

The absence of elephants and rhinoceroses reduces biodiversity in tropical forests

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Habitat loss, poaching, and the conflict between elephant and man has caused a 95 percent loss in Asian elephant (*Elephas maximus*) historical distribution range. Credit: Ahimsa Campos-Arceiz

The progressive disappearance of seed-dispersing animals like elephants and rhinoceroses puts the structural integrity and biodiversity of the tropical forest of South-East Asia at risk. With the help of Spanish researchers, an international team of experts has confirmed that not even herbivores like tapirs can replace them.

"Megaherbivores act as the 'gardeners' of humid <u>tropical forests</u>: They are vital to <u>forest regeneration</u> and maintain its structure and <u>biodiversity</u> ", as was explained to SINC by Ahimsa Campos-Arceiz, the lead author of the study that was published in the '*Biotropica*' journal and researcher at the School of <u>Geography</u> of the University of Nottingham in



Malaysia.

In these forests in East Asia, the large diversity of <u>plant species</u> means that there is not enough space for all the trees to germinate and grow. As well as the scarce light, seed dispersion is made more complicated by the lack of wind due to the trees that are up to 90 metres high. Plant life is then limited to seeds dispersed by those animals that eat pulp. They either scatter seeds by dropping their food, regurgitating it or by defecating later on.

In the case of large seeds, "plants need a large animal capable of eating, transporting and defecating the seeds in good conditions," as outlined to SINC by Luis Santamaría, co-author and researcher at the Mediterranean Institute for Advanced Studies (IMEDEA) of Spain's CSIC Scientific Research Agency. This is where <u>elephants</u> and rhinoceroses come into play because they can scatter large quantities of seeds thanks to the fact that they slowly digest very little of their food.

However, habitat loss, poaching, and the conflict between elephant and man has caused a 95% loss in Asian elephant (*Elephas maximus*) historical distribution range and has left the rhinoceros just a step away from extinction: there are less than 50 Java rhinoceroses (*Rhinoceros sondaicus*) and 200 Sumatra rhinoceroses (*Dicerorhinus sumatrensis*).

According to the red list of the International Union for Conservation of Nature (IUCN), elephants are in 'danger of extinction' and the two rhinoceros species are 'critically endangered'.





Asian tapirs are not good dispersers for plants with large fruits and seeds. Credit: Ahimsa Campos-Arceiz

Asian tapirs are no elephants

In light of the situation, the research team evaluated the seed-dispersing capacity of another large herbivore weighing 300 kg. For cultural reasons it is not hunted and has a similar digestive system to that of elephants and rhinoceroses: the Asian tapir (*Tapirus indicus*).

The study allowed researchers to analyse the effect of dispersion by tapirs on the seed survival of nine different plants. This included some large plant species such as the mango tree and durian, as well as other smaller species like the 'elephant apple' (*Dillenia indica*).

Among other outcomes, the results show that tapirs defecated 8% of the tamarind seeds ingested (none of which germinated) compared to elephants, who defecated 75% of the 2,390 ingested seeds (65% of which germinated).



"The Asian tapirs spit, chew or digest the majority of large seeds. This either destroys them or leaves them in the same place. As a result, they are not good dispersers for plants with large fruits and seeds," confirms Campos-Arceiz. In this sense, "given the role that they play they belong to a different group to elephants and rhinoceroses."

Stopping illegal hunting is the priority

"If these megaherbivores disappear from the ecosystem, their contribution to ecological processes will too be lost and the path of the ecosystem will change irreversibly," explains the lead author, who goes on to state that "the most probable consequences are the change in the structure of the undergrowth and the forest and the loss of certain species." Elephants and rhinoceroses play a unique ecological role that cannot be replaced by other species.

Without large herbivores, new large seed plants will always grow in close proximity to the mother plant and are therefore "unable to colonise available space in other forest areas," warns the IMEDEA researcher.

In this respect, those species that depend on large animals will become increasingly rare whereas those that depend on the wind and smaller, abundant animals will increase in terms of density and dominance. Campos-Arceiz asserts that "at the end of the day, the composition and structure of the forest changes and ends up becoming less complex on a structural and functional level: this translates as a loss of biodiversity."

To avoid such a scenario, researchers suggest that megafauna should be protected and in some cases megaherbivores should be reintroduced into areas from where they had previously disappeared. "In the south-east of Asia, the priority is to stop illegal hunting and mitigate the impact of habitat loss," indicates the expert, criticising the "absurd" motivation to kill in order to sell their horns and tusks for traditional medicine ("with



no therapeutic benefits") or to make ornamental products. This also highlights the need to combat illegal trade in a "much more determined way."

More information: Campos-Arceiz, Ahimsa; Traeholt, Carl; Jaffar, Razak; Santamaría, Luis; Corlett, Richard T. "Asian Tapirs Are No Elephants When It Comes To Seed Dispersal" *Biotropica* 44(2): 220-227 DOI: 10.1111/j.1744-7429.2011.00784.x 2012

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