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Raspberry invasion

How a berry can destroy an ecosystem

The Galápagos Archipelago is a collection of 13 main islands and more than 100 volcanic islets located in the Pacific Ocean. Galápagos inspired Charles Darwin's momentous Theory of Evolution by Natural Selection, and is a haven for terrestrial and marine wildlife including the famous giant tortoises.



The Galápagos Islands are home to a range of endemic plant and animal species, including giant tortoises.

For over 400 years, people have been visiting the islands but multiple attempts at setting up permanent colonies have failed. In the 20th century, new technology and a re-kindled frontier spirit amongst Europeans and South Americans led people back to the Galápagos Islands, this time to set up colonies that would remain and thrive. They brought their cats and dogs, their pigs and other livestock. They brought seeds for the crops that would one day feed them. They tried

to surround themselves with familiar animals and plants, unaware of the impact that certain species would have on the delicate Galápagos ecosystem that had remained almost completely isolated for millions of years.



Invasive species, including dogs, have damaged the delicate ecosystem of the Galápagos Islands.

Key words

invasive species
alien plants
ecosystem
biological control

Invasive species are present across the globe.

The word 'invasive' describes an alien animal or plant, moved to a new site, which then thrives within the new site, challenging and damaging the native species. In some cases, invasive species cause little damage to the local species, but in other areas of the world, local species may suffer almost irreversibly.



Galápagos Conservation Trust

*The hill raspberry, *Rubus niveus*, was originally planted by settlers in Galápagos for its berries.*

Introduction of mora to Galápagos

No-one thought that household cats left to fend for themselves would turn to hunting endemic marine iguanas. No-one considered that feral pigs could one day feast on the eggs of giant tortoises. Certainly no-one suspected that a raspberry would become one of the leading threats to biodiversity in this unique environment.

The flora of Galápagos was changed during the 1970s due to the introduction of the hill raspberry, *Rubus niveus*, which is known locally as 'mora'. Mora is native to a large area of Southern Asia and it is understood that the inhabitants of Galápagos at the time brought seeds over from the continent in order to cultivate the tasty berries that this species produces.

The settlers soon found that Galápagos had the perfect climate for mora. Good news for the settler's pantry, bad news for the existing wildlife and plant life of the Islands. Mora outcompeted other native and endemic species. It grew rapidly, spread quickly, and the thousands of seeds produced by each plant were easily transported. Mora has now become one of the leading threats to biodiversity in this unique environment.

Why is mora a problem?

Several studies have been undertaken looking at the impact of mora on the delicate Galápagos ecosystem, and how best to eradicate it. Mora grows into dense, thorny thickets that can reach up to 4.5 metres in height. As it grows, it becomes more and more impenetrable, starving any other species of plant of light and nutrients and becoming an impassable obstacle for ground-based organisms. Each plant is capable of producing thousands of seeds each year which can then be dispersed over long distances by the organisms that have feasted on the sweet berries including birds, humans and even giant tortoises.



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Mora thickets can become extremely dense, causing issues for native plant and animal species.

Once seeds have been dispersed to a suitable patch of soil, approximately 80% of seeds will germinate. If the conditions are not ideal, the seeds can stay dormant for up to 10 years. With this level of resilience before the seed has even taken root, the plant proves very hardy and immensely tricky to control. Incredibly, within just six months of germinating, mora plants are able to produce fruit and the cycle of seed dispersal continues.

Understanding and tackling mora

When considering all methods to remove the damaging mora, it is important to find a solution that will effectively remove this alien species while causing the least amount of damage to other existing species.

Removing mora by hand, also known as mechanical management, has a number of drawbacks. Given the rapid growth of the thickets and the restrictions on heavy machinery in the protected national park zone, wellington boots and machetes are often the go-to management strategy. Unfortunately, hacking away at the brambles is not enough to effectively deal with the alien plants. It will also take a number of years to clear a thicket, as it only takes an astonishing six months for any dropped seeds to grow into a plant which can re-seed. Repeat visits are necessary and time consuming.

An alternative mechanical approach would be to remove the plant at the roots and dispose of it carefully. This approach is effective but also time-consuming and not entirely guaranteed; seeds could be accidentally dropped along the disposal route, leading to further plants growing.

We can also try to remove mora by swapping our machetes for barrels of herbicide. Like cutting the mora down, spreading the herbicide is hard work and will take a large number of people to cover an overgrown area. There are various herbicides that have been shown to be effective in managing mora, such as those containing picloram and 2,4-D. However, introducing chemicals into fragile ecosystems can also have negative impacts which may be even more drastic.

If chemicals have drawbacks, what about biological controls to fight the invasive mora? Biological management would involve introducing another species to the ecosystem, perhaps one that feeds on mora. A good example of how this works in practice is when the Australian ladybug (*Rodalia cardinalis*) was introduced to the Galápagos in order to manage the population of invasive cottony cushion scale (*Icerya purchasi*), another Australian native that was threatening over 60 endemic and native plant species on the Islands.

It took over six years of research to assess whether it would be safe to release the Australian ladybug, and to date the introduction of this species has not negatively impacted native and endemic species. The potential for using fungal pathogens to control mora is currently being explored and researched.

So what's the answer?

With its capacity for rapid growth and the difficulties surrounding its removal, it would seem that total eradication of mora from Galápagos is an impossible task. However, whilst eliminating mora from the environment is the ideal goal, a study from 2012 suggests that this is not necessary to maintain a healthy ecosystem. It was found that reducing the amount of mora to just 40% of the cover in an area could achieve the balance needed for native plants to thrive. While this does rely on ongoing management, it does suggest that there is a long-term solution in the battle against mora.



Anne Parr

Unspoiled Galápagos landscape

Look here!

The Galápagos Islands are a microcosm with lessons for the world. Biologists are on the frontline of conservation for the islands and are dedicated to protecting this treasure. To learn more about invasive species, the endemic wildlife, the fascinating history and the amazing geography of Galápagos together with lots of free resources, visit discoveringgalapagos.org.uk.

The Galápagos Conservation Trust is the only UK charity working solely for the conservation of the Islands. For more information, visit Galapagosconservation.org.uk

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Turn to the back page for more about the wildlife of the Galápagos.