VERTICAL AND HORIZONTAL MINIMAL AUDIBLE ANGLES OF THE BARN OWL
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The barn owl (Tyto alba) is an established model for audition, but its spatial discrimination has not been studied in detail.

The barn owl is able to detect sound from any location in space.

The azimuth response determines the location of a repeated presentation.

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Azimuth and elevation discrimination

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Data from sessions like the one performed above was used to compile a vector-represented characteristics (HOC) curve (Winter and Boys, 1989). Data was presented to each test animal across 67 trials separated by peak and each trial ended with each stimulus being presented in a random order to the animal. The responses for each trial were used to create the HOC curve for each animal. An example of each HOC curve is shown below.

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Frequency effects on elevation discrimination

Barn owl HOCs suggest that higher frequencies are more important for elevation discrimination.

Oval head-related transfer functions (HRTFs), as shown in the figure, indicate that the major cues for elevation discrimination is the interaural level differences. ILD cues at lower frequencies (below 7 kHz) are predominantly horizontal, while at higher frequencies, the gradient is oriented vertically.

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Do higher frequencies contribute more to elevation discrimination?

Conclusions

1. The aspect ratio of receptive fields of space map neurons corresponds to the behavioral acuity of owls.

2. Higher frequencies are more important for elevation discrimination.

3. Removal of higher frequencies (8 - 11 kHz) does not impair azimuth discrimination.

References

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