

Acoustic communication in the pear psyllid *Cacopsylla pyri* L. (Hemiptera: Psyllidae)

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The Problem

Intraspecific communication through substrate vibrations has been observed in many Hemiptera. For Psyllidae little is known about sound production and its importance for mate finding. Jumping plant lice of this family have mainly been studied with regard to their economic importance as vectors of pathogenic phytoplasmas in fruit trees. Pear psyllids of the species *Cacopsylla pyri* L. are the most damaging pest of pear trees in Europe. Adult *C. pyri* transmit pear decline (PD) caused by *Ca. Phytoplasma pyri*. This species is monophagous on pears and produces several overlapping generations during summer. The highest pathogen transmission rate was found for the late summer generations. Therefore, knowledge of the cues used for mate finding are decisive for the design of control strategies that allow to interfere with mating behavior and reduce oviposition and thus population growth and further spread of the disease.



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Techniques

Recording of vibrational signals:

Acoustic signals were recorded with a digital laser vibrometer PDV-100 (Polytec). Signals were registered with a digital recorder and analyzed using Raven Pro 1.4.

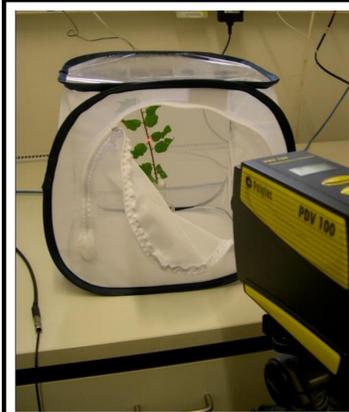
Scanning electron microscopy:

SEM pictures were taken with a Zeiss EVO LS 10 electron microscope at the Museum für Naturkunde, Berlin.

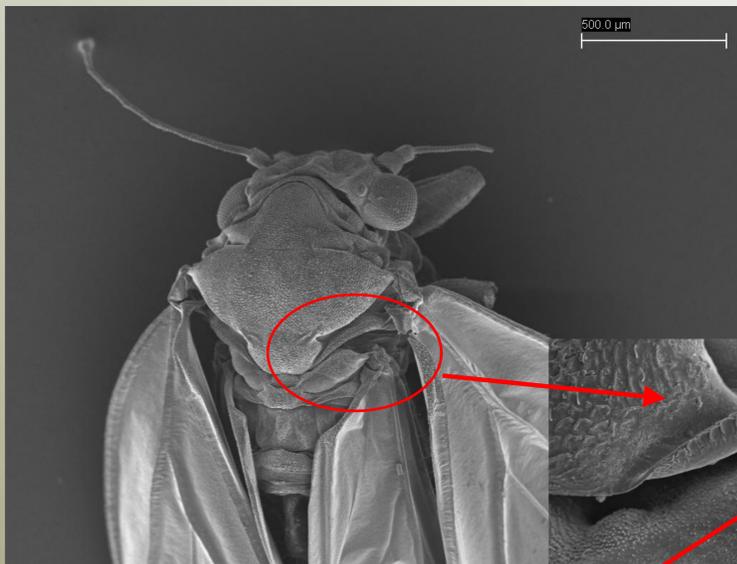
Insects:

Psyllids were reared on potted pear trees in the green house at the JKI.

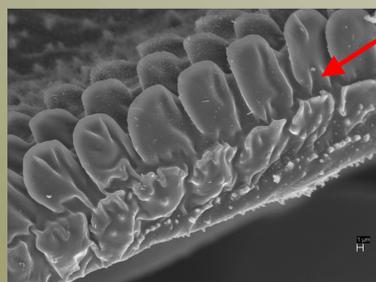
Insects and plants were transferred to the Museum für Naturkunde where sound recording took place.



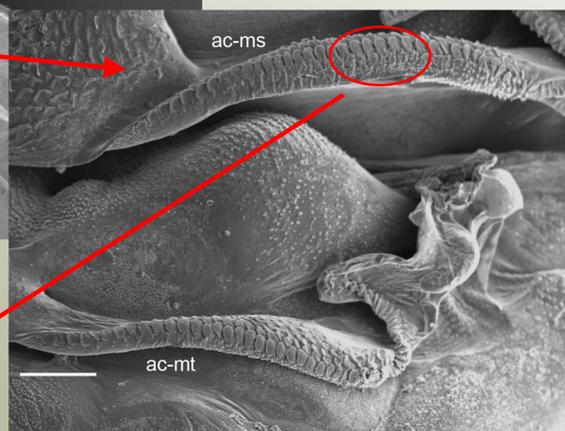
Results



SEM picture of the head, thorax and base of wings of a male of *Cacopsylla pyri* showing the axillary cords.

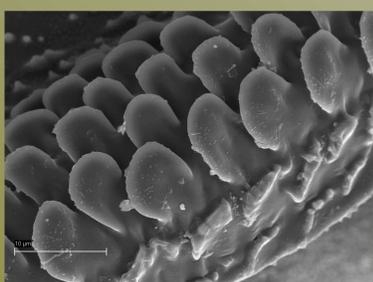


Scale-like denticles of *C. pyri*

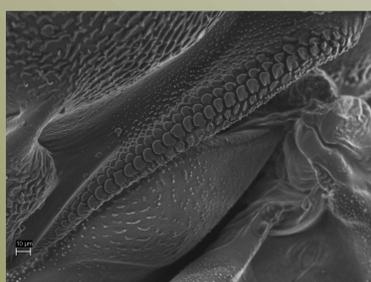


SEM picture of the axillary cords of the mesoscutellum and metascutellum of *C. pyri*. Scale bar = 50 μ m. Abbreviations ac-ms = axillary cord of the mesoscutellum, ac-mt = axillary cord of the metascutellum.

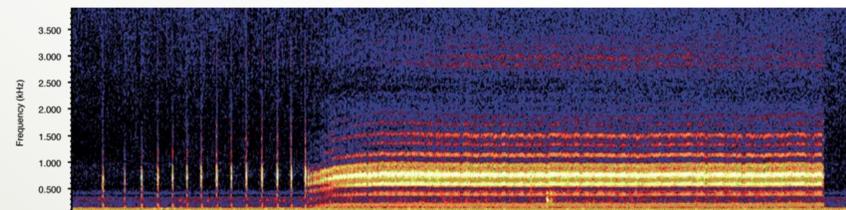
Related species:



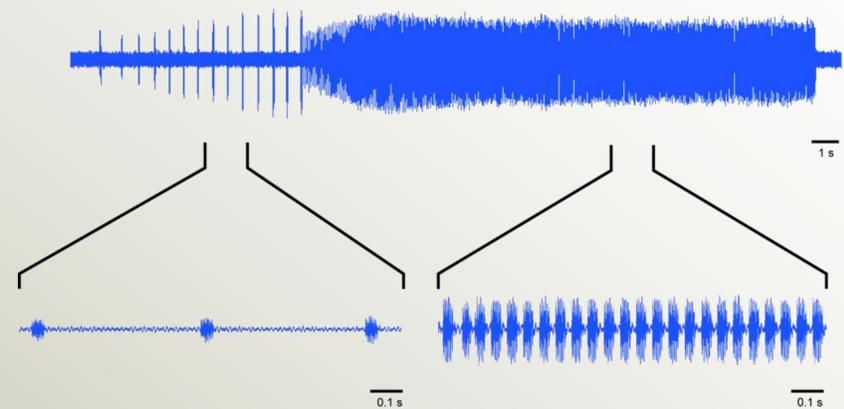
Scale-like denticles of *Cacopsylla pruni*



Scale-like denticles of *Cacopsylla picta*



Sonogram of a male call of *Cacopsylla pyri* (temporal resolution 1 s, FFT size = 2048). The strength of the colour indicates the power of a particular frequency at each point of time.



Oscillograms of a male call of *Cacopsylla pyri*. - Top. Complete call at 1 s temporal resolution. - Left. Section of the first part of the call at higher temporal resolution. - Right. Section of the second part of the call at higher temporal resolution.

Conclusions

We found first evidence for acoustic communication via substrate vibrations in *C. pyri*. The male call with an average duration of 24 s is remarkably long and showed a high repeatability. The signal has a comparably high carrier Frequency of 693 Hz. Length of the call, pulse rate and number of signals may indicate male fitness in Hemiptera. To date, we can still not conclude with certainty how the signal is generated. SEM images from possible stridulatory organs in male and female pear psyllids show no sexual dimorphism and resemble the structures observed by Taylor and Tishechkin. Further knowledge on the use of acoustic signals in the genus *Cacopsylla* will allow to design innovative strategies for pest control involving mating disruption. Comparative studies of mating behavior in this genus are necessary to understand the importance of acoustic communication for courtship and mate finding in these important pest insects.

Acknowledgments

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