Supplementary Materials

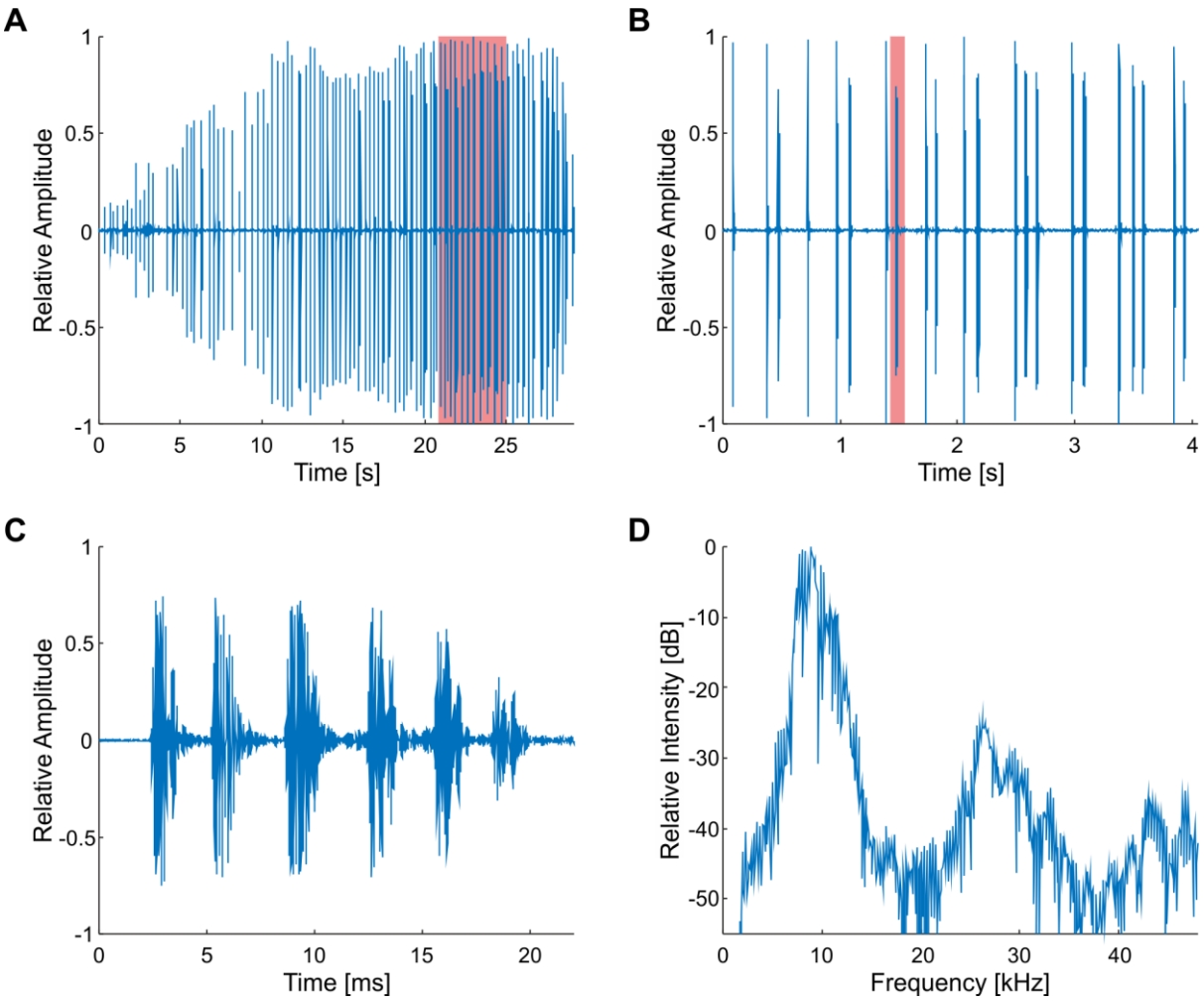


Fig. S1. *Acanthacara acuta* male song as recorded under lab conditions. (A) Continuous calling song consisting of long train of individual pulses. (B) Group of pulses taken from shaded area in A. (C) Magnification of pulse in shaded area in B, showing six separate impulses. (D) Frequency spectrum of pulse in B, C, showing main song energy in a frequency band between 8-11 kHz (peak at 8.8 kHz) and a low amplitude frequency band between 25-28 kHz.

Table S1: Individual results from song parameter analysis. CF = pulse carrier frequency, n = number of pulses, PL = pronotal length (measured as proxy of body size from anterior to posterior part of the pronotum, including the pronotal chamber itself), SD = standard deviation. *Animal recordings performed under lab conditions rather than field recordings. The pooled mean was calculated as: $\bar{X} = \frac{\sum_i n_i x_i}{\sum_i n_i}$; with *x* being individual averages and *n* the numbers of observations in each average. The pooled standard deviation was calculated as: $\sigma_p = \sqrt{\frac{\sum_i (n_i - 1)\sigma_i^2}{\sum_i (n_i - 1)}}$; with σ being the individual standard deviations.

	PL [mm]	*CF [kHz]*	*SD [kHz]*	*n*
M1	*10.54*	*9.48*	*0.40*	*90*
M2	*10.56*	*10.33*	*0.37*	*252*
M3	*10.18*	*9.04*	*0.12*	*876*
M4	*10.05*	*8.90*	*0.19*	*398*
M5*	*10.03*	*9.04*	*0.30*	*118*
Pooled mean		*9.22*	*0.22*	*-*

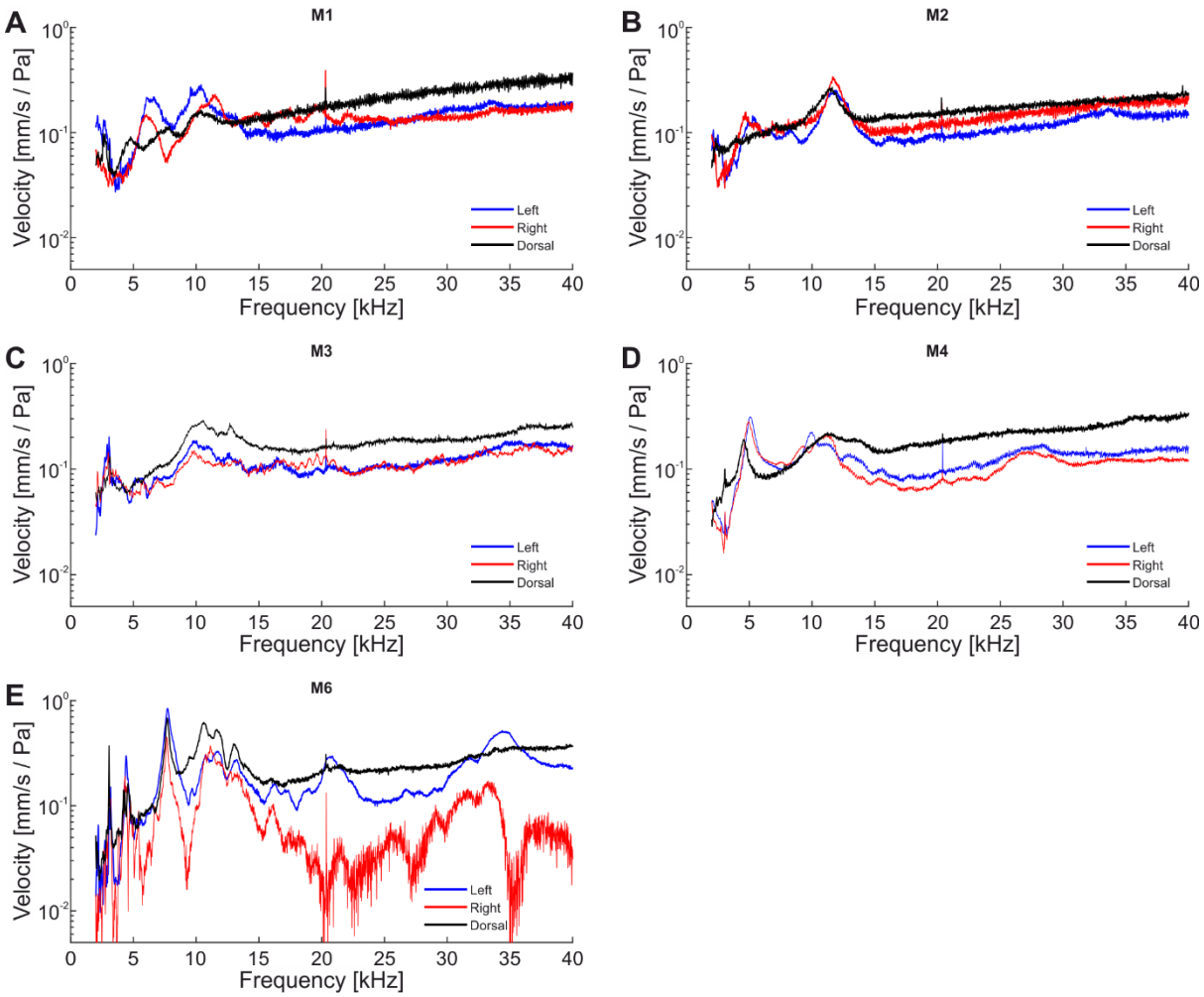


Fig. S2. Frequency analysis of the vibratory displacement of 5 male A. acuta intact pronotal chambers in response to broadband periodic chirps (2-100 kHz, only frequencies up to 40 kHz shown here). Chambers were scanned from both lateral sides (blue and red lines) and dorsally. Values are normalised to the maximum displacement for each specimen. A-D shows recordings from live specimens, while E shows data from a dried and pinned specimen.

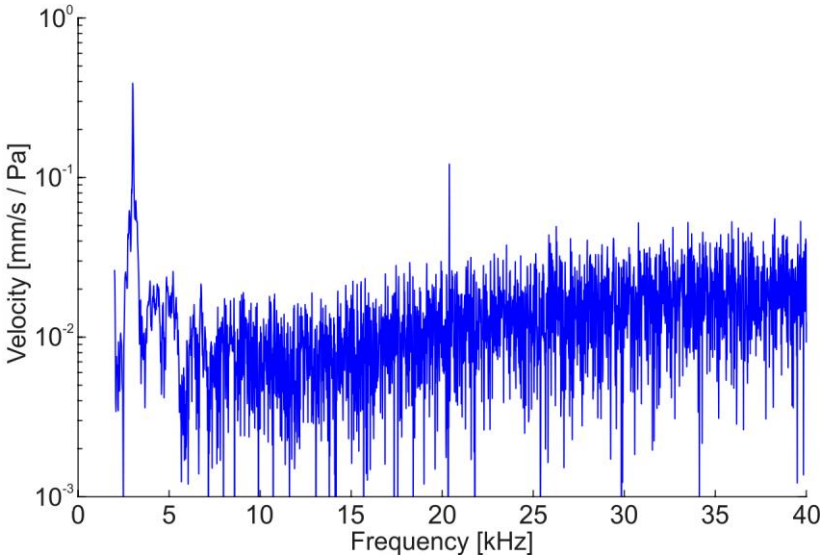


Fig. S3: LDV control recording on for the vibrational responses of the printed pronotal chamber. The laser was focussed on a holder in the experimental setup and no sound was played. This shows an underlying 3 kHz vibration present in the anechoic chamber on this particular recording day (probably due to building noise).

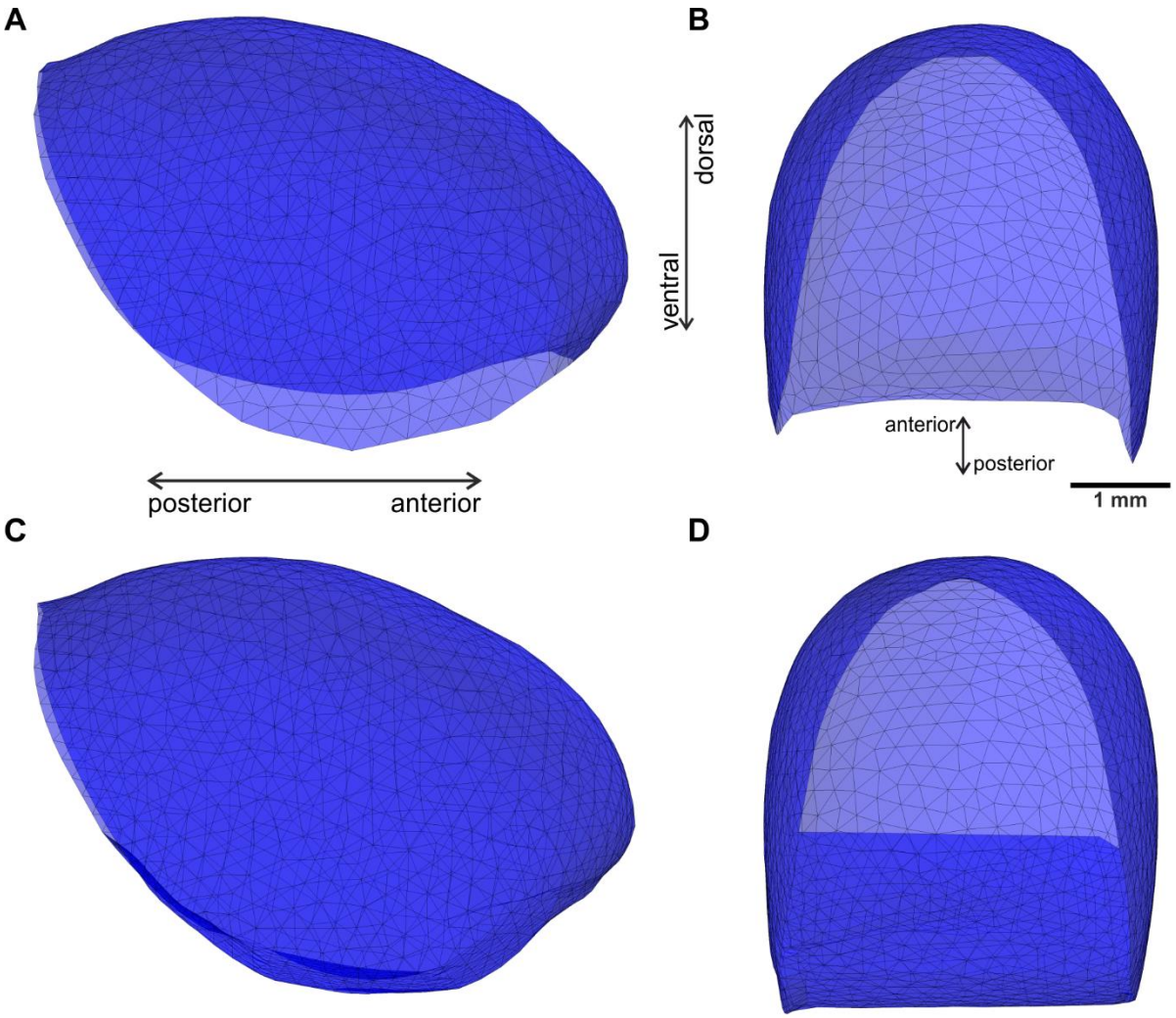
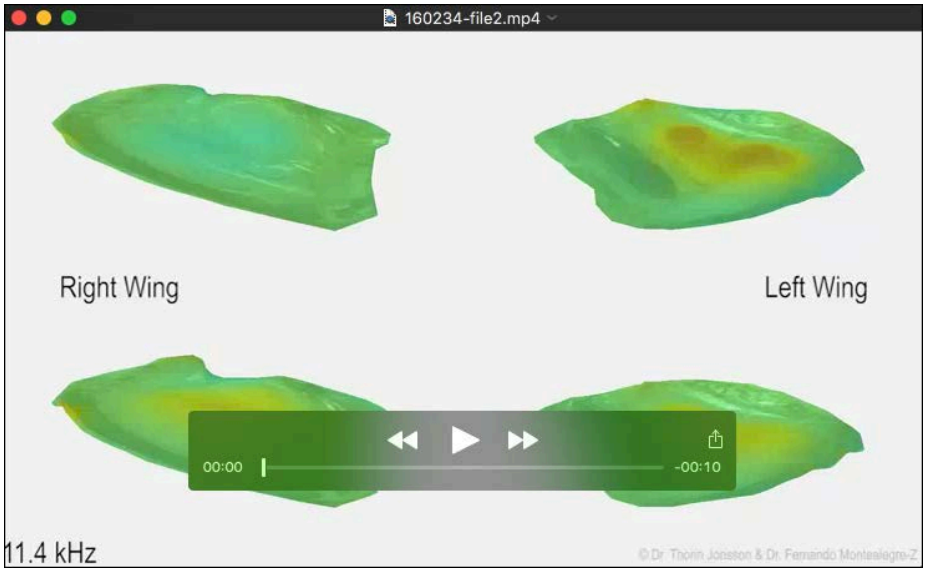
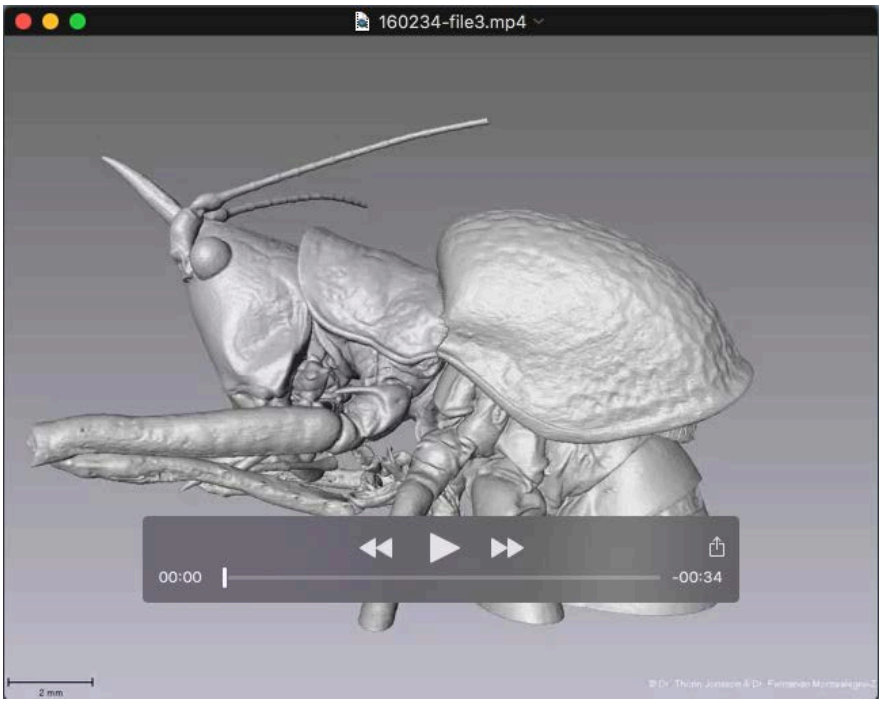


Fig. S4: Overview of the two different 3D mesh models of the pronotal chamber of A. acuta used as basis for finite element modelling. (A, B) lateral and posterior-anterior view of the open chamber mesh. (C, D) lateral and posterior-anterior view of the closed chamber mesh.



Movie 1: Video showing a frontal view of the vibratory patterns of the forewings of a male *Acanthacara acuta* as recorded with laser Doppler vibrometry. The top half shows vibration amplitudes of both wings at the left wing's resonance (10.1 kHz), the bottom half at the right wing's resonance (11.4 kHz, see also Fig.2).



Movie 2: Video of a male *Acanthacara acuta* as modelled from µ-CT scans with a focus on the pronotal chamber and wings.

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