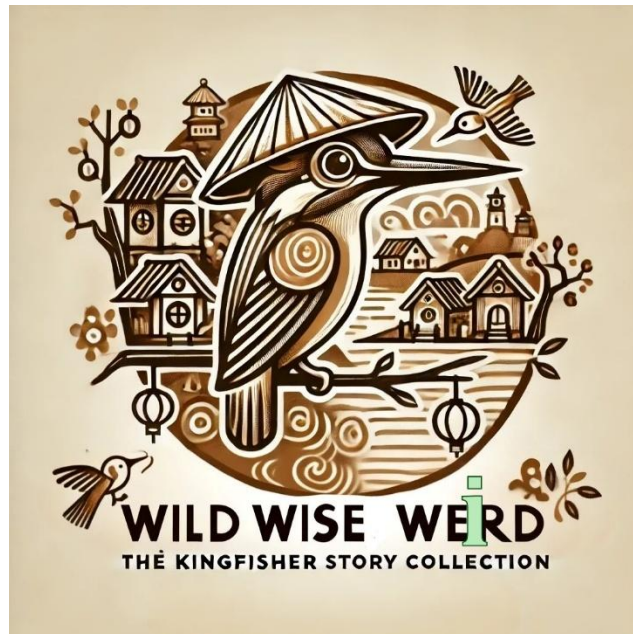


How Invasive Species Rely on, Disrupt, and Reshape Mutualisms

Mòng Két

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“– Granny, you’ve memorized the second half, so there’s no need for me to say anything. Goodbye!”

In “Ill-mannered”; *Wild Wise Weird* [1]



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In nature, cooperation between species—known as mutualism—is fundamental to sustaining biodiversity. Whether it is bees pollinating flowers or fungi nourishing plant roots, these mutually beneficial relationships underpin the functioning and resilience of ecosystems. Yet, as Aizen and Torres [2] reveal, the global spread of invasive species is closely linked to these very interactions: invaders both depend on mutualisms and often disrupt them.

Invasive species—organisms that flourish outside their native ranges—frequently rely on mutualistic relationships to establish and expand. For example, invasive plants often depend on local pollinators, soil-dwelling fungi, or seed-dispersing animals to thrive. In some cases, invaders even arrive with their own mutualistic partners, such as nonnative pines that successfully colonize new areas alongside symbiotic fungi from their native habitats [3]. Alternatively, invaders may adapt by forging new alliances with native species or, when mutualism becomes unnecessary or too costly, evolve to abandon these interactions altogether [2].

While mutualisms often enable invasive species to thrive, these same invaders can profoundly disrupt existing mutualistic networks. Invasive species frequently “usurp” native mutualists by monopolizing pollinators, seed dispersers, or other key partners, thereby diminishing native species’ reproductive success and survival prospects. A striking example is found in Patagonia, where the European bumblebee *Bombus terrestris* has displaced the native *Bombus dahlbomii*, altering plant-pollination dynamics and reducing the reproductive success of many native plants. Beyond these direct effects, invaders can also indirectly destabilize mutualisms through habitat degradation, competitive exclusion, or the introduction of novel pathogens.

A particularly alarming phenomenon is the formation of “invader complexes”—networks of mutually reinforcing nonnative species that accelerate one another’s spread and magnify their ecological impacts [4]. This process, known as an invasional meltdown, can lead to rapid biodiversity loss and compromise ecosystem stability [5].

In addition, invasive species often restructure entire mutualistic networks. Although they may increase network connectivity, these changes frequently come at the cost of functional quality, as interactions become less efficient due to mismatched traits and the absence of a shared evolutionary history. Such reconfigurations can leave ecosystems more vulnerable to further disturbances [2].

Ultimately, Aizen and Torres [2] emphasize that mutualism is both a pathway enabling invasions and a victim of them. Recognizing this dual role is crucial for understanding and predicting the ecological consequences of biological invasions. As human activities continue to accelerate species movements and reshape ecosystems, protecting these often-overlooked mutualistic interactions is vital to preserving the intricate balance between nature and humanity [6].

References

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