) ▶

▲ Mesquite (*Prosopis juliflora*)

▲ Water hyacinth (*Eichhornia crassipes*)

Pink morning glory (*Ipomoea Carnea*) ▶

▲ Goat weed (*Ageratum conyzoides*)

Tracking the intruder

How the citizen science initiative mapped risk areas and where they found the alien invasive species

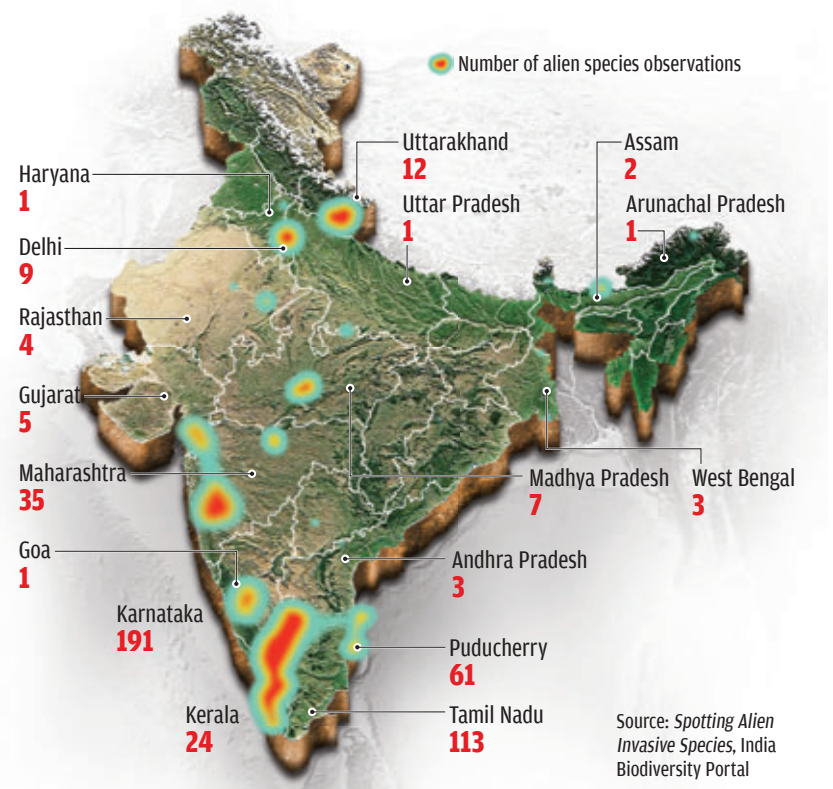
CAMPAIGN METHOD

Spotting Alien Invasive Species (SPAIS) group set up on the India Biodiversity Portal (IBP); experts and resource persons invited to join the group

Citizen science campaign announced on IBP portal, which has over 7,000 registered users; campaign outreach through press and social media

Information on 20 invasive species put up on IBP portal. Users upload their observations along with photographs of species; 473 observations received from across the country

Citizen observations validated by experts; all observations uploaded were geo-tagged; about 284 different species were observed, of which 153 species were either categorised as "invasive" or "naturalised/invasive"



Source the people

Crowd sourcing helped develop risk maps for the giant African snail

CROWD-SOURCING can help map the distribution of several alien species. Take for instance the highly invasive giant African snail (*Achatina fulica*), which was introduced in India in 1847. Researchers geo-tagged information on its distribution across India using data from various Internet and social media sources along with published records. They used the technique of ecological niche modelling to develop risk maps of the giant African snail under various climatic scenarios. Their mapping can help experts take appropriate action to control the species.

Nearly 50 per cent of data on temporal and spatial distribution of the giant African snail, which have been used to develop these maps, has come from crowd-sourced information. This highlights the tremendous contribution that citizen scientists can make towards mapping and managing invasive alien species.



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much so, that the Convention on Biological Diversity now recognises alien invasive species as among the most significant threats to biological diversity.

Take for instance *Lantana camara*, a large perennial shrub native to Central and South America. It was introduced in India by the British in 1809. It is today found everywhere—from the foothills of the Himalayas to the tropical forests of south India. *Lantana camara* alters the three-dimensional physical structure of forests, and is associated with wiping out native plants, reducing the quantity of forage available for herbivores. This has a cascading effect on the ecosystem, potentially resulting in increased human-animal conflicts, with large herbivores raiding crop fields, and large predators resorting to preying on livestock.

Lantana camara is one among countless alien invasive species that are disturbing the balance of ecosystems. Alien species are also called non-native species or non-indigenous or exotic species. They are plants and animals that have been transported to regions outside their natural range of distribution. Many alien or non-native species are intentionally introduced by people for food, timber, medicines, or as pets or ornamental species. But not all non-native species are harmful. A large number of species are valu-

able and account for many of the foods we eat, the plants that add colour to our gardens and the fibers that we use.

Threats to diversity

The SPAIS campaign is significant as it focuses on invasive species. A well-known example is the congress grass (*Parthenium hysterophorus*) from Mexico, believed to have been accidentally introduced to India with a consignment of wheat. It is now a widespread weed that is a common cause of allergies. Water hyacinth (*Eichhornia crassipes*) is another alien invasive species, which was deliberately introduced in the 1800s for its attractive flowers. It now clogs waterways across the country.

Not just plants, animals too can become invasive. Take the case of the giant African snail (*Achatina fulica*). A pair of these snails was reportedly introduced in Kolkata in the late 19th century. Today, these snails have spread across large parts of the country,

Participants of the science initiative used smartphones to collect photographic evidence of species, thus enabling experts to verify them

fouling waterways and damaging crops, both by feeding on them and by acting as a disease vector. Crowd sourcing of information has yielded important insights (see 'Source the people').

A 2013 analysis estimated that economic losses due to invasive species in the agricultural sector alone in Southeast Asia amounted to about US \$23.4-33.9 billion per annum. Invasive species also have an adverse effect on the livelihoods of communities that depend on forests. For example, in the Biligiri Rangan Hills of Karnataka, researchers have found that *Lantana camara* may be affecting the regeneration of *amla*, an important fruit that local people consume. Invasive species also affect services that ecosystems provide to communities.

In South Africa, for instance, researchers have demonstrated that the spread of introduced trees (especially pine, eucalyptus and *Lantana camara*) in upstream catchments has had a detrimental impact on Cape Town's water supply. More systematic collaborations between researchers and citizens could provide vital information to manage and control problematic invasive alien species. ■

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