Sensory bursts in a single motion sensitive pathway of the locust
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1. ABSTRACT
The descending contralateral movement detector (DCMD) is part of a neuronal pathway that is specifically tuned to small looming objects$^1$ and has lateral projections that synapse with motor neurons involved in collision avoidance$^2$. DCMD responses are typically described in terms of rate coding$^3,4$, yet responses to looming often display observable oscillations in mean firing rates and tight clustering of spikes in raw traces; an indication of the presence of bursting. We tested 20 locusts with 30 looming stimuli known to generate bimodal responses. We found frequent and shorter inter-spike intervals (ISIs) ranged from 1-4ms, while longer less frequent ISIs ranged from 20-40ms. A subsequent burst analysis revealed inter-burst frequencies of ~25Hz (within the range of the wingbeat frequency of a flying locust$^5$). We propose that the DCMD employs a bimodal coding strategy to relay information regarding looming objects.

2. EXPERIMENTAL SETUP
A

![Image](https://example.com/image1)

B

![Image](https://example.com/image2)

3. LOOMING RESPONSES

![Image](https://example.com/image3)

4. ISOLATION OF DCMD ACTIVITY AND QUANTIFICATION OF BURSTS

![Image](https://example.com/image4)

5. DISTRIBUTION OF DCMD SPIKES PROVIDE EVIDENCE OF BURSTING

![Image](https://example.com/image5)

6. ISI HISTOGRAMS AND AUTOCORRELATIONS SHOW BIMODAL DISTRIBUTIONS

![Image](https://example.com/image6)

7. CONCLUSIONS
- Evidence of bursting (particularly up to 200ms before TOC) based on distribution of spikes and autocorrelations: peak burst ISI and autocorrelation occurred around 40ms (or 25Hz).
- Results suggest a behavioural implication of bursting: previous studies have shown that low DCMD firing rates that occur around 200ms before TOC may trigger avoidance steering responses in rigidly tethered locusts$^6$.
- Given that the average wingbeat frequency of a flying locust is ~25 beats/s, our findings provide evidence to drive future experiments to test if DCMD bursting may have a role in gaiting non-rhythmic sensory input (object motion) to coordinate rhythmic modulation of wing kinematics linked to avoidance behaviour.

8. REFERENCES

9. ACKNOWLEDGEMENTS
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