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Advanced Bioscience Seminar / アドバンス生命理学特論

Spatial perception mediated by insect antennal mechanosensory system

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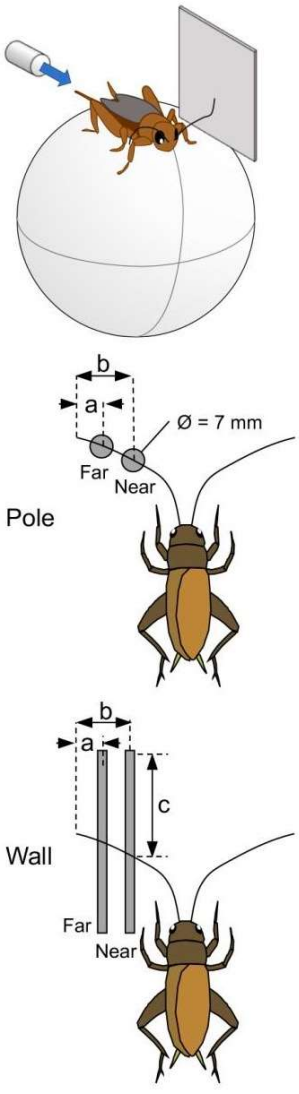

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Animals perceive their surroundings by using various modalities of sensory inputs to guide their locomotion by acquiring and integrating information of surrounding objects such as shape and location using multiple sensory organs. Crickets exhibit escape behavior in response to a short air-puff perceived as a “predator approach” signal by the cerci. The antennae are used to sample the near-head space and active sensing by the antenna improves sensory acquisition. Spatial information is acquired via voluntary antennal contacts with surrounding objects, but it remains unclear whether the insects modulate behaviors mediated by other sensory organs based on that information.

An open loop system was used to examine spatial perception of the cricket antennal mechanosensory system during wind-elicited escape behavior. Objects of different shapes were placed at different locations with which the cricket actively made contact using its antenna, and then examined the changes in various locomotion parameters of the wind-elicited escape behavior. The crickets changed their movement trajectory in response to nearby objects to avoid collision with these obstacles during the cercal-mediated behavior. Even when the antenna on the free side without the wall was ablated, this collision avoidance was also observed, suggesting that the mechanosensory inputs from one antenna detecting an object edge would be sufficient to perceive the location of obstacle in front but with bilateral comparison objects are localized more precisely.
This study demonstrated that crickets were able to use the spatial information acquired with their antennal system to modify their behavior mediated by other sensory organs.

English

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