

A handheld and portable gas chromatograph: A new tool for behavioural biologists



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The Issue

Analysing chemical signals in the field is difficult. Odour samples have to be collected, stored and the analysis has to be done later in the laboratory. But volatiles are sometimes hard or even impossible to collect or difficult to bring from the field to the lab. In addition, the immediate knowledge of the presence or absence of substances or the composition of a scent may sometimes be important. A portable gas chromatograph (zNose™) promises to solve all these problems. We made first trials with this handheld GC to analyse scent profiles of male sac-winged bats *Saccopteryx bilineata*. In the harem-polygynous sac-winged bat, odour is involved in male courtship and territorial defence. Males have a sac-like organ in their front wing membrane (Fig.1) with a brownish sweet-smelling liquid, whereas females have only a small inconspicuous wing-sac without a liquid (Bradbury & Emmons 1974). The male wing sacs are used for the storage and display of odour (Voigt & von Helversen 1999). The scent of a male's wing sac is probably important for mate attraction and mate choice.

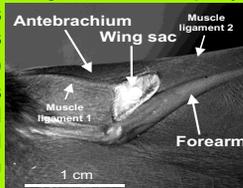


Fig.1: Male wing sac

Method

Male sac-winged bats were caught and immediately afterwards the wing-sac odour was analysed with the portable GC (zNose™). The zNose™ (Fig.2) contains all prerequisites for the collection of volatiles and the desorption and separation of scent compounds. To analyse the male odour the opened wing sac was held under the GC-inlet. The vapour sample was captured and passed through the GC column where the volatiles were separated. After the column the compounds hit a sensory acoustic wave (SAW) detector where they change the detector's inert frequency. The frequency shift caused by each analyte is characteristic of the amount of material hitting the detector; thus allowing the quantification. By calibrating the system, it is possible to detect specific substances in less than a minute. An example of two different odour profiles is shown in Fig.3..



Fig.2: The zNose™

Examples

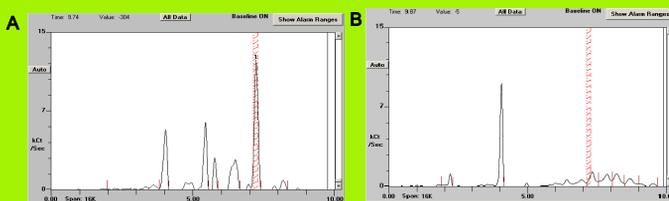


Fig. 3: Odour profiles of two different male sac-winged bats. A terpenoide (hatched part) is present in the profile of the adult male (A) and absent in the profile of the subadult male (B).

Conclusions

The zNose™ opens new possibilities in the study of chemical signals. The advantages of this system are as follows:

Analysis of volatiles can be done

1. in the field,
2. non-destructively,
3. in real time.

References

- Bradbury, J.W. & Emmons, L. (1974): Social organisation of some Trinidad bats. I. Emballonuridae. *Z. f. Tierpsychologie* 36:137-163.
- Voigt, C.C. & von Helversen, O. (1999): Storage and display of odor in male *Saccopteryx bilineata* Emballonuridae. *Behav. Ecol. Sociobiol.* 47:29-40.

Adult male sac-winged bat (mean weight 7 g)