Project: Testing Small Hives as a Management Tool for Sustainable Beekeeping

Researcher: Thomas Seeley

Need:
The parasitic mite *Varroa destructor* is responsible for massive losses of honey bees in the US, spreading deadly viruses and bacteria that eventually kill entire colonies if not managed by beekeepers. Currently, the primary treatment is miticides. This approach is not sustainable because it leads to contamination of hive equipment and products, the evolution of resistance by parasites, and often has negative side effects on the bees. New, sustainable, and natural management practices are necessary for reducing disease and improving the long-term health of the beekeeping industry and agricultural sectors that rely on pollination by honey bees.

Approach:
This project (NYC-191400), led by Dr. Thomas Seeley, tested a management tool that mimics how feral honey bee colonies survive infestations of *Varroa* mites without miticide treatments. Seeley hypothesized that smaller hives, like natural nest cavities, would force bees to rear less brood and swarm more frequently, thereby providing fewer opportunities for mite reproduction. He compared the population dynamics and survivorship of two groups of genetically matched colonies that lived in small or large hives, representing wild and managed colonies respectively.

Results and Impact:
Researchers found that colonies kept in small hives swarmed more often and experienced much less mortality from viruses spread by the mites compared to colonies kept in larger hives. One of the most fundamental manipulations that beekeepers make to increase honey production is to increase hive size by as much has four times that of natural hives, thereby increasing space for brood production and honey storage and decreasing swarming activities. Unfortunately, this manipulation also improves conditions for mite infestation and boosts colony mortality. These findings provide a valuable alternative to the unsustainable use of miticides. More broadly, this work marks an important stage in the growing movement toward sustainable beekeeping, which allows bees to live more naturally and make full use of the suite of adaptations they have developed over their 30-million-year history.