LIVING WITH THE ENEMY
What makes a good invader?

One of the most significant ways in which humans have altered natural ecosystems is by introducing organisms beyond their native ranges. Some introduced species have been spectacularly successful at invading new areas, others much less so. European Starlings introduced to Cape Town in the 1890s, for instance, are now widespread in South Africa and have colonised areas as far afield as Durban and Johannesburg. In stark contrast, the descendants of the Common Chaffinch introduced at roughly the same time persist only as a small, somewhat precarious population restricted to the immediate area of their original release on the Cape Peninsula.

What makes a good invader? There are many reasons why some species do better than others in new environments. Generalists that are flexible in their habitat and breeding requirements are more likely to establish themselves and colonise new areas than specialists with very specific requirements. However, many other factors are also involved and the avian immune system has recently been identified as a particularly important piece of the puzzle. A bird's immune system, like that of a human or any other animal, provides defence against the constant attacks of parasites.

Studies of birds and other animals have revealed that indigenous populations tend to be much more heavily infested with parasites than introduced populations. One reason for this is that the relationship between a particular parasite and its host often represents eons of co-evolution; when a bird is introduced into a new environment, the chances are that other hosts required for the parasite to complete its life cycle will be absent. Moreover, local parasites may not be able to infect novel introduced species if their life cycles are adapted to specific native hosts.

The observation that introduced populations harbour fewer parasites than indigenous ones has led to the formulation of the 'enemy release hypothesis'. This posits that one of the major reasons some introduced species rapidly invade new areas is because they can get away with investing fewer resources in immunity.

House Sparrow

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An immune system is a complex and sophisticated defence network involving many tissues and cells, and the energy and nutrients needed to maintain it often represent a significant percentage of the food a bird obtains from its environment. When parasite loads are lower in a new environment, reduced demands on the immune system mean that this 'defence budget' can be cut back, and more resources can be invested in activity and reproduction. Introduced species can therefore find themselves doing far better than the native species, which have higher immunity costs.

House Sparrows in Kenya provide strong support for the hypothesised link between immune systems and invader success. These sparrows represent a recent introduction (they only arrived in Mombasa in about 1950) and their subsequent movements are well documented. After remaining confined to the Mombasa area until the 1980s, they then spread inland, arriving in Nairobi in the mid-1990s, western Kenyan towns such as Nanyuki a few years later, and then reached Kampala, Uganda, in 2008.

American and Kenyan researchers recently took advantage of the known history of this population to test some of the predictions of the enemy release hypothesis. They compared the immune responses of Kenyan House Sparrows to those of Rufous Sparrows, a closely related and ecologically similar native species. When the immune systems of the sparrows were artificially triggered by means of an otherwise harmless chemical that causes mild, short-term inflammation, responses were significantly more pronounced in Rufous Sparrows. The weaker immune response by the introduced House Sparrows indicates the investment of fewer resources in immunity, supporting the idea that this species has to contend with fewer parasites and pathogens than its native cousin.

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REFERENCE
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