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Three-dimensional imaging of tympana provides critical correction to model for hearing in a parasitoid fly MAX MIKEL-STITES, MARY SALCEDO, JOHN J SOCHA, ANNE STAPLES, Virginia Tech — *Ormia ochracea* is a parasitoid fly known for its precise sound localization abilities. The model for hearing in *O. ochracea* may be the only detailed mathematical model of the mechanics of hearing in response to incident acoustic waves in a binaural organism. It accurately predicts the interaural amplitude difference (ITD) between the tympana for all incident sound angles, but fails to predict the interaural time delay (IAD) accurately for high incident sound angles. Here, we determined the 3D morphology of the tympana of two *O. ochracea* specimens using synchrotron radiation microtomography (SR-μCT). In contrast to previous models that assume 2D-like plates, imaging reveals that the tympanal structures are complex and three-dimensional. We used this new information to improve the existing model for hearing in *O. ochracea* by adding a term that represents the tympanas elastic material response in the lateral direction and recovers observed IAD for all incident sound angles. This work demonstrates that hearing in *O. ochracea* involves acoustic information in two primary planes, rather than one. The improved model may be useful in the design of further directional microphones and hearing aids based on hearing in *O. ochracea*.

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