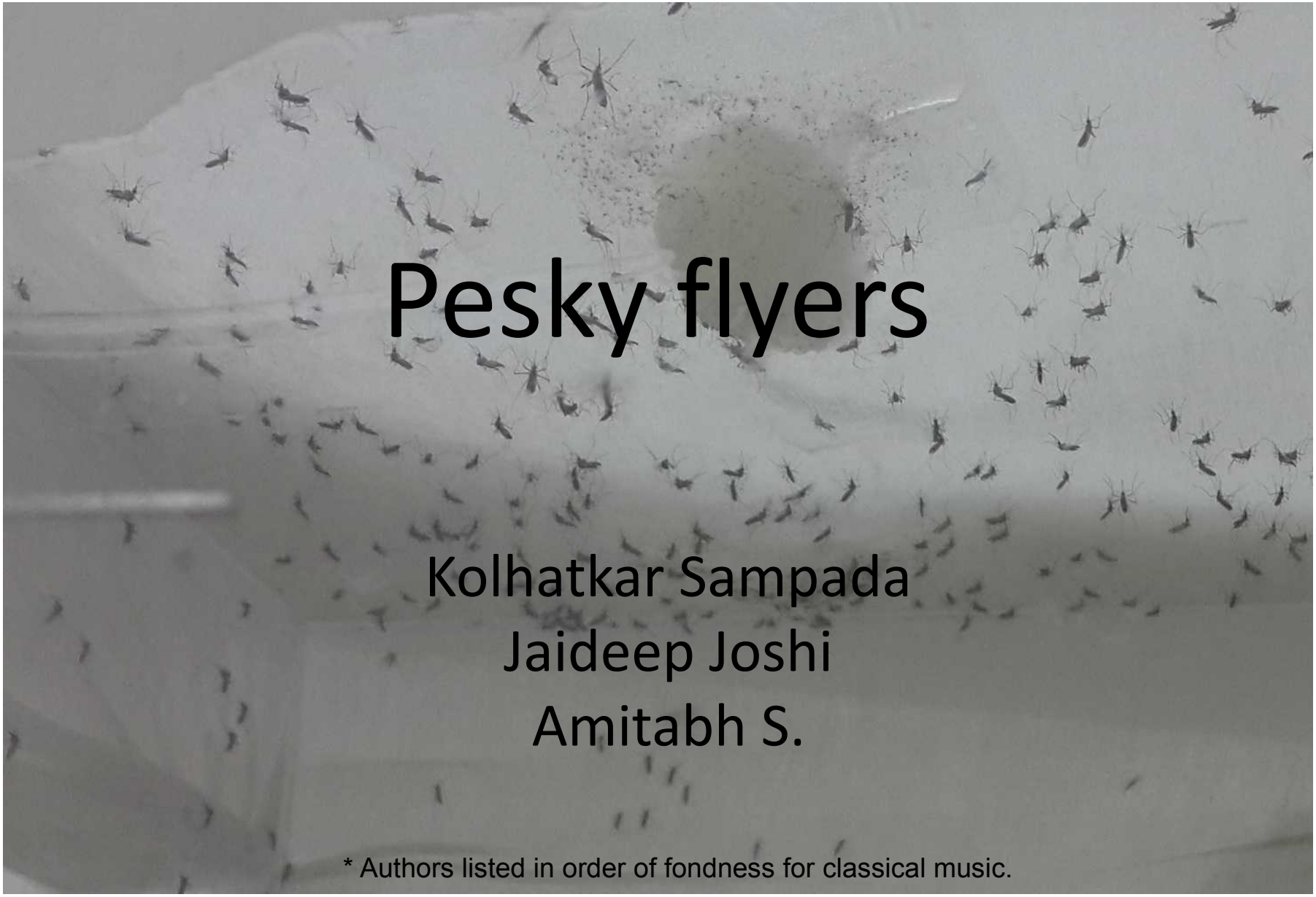


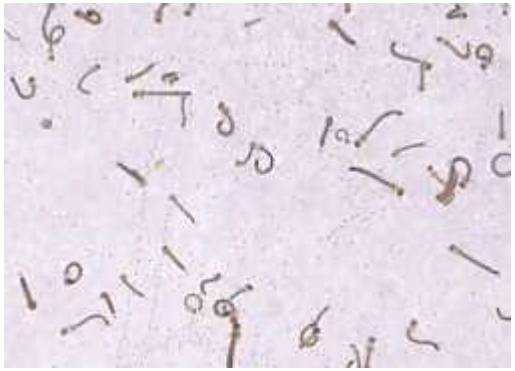
Pesky flyers

Kolhatkar Sampada
Jaideep Joshi
Amitabh S.

* Authors listed in order of fondness for classical music.

The Beginnings

- Motivation: Jaideep got a fever
- Aim: To study collective motion in mosquitoes with special focus on diffusion
- The challenge: Mosquitoes in a box don’t exactly show collective motion



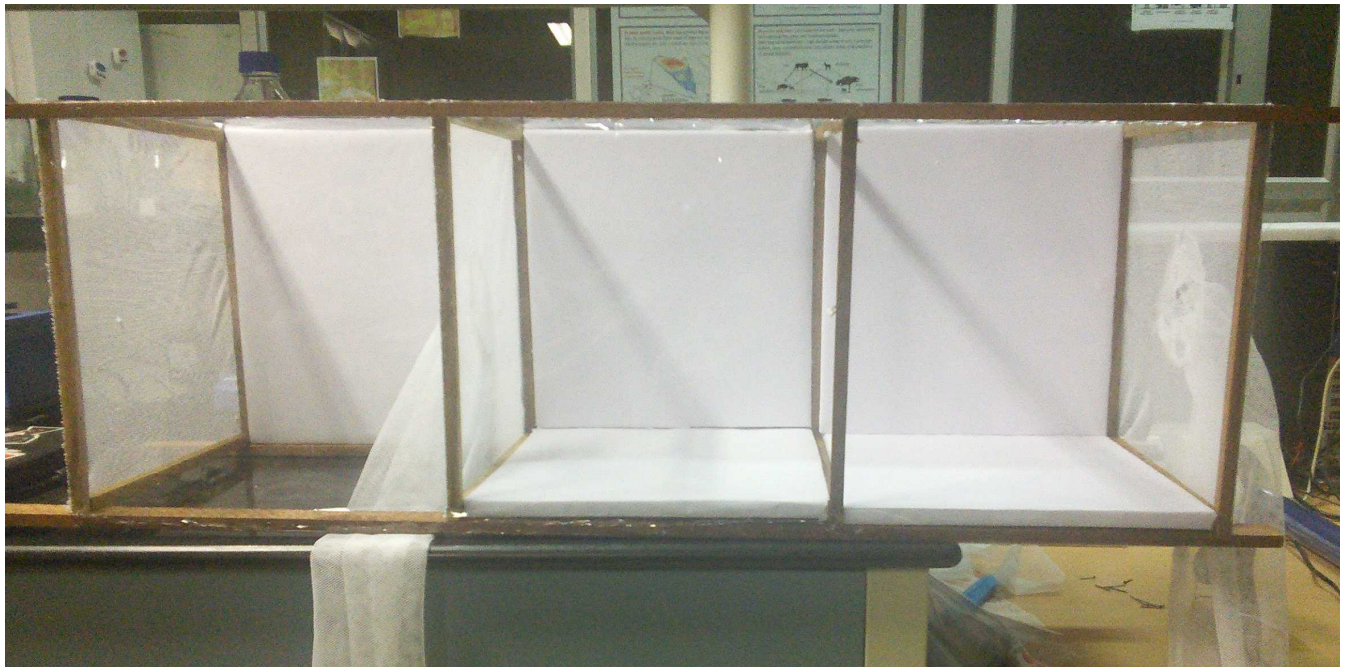
Larvae

- Diffusion

- Video
- Characteristics
  - Light aversion
  - No discernible collective motion
  - Corner hugging

Mosquitoes

- Diffusion



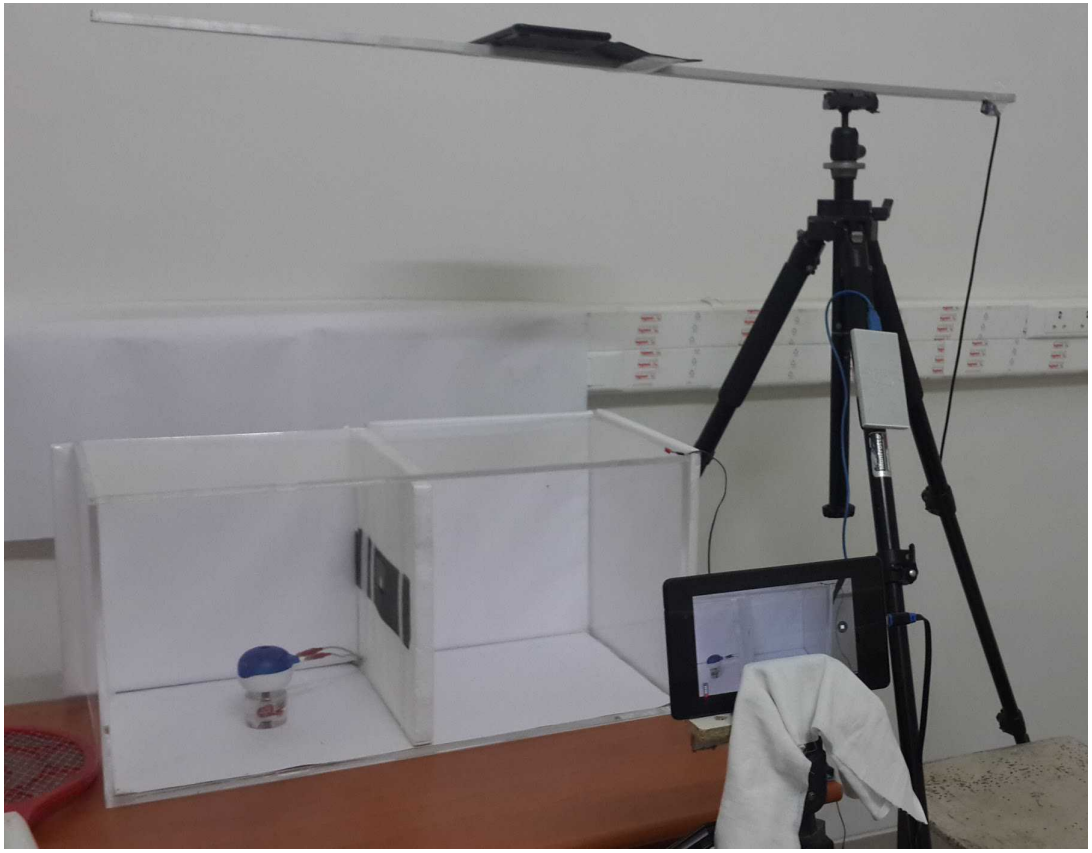
Mosquitoes

- Diffusion
  - Lot of sitting around
  - No discernible collective movement
  - Repellent or incentive did not work
  - No diffusion observed. Ever.

3D tracking

- Motivation
  - Flight characteristics
    - Speed
    - Angle of motion change
    - Directionality
  - Coolness factor
- Motion tracked for single mosquito in a box with and w/o repellent diffusing into the chamber

Setup



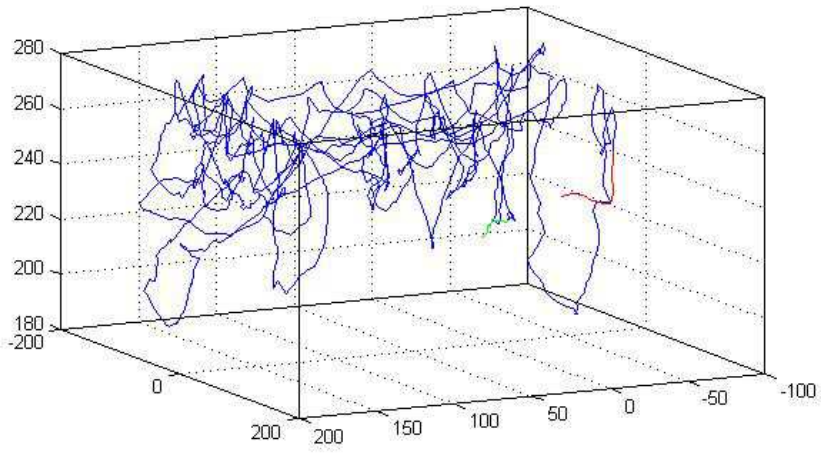
3D tracking - Experiments

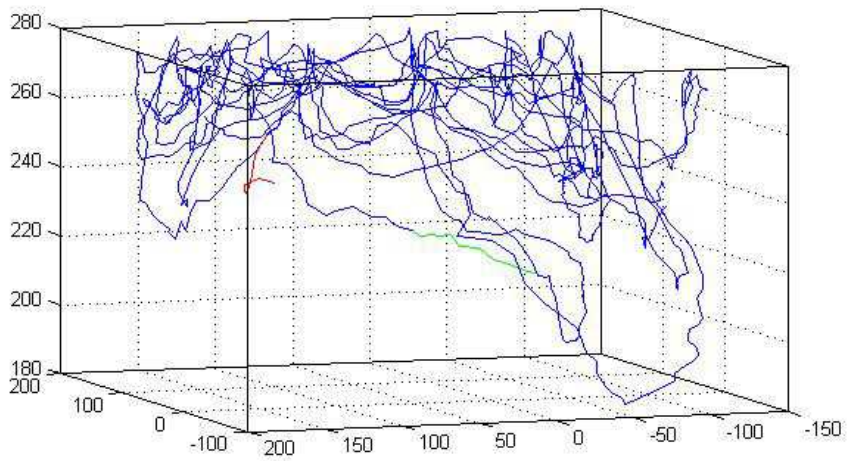
- 1 Mosquito in a box flying for more than a minute
- 1 Mosquito in a box with a repellent in another box introduced from a hole
- Many mosquitoes in a box and repellent introduced the same

3D tracking - Experiments

- Experimental constraints
  - non - flying mosquitoes
  - Wings clipped while transfer
  - Proper aeration between 2 trials
  - Minimizing use of material with odour
  - Mosquito bites

3D tracking - Analysis





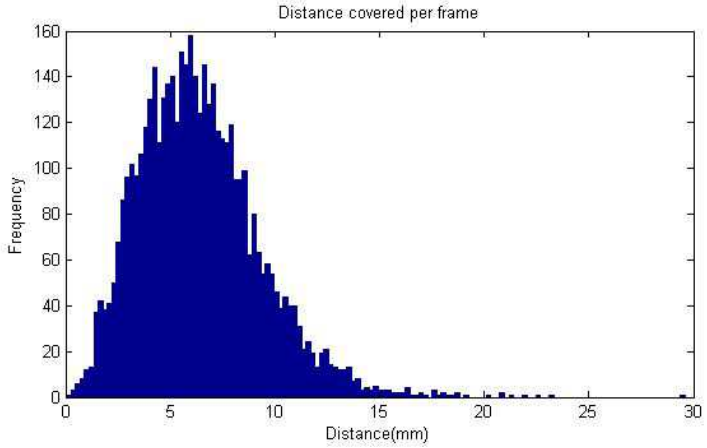
3D tracking - Analysis

Flight Speed

Without repellent:

Mean: 6.4 ± 3 mm/frame

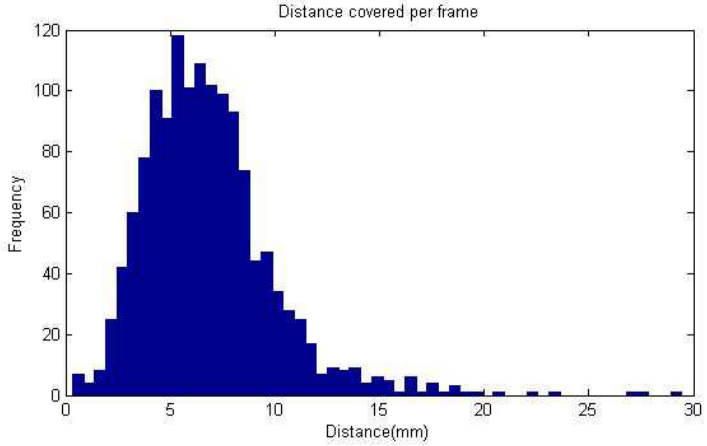
13 ± 6 cm/sec



With repellent :

Mean: 7.0 ± 4 mm/frame

14 ± 8 cm/sec

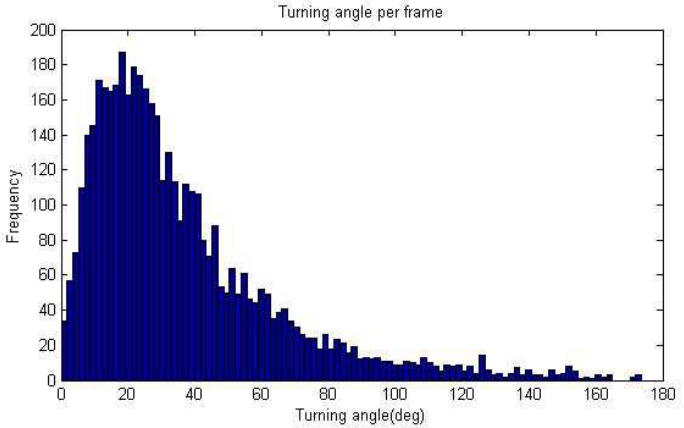


3D tracking - Analysis

Turning angle

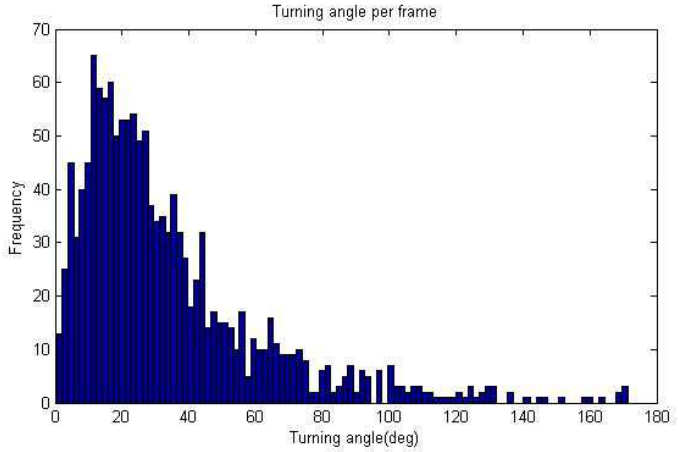
Without repellent:

Mean: 37 ± 29 deg/frame

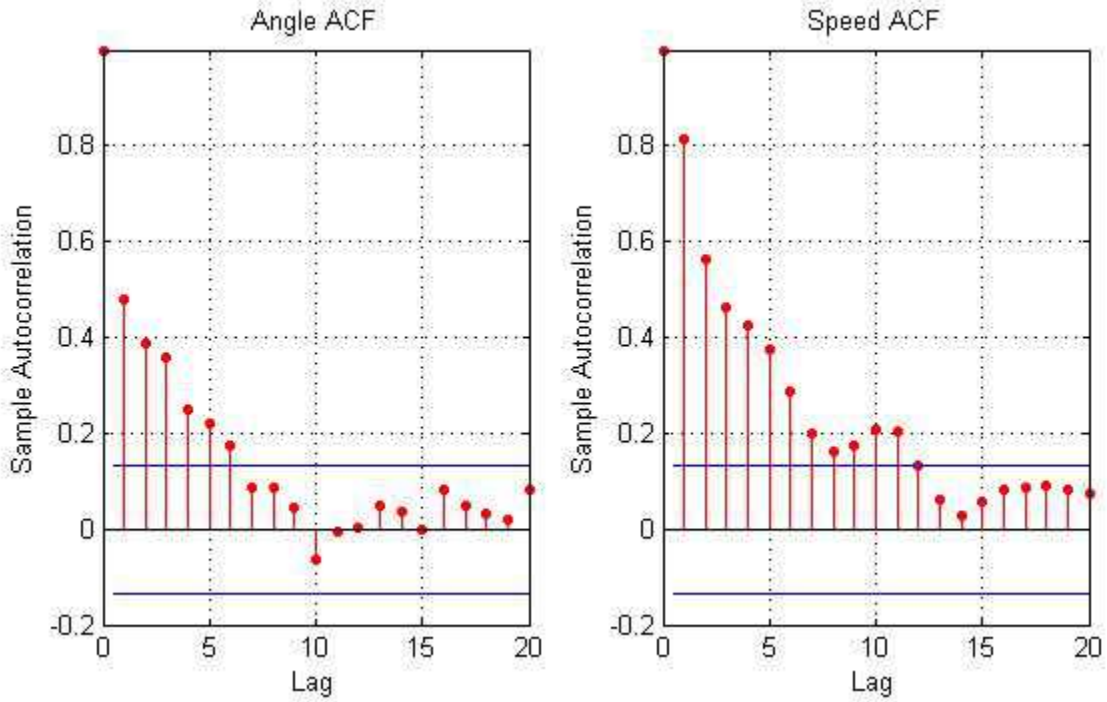


With repellent :

Mean: 34 ± 28 deg/frame



3D tracking Analysis: autocorrelation



3D tracking - Analysis

Without Repellent		
System memory(# of frames)		
#	Angle	Speed
1	12	>20
2	3	15
3	4	>20
4	2	16
5	3	7
6	2	18
7	1	20

With Repellent		
System memory(# of frames)		
#	Angle	Speed
1	2	10
2	6	11
3	4	16
4	1	7
5	1	8
all out	3	>20

Further research

- Long run diffusion experiments with many mosquitoes
- Automated tracking of single mosquito flight
- Modelling of corner behaviour of Larvae

Special thanks to

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Evolutionary Ecology Research Group

(Kavita's Lab)

This project would not have been possible without their support and guidance.

Thanks Aakash for letting us use the fish room

and thank you for listening.

Larvae

- Variation
  - Figure
  - Gradient
    1. Sudden motion
    2. Random movement begins after few seconds

       LIght → Dark

Larvae

- Corner behaviour (An interesting Q)
  - Group or collective crowding
    - Movement characteristics on Predator / external object
    - Insert Paint image / draw