

DOUBLE WHAMMY CONSERVATION PROBLEM FOR THE ENDANGERED LEAR'S MACAW:

Urgent action to remove invasive Africanized honey bees in nesting areas



Africanized Bee © Smithsonian Institution Archives



The Africanized honey bee is a hybrid of the African honey bee (*Apis mellifera scutellata*) and the European honey bee (*Apis mellifera mellifera*). The result of this cross is an aggressive insect that has quickly spread to become one of the most successful invasive animals in the world. These bees reproduce rapidly and use a wider range of sites to build their hives compared to other bees; their spread across the world has brought them into conflict with humans and animals alike. African honey bees were first introduced into Brazil in 1956, and after accidentally hybridising with the naturalised European honey bee easily spread into other parts of the Americas.

For more than a decade, our research group has been working with the last remaining Lear's Macaw population. From the initial study, started in 2008 with the Lear's Macaw Breeding Biology project, we uncovered unprecedented information on the species' biology and ecology, leading to many new questions. Over the years we have gathered more information that has informed conservation strategies for the species.

The Lear's Macaw (*Anodorhynchus leari*) is a globally endangered species and one of the most range-restricted and threatened parrots of the world, endemic to the Caatinga dry-forest in Bahia State, northeastern Brazil, an exclusively Brazilian Biome. The species was thought to be extinct in the wild until a small group of macaws (ca. 200 individuals) was located in 1978 in the Raso da Catarina ecoregion, having already experienced an acute population decline.

The Lear's Macaws are under serious threat, endangered by several *anthropogenic* (human-caused) disturbances such as habitat loss (caused mostly by deforestation and overgrazing), capture for illegal international trade and hunting, and also

the absence of reserves to protect the licuri palm (*Syagrus coronata*), whose fruits are the main food source of the species.

Specialising in nesting in natural cavities in sandstone cliffs, these amazing birds also face another conservation problem: nesting-cavity competition with invasive Africanized honey bees (*Apis cff. melifera*), that build hives in the same cavities used by the macaws – the aggressive behavior of Africanized honey bees allows them to usurp macaws' nesting cavities, preventing them from nesting in the proximity, or even killing parrots using the same (or nearby) cavities. This makes them a serious menace to the wild Lear's population.

There is circumstantial evidence that Africanized honey bees compete with several parrot species for tree-nesting cavities and also artificial nest boxes placed to increase nest-site availability. Interestingly, there is a possibility that the bees also take over natural and artificial cavities abandoned by parrots. In addition, several bird species, including at least one parrot, associate with more aggressive nesting species (including wasps) to gain protection against predators.

The World Parrot Trust (WPT) is supporting bee eradication work with Lear's Macaws, as well as efforts on the island of Bonaire with Yellow-shouldered Amazons. Parrot recovery projects elsewhere also take special precautions to prevent bee infestations.

During our monitoring of the macaws in the 2010 breeding season, we observed the occurrence of Africanized honey bee hives in Lear's nesting cliffs, and from local residents we learned that macaws bred previously in cavities that are currently occupied by the bees. Such reports, along with the knowledge that limited nest-site availability may constrain reproductive success and breeding populations in cavity-nesting birds, lead us to hypothesize that the Africanized honey bees could be associated with the Lear's Macaws population decline to local extinctions during the 1980s.

We thus started a new study, the first of its kind, in 2016 with the support of WPT and collaborating with Caroline Efstathion and Robert French Horsburgh,

two US-based entomologists, to investigate the extent of Africanized honey bee occurrence in the macaw's breeding cliffs, and the potential nest site competition between bees and macaws.

We predicted that limited nest-site availability due to Africanized honey bee infestation might limit the macaws' population growth, particularly in the historical areas of Barreiras and Baixa do Chico – areas undergoing recent occupation by the macaws after local extinctions and that are believed to be among the macaw breeding areas most infested. Setting-up sugar water feeding stations to attract the bees complemented direct observations. This allowed us to note their 'bee-lining' (flight path) after they had gorged on sugar water; we were able to follow them back to their nest cavity, thus helping us to identify less obvious hive locations.

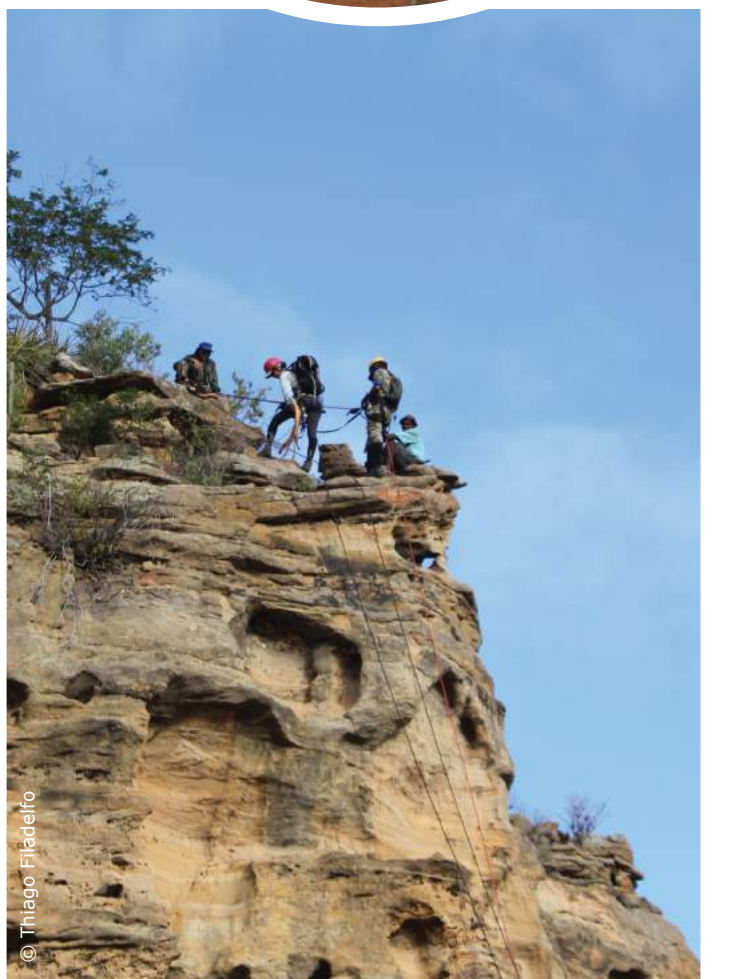
Our results show high infestation of the macaw nesting cliffs by Africanized honey bees, especially in historical sites where hives outnumbered macaw nests by about 10 times.



After this discovery we carried out beehive removal experiments, testing their effectiveness on the macaws' *nest recruitment* (the ability to access and successfully use cavities for nesting). We treated hives with *permethrin* (a chemical that resembles that found naturally in *Chrysanthemum sp.* flowers), because it has been shown to be highly effective in deterring Africanized honey bees from taking over nest boxes placed to help parrot species breed in areas where nesting trees have been lost to deforestation. It is a chemical that is safe for birds, has low toxicity to other vertebrates, and does not last long in the environment.

The experimental treatment of Africanized honey bee hives was associated with an increase in recruitment of new breeding macaw pairs by 71.4%. We concluded that the elimination of beehives from cavities previously occupied by the bees increased nest-site availability and favored recruitment of macaw nesting pairs within two years post-treatment. An intensive and ongoing eradication program is recommended to enhance macaw breeding and habitat restoration, facilitating its expansion into historical areas. 📷

Upper left: Honey gatherers drive sticks into the sandstone wall to create ladders to reach beehive combs. Once there, many realise they can reach Lear's nests to capture chicks.
Upper centre, L+R: Team members rappel down cliff walls to remove invasive bee combs from cavity entrances so macaws can start breeding. A Lear's pair rests at a cavity entrance.
Upper right: Bee combs built by Africanised honey bees can obstruct cavity entrances.
Bottom right: Once the beehives are removed, team members can safely reach the nests to conduct research.
Bottom centre: Beekeeping gear and smokers kept the aggressive bees at bay.



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