

Some General Impacts of Invasive Ants

1.0 Mutualism

Invasive ants may alter an ecosystem by interfering with mutualistic relationships. Mutualistic relationships involving ants are typified by the trade of services, such as protection or seed dispersal, in return for various nutritional resources (provided by the ant-dispersed and/or ant-tended plant or the ant-tended arthropod). If invasive ants are inferior to native ant mutualists but competitively superior in other ways then both species in the partnership will suffer, especially if the relationship is specialised or obligate (Ness and Bronstein, 2004).

1.1 Myrmecochores

There are about 3000 ant-dispersed plant species, known as myrmecochores. They produce seeds that have lipid-rich appendages known as elaiosomes. These are ingested by mutualistic ants, which leave the remaining seed untouched and disperse and bury the seeds. The plants are benefited by the ants' mobility, which allows increase dispersal of seeds and the burying of the seeds (which increases seed access to nutrients in the soil and confers protection from predators and fire). Invasive ants may compete with native ant dispersers, reducing the dispersal rates of myrmecochorous seeds. They may also eat the elaiosome without dispersing or burying the seed, disperse seeds across shorter distances (due to their relatively small size) or even eat the whole seed (Ness and Bronstein 2004).

1.2 Trophobionts

Trophobionts include species of mealybugs, aphids, treehoppers and scale insects and are prevalent in the Homoptera and Lepidoptera. These insects produce bodily exudates rich in carbohydrates or amino acids. Ants harvest these exudates and may protect the insects from predators or parasites. They may even transport the insects to more favourable locations on the host plant. However, the act of harvesting itself is beneficial because it protects the insect from fungal and bacterial infection. As well as this, it prevents sooty mold infections on plants associated with the trophobiont. Ant populations that are protein limited may consume the insects themselves, rather than merely harvest their exudate. The red imported fire (*Solenopsis invicta*) is a notable example of an invasive ant that prefers a protein-rich diet and that is more likely to negatively effect trophobionts. On the other hand, there are many examples of invasive ants killing or deterring trophobiont predators, although invasive species do tend to associate more frequently with exotic Homoptera than with endemic Homoptera. High densities of Homoptera, which feed on plant phloem, cause direct damage to plants and also cause plants to be more susceptible and exposed to any potential pathogens present in the environment. Because agricultural systems and the income gained from these systems have been negatively impacted due to this effect many invasive ant species have become classed as pests. On the other hand, the negative impact of increased Homoptera populations may be offset by positive changes, for example a decrease in populations of more serious plant pests such as defoliators. This effect has even provided evidence for the rationale behind the introduction of some invasive ant species, including the red imported fire ant and the Argentine ant (*Linepithema humile*), and their use as biological control agents to deter herbivorous arthropods (Holway *et al.* 2002; Ness and Bronstein, 2004).

1.2 Nectar producing plants

Many plants offer extrafloral nectar to attract carnivorous arthropods including ants, which may recognise the plants value by consuming or attacking resident herbivorous arthropods. Ant-protected plants are found in over 90 families, but it is doubtful that the act of “protecting” the plant is always motivated by mutualism. That is, a decrease in herbivorous arthropod populations is correlated with the presence of invasive ants regardless of the plant’s nectar-producing status. The advantages provided to plants by ants may include increased seed or fruit production, increased growth and decreased plant pathogenesis. Some plant species however, may receive no benefits or may be negatively impacted by invasive ants (Ness and Bronstein, 2004).

2.0 Competition with native ants

The most dramatic and widely reported direct environmental impact of invasive ants is usually the displacement of native ants due to the huge competitive advantages they possess. The local abundance of some native ants may be reduced by over 90%. In general invasive ants excel at discovering and exploiting resources and at recruiting workers. This may be achieved by having large numbers of workers or by having workers active both night and day. Although invasive ants have been introduced into all the major biogeographic regions, heat-tolerant, cold-tolerant or hypogeic native ant species may be able to survive within some climates or niches in these regions that are unfavourable to invasive ant species. For example *Monomorium* species are able to escape the competitive pressure imposed by native ants due to their tolerance of warm temperatures and ability to produce toxic defence compounds (McGlynn 1999; Holway *et al.* 2002). (Hypogeic ants forage below the ground while epigeic ants forage on the ground.)

3.0 Ecosystems

When invasive ant species reach high densities and local native ant species decrease many aspects of an ecosystem may be altered because of the important roles that ants play in the ecosystem. Ants act as predators, scavengers, herbivores, detritivores and granivores (consumers of grains, seeds and nuts) and are preyed on by a variety of specialist predators, including reptile, mammal and insect species (Holway *et al.* 2002).

3.1 Pacific Island ecosystems

More ants were transferred to the Pacific islands than to any other biogeographic region, including Australasia, the Afrotropics and the Neotropics. Oceanic islands are thought to be more vulnerable to invasive ants due to a typically low level of native ants species. This releases introduced ants from some competitive pressures. In Hawaii, where there is a complete lack of native ant species, invasive ants such as *Hypoanera opaciceps* and *Solenopsis papuana* have spread into previously undisturbed forest habitats (McGlynn 1999; Holway *et al.* 2002).

The potential impact on native invertebrates in regions lacking native predacious ants is particularly great and invasive ants have been implicated in the decline of many non-ant invertebrates. The extinction of at least one insect due to an invasive ant introduction has been reported in Oahu, Hawaii. A few species have been correlated with reduced numbers of small mammals, reptiles and birds. However, with respect to vertebrate declines, it has been difficult in most cases to determine the cause of death and the extent to which death was due to the presence of invasive ants (Holway *et al.* 2002).

References:

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