Bat overpasses:
an insufficient solution to encourage bats across the road

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Take-home messages:

An **innovative method** which:
- permits monitoring throughout the night at a low cost
- is easily repeatable (not need to put a microphone in the middle of the highway)
- does not depend on the experience of the experimenter
- is easy to set up to obtain more information on the flight behaviour of individual bats

Bat overpasses:
- bats crossed the roads at the level of bat overpasses
- however, the proportion of bat crossings along known commuting route and un-bridged was the same as that at the overpass
- Adequate Environmental Impact Assessment studies are critical to avoid fragmentation and for the placement of mitigation measures
- this mitigation measure could not restore habitat connectivity for the two types of bat overpasses instigated in this study

Methods:

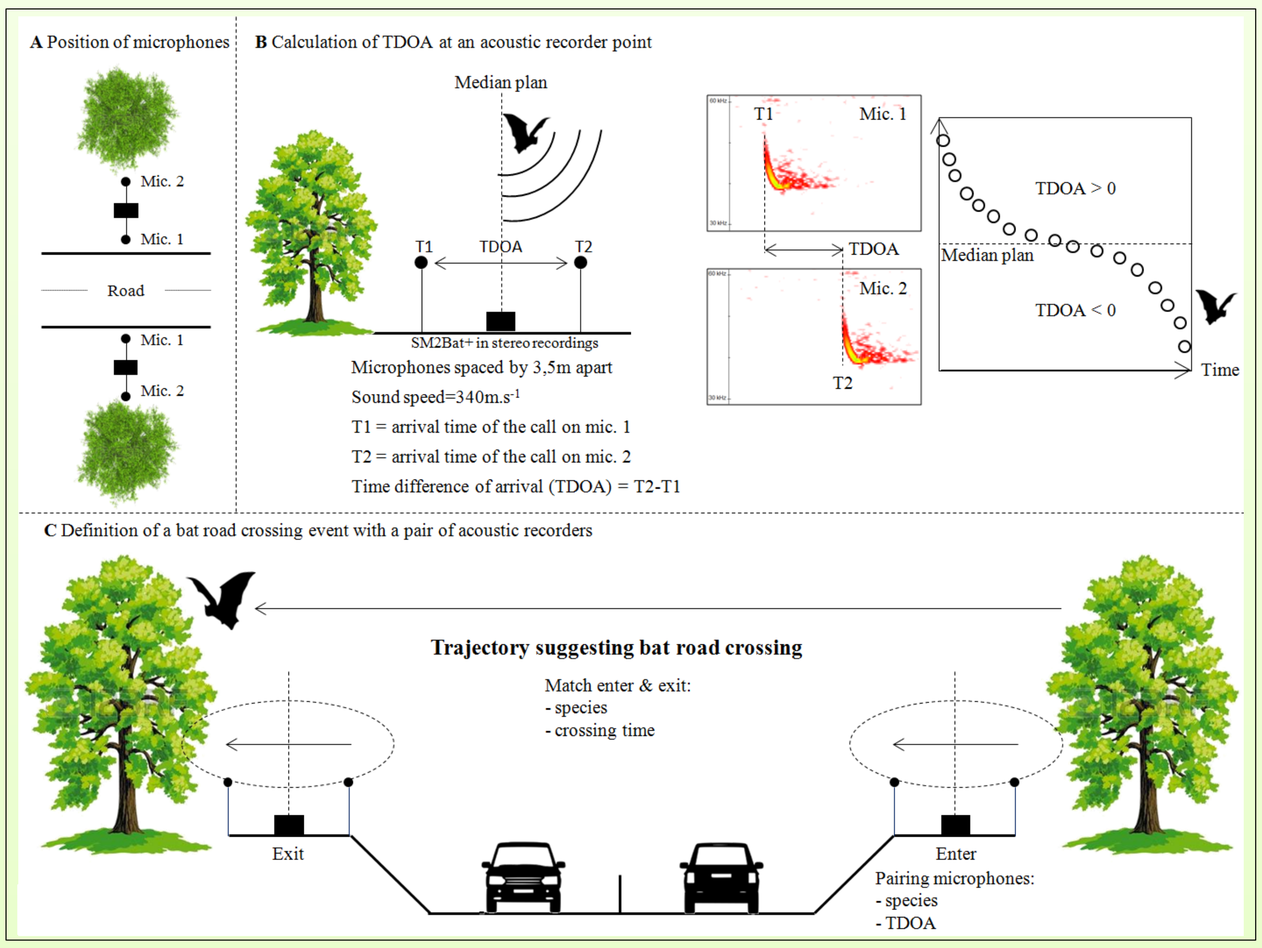

Figure 1. A. Positions of the microphones: the left channel (mic 1) facing the road and the right channel (mic 2) facing the habitat context and perpendicular to the road. **B.** Calculation of the time difference of arrival (TDOA). **C.** We define a crossing as when a bat who entered the road on one side was detected exiting the road. As it was not possible to identify individual bats based on their commuting/foraging calls, we matched entering and exiting using two criteria: species identity and time elapse.

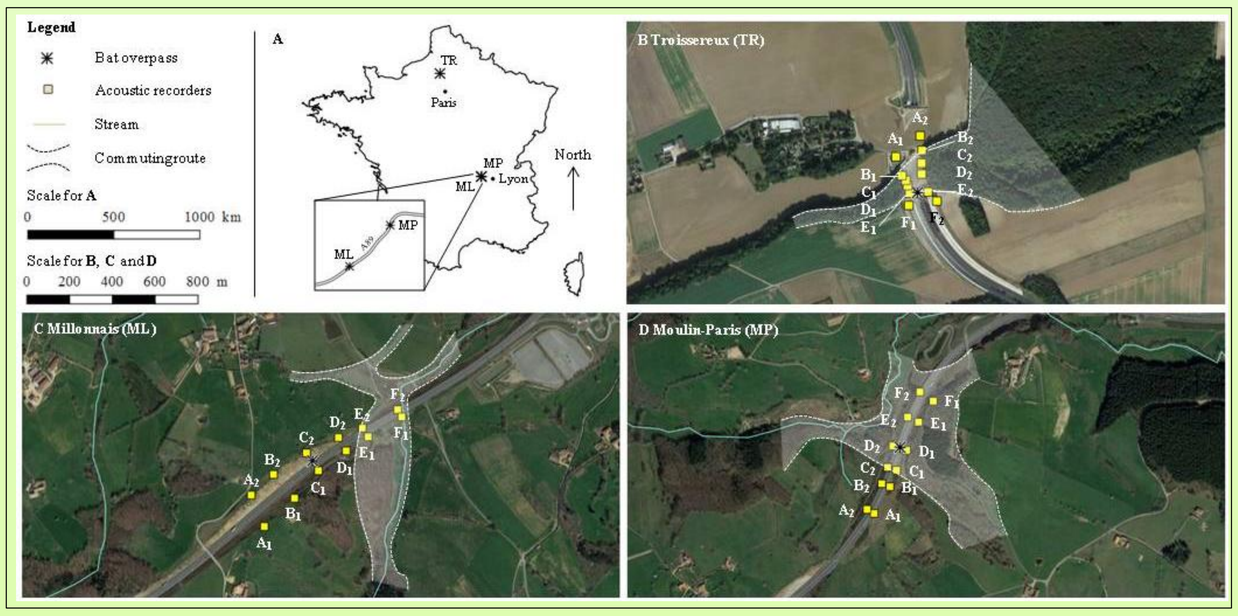

Figure 2. A. Location of the three study sites with a focus on each site and the location of overpass (**B**, **C** and **D**), the location and number of acoustic recorders in different habitat types and the commuting route for bats. Image source: Google Maps (October 2017).

Results:

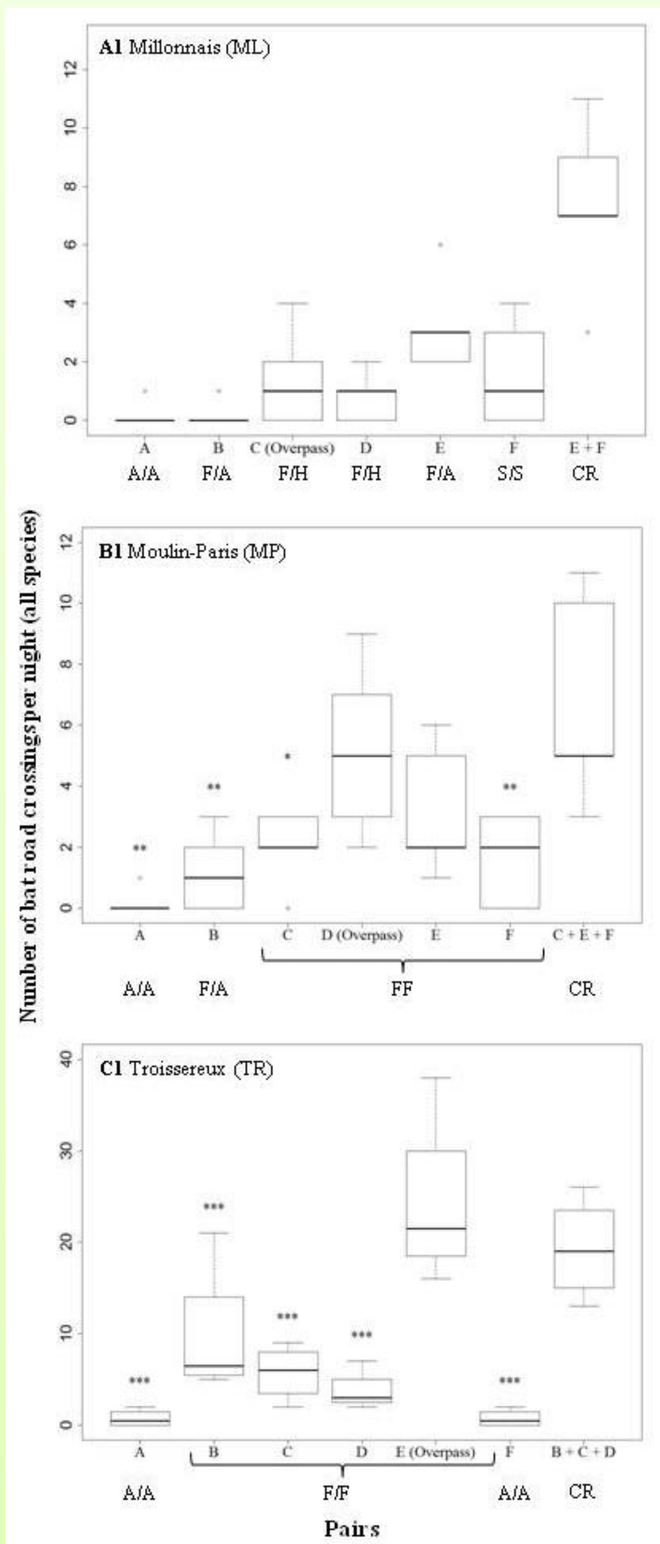

Figure 3. Number of bat road crossings per night for all bats (raw data) per pair of acoustic recorders per overpass. The habitat types (A, agricultural land; F, forest; H, hedgerow; S, stream; CR, commuting route) is included under the number of pairs. Comparisons of bat crossings between overpass and the other pairs where at site scale by GLMM (Bat crossings ~ Pairs +1|Date). Bat crossings at the overpass were used as the reference (i.e., intercept) in each model (***, $P < 0.001$; **, $P < 0.01$; *, $P < 0.05$).