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Managing Asian hornet incursions with nest dissection and microsatellite marker analysis



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The yellow-legged Asian hornet (*Vespa velutina nigrithorax*) is an invasive species that poses a particular threat to the European honey bee (*Apis mellifera*). This study reports on the management of Asian hornet incursions in the UK, including the use of nest dissection and microsatellite marker analysis (a form of genetic testing) to determine the relatedness and reproductive status of detected nests and hornets.

The yellow-legged Asian hornet (*Vespa velutina nigrithorax*) is an invasive species in Europe. Once established, the hornet [presents a threat](#) to native invertebrate species — particularly the European honey bee (*Apis mellifera*), which is vulnerable to predation. Since 2004, Asian hornet populations have colonised parts of France, Spain, Portugal, Belgium, Italy, Germany and some of the Channel Islands. Their nests and lone individuals have also been detected in other countries, including the UK.

[Pollinators](#) are vital for our food production. By helping plants to reproduce, pollinators supporting a supply of healthy and economically valuable food for humans, while supporting entire ecosystems. The [EU Pollinators Initiative](#) is a strategy for Member States to address the decline of pollinators in the EU and to support global conservation efforts.

In the study, British researchers describe the management of Asian hornet incursions, including the use of nest dissection and microsatellite marker analysis (a form of genetic testing) to determine the relatedness and reproductive status of detected nests.

In the UK, the [Non-Native Species Secretariat](#) and [National Bee Unit](#) respond to all reports of foraging Asian hornets and use trajectory tracking techniques to locate and destroy nests. Between the time of the first detection in 2016 and the end of 2019, a total of nine nests were detected. Lone adult individual hornets were sampled from seven additional sites during the same time period.



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Managing Asian hornet incursions with nest dissection and microsatellite marker analysis (continued)

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After destruction, all nests were sent to a laboratory for dissection. For each, the number of adult hornets, sex ratio, and mass of individuals was recorded. The diameter of the nest and each individual comb was also measured, and the life stages present in the nest were determined. Tissue samples from the nests and lone adult hornets were then collected for microsatellite marker analysis. Microsatellites are segments of DNA where a short section of the nucleotide (a basic building block of nucleic acid — an organic substance present in living cells such as DNA) sequence repeats and are useful for measuring genetic variation.

The results of these analyses suggest that the Asian hornet has not established a population in the UK, and that the detected nests and lone individuals are likely the result of separate incursions from the European continent. None of the nests were found to have produced the next generation of queens, and follow-up monitoring in affected regions detected no new nests in later years.

Diploid males (i.e. those having two identical chromosomal sets — indicative of inbreeding) were also found in many UK nests, while microsatellite analysis showed that nests had low genetic diversity and the majority of queens had mated with only one or two males. All nests were found to have derived from continental Europe, rather than from Asia or elsewhere in the UK.

The researchers report such insights are used to guide real-time decision making in the UK. Data on the reproductive status of the nest are used to inform the level of monitoring in the area implemented in subsequent years. Determining whether captured individuals belong to one or more nests also enables inspectors on the ground to know how many nests they are searching for. For this reason, this research may be of interest to policymakers, particularly those concerned with the management and control of invasive species and the protection of European apiculture.