DESCRIPTION FOR THE GENERAL PUBLIC

Communication in social insects has fascinated scientists and the general public for centuries. One of the most famous examples is the dance language of honeybees, a breakthrough for which Karl von Frisch was granted the Nobel Prize in 1973. Since then, our understanding of the topics and mechanisms of communication in social insects has significantly advanced for a wide variety of species. Efficient communication to coordinate the actions of up to a million specialised nestmates is fundamental to the success of social insects, especially ants which represent some of the most sophisticated societies known to biology. Various modalities of signalling have been identified in ants, including the predominant release of chemical substances, visual behavioural displays involving movement or posture, tactile interactions, and the emission of sounds and vibrations whose role has been underestimated for long time.
Vibratory messages can be generated by wagging the whole body while standing on the substrate, by scraping the substrate with the mandibles or by tapping the nest substrate with both the head and apex of the abdomen. Besides the employment of these unspecialised morphological features a specialised stridulatory organ made of a '*plectrum*' rasping across a 'file' ('*pars stridens*'), has evolved in at least five ant subfamilies.
Until now, it was thought that acoustic cues were a very minor part of ant communication, representing simple signal conveying alarm or used as a beacon by other ants for orientation but it has recently become clear that sounds and vibrations are also used to transmit more abstract information, including a species' identity or an individual's caste and status. The importance of these signals has become striking after that recent studies have demonstrated the ability of several social parasites to imitate ants' language to live for long periods, as undetected intruders, in close contact with their host ants.

The project aims at characterising the acoustic signals and production modalities of various ant species disentangling the factors that shaped the evolution of acoustic communication in ant societies.

Firstly, I will verify if sounds and vibrations vary at multiple scales, i.e. among colonies within populations, among populations within species, and at higher taxonomic levels (between species, genera and subfamilies). The entity of variation of the first two levels will be evaluated along a latitudinal gradient using *Myrmica scabrinodis*, a common red ant as a model. Secondly, the acoustic patterns of twenty-five common European ant species will be investigated and compared with signal producing structures.

I will then compare the level of within- and between-populations signal variation of *Myrmica scabrinodis* with population genetic data, testing the hypothesis that more marked differences of vibroacustic signals between populations exist due to geographical and genetic distance. In addition, I will test the hypothesis that acoustic patterns have evolved across species, genera and subfamilies following phylogenetic trajectories even though some signal characteristic may be explained by other factors (e.g. nesting and habitat preferences).

Finally, I will study the coevolution of acoustic communication in host-parasite interactions focusing on the slave-making ant *Myrmoxenus ravouxi* whose workers have to continually raid other ant (*Temnothorax* spp) nests for worker brood to refresh the labour force of its colonies. The vibroacoustic patterns of the host and the parasite will be compared and playback experiments will be performed to test whether parasite imitates the host acoustics signals or if the host's slave workers may "learn" the signals of the parasite during their development as slavers into the parasite colony.

The project aims at demonstrating that the acoustic communication in ants is much more developed and complex than previously supposed. I will seek to demonstrate that the acoustic signals in ants possess an increasing variability at multiple scales, starting from an intra-language variation – dialects – in different populations of the same species, to variability of "language families" unifying different species, until the existence of different "languages" at the genus or subfamily level.