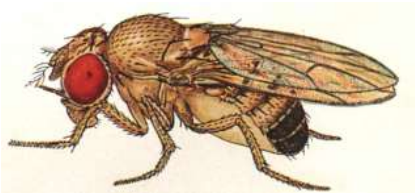
Drowsy Drosophila
Activity Two

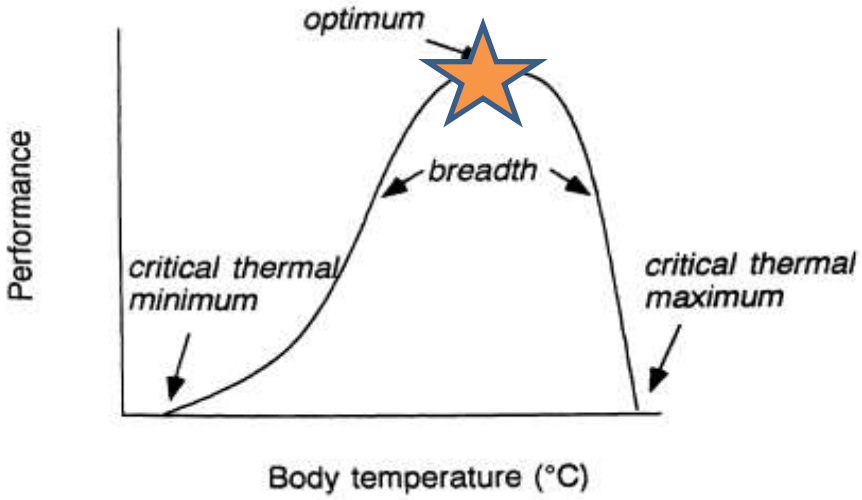
Model organisms allow us study effects of climate change in lab.

What characteristics would be desirable in such an organism?

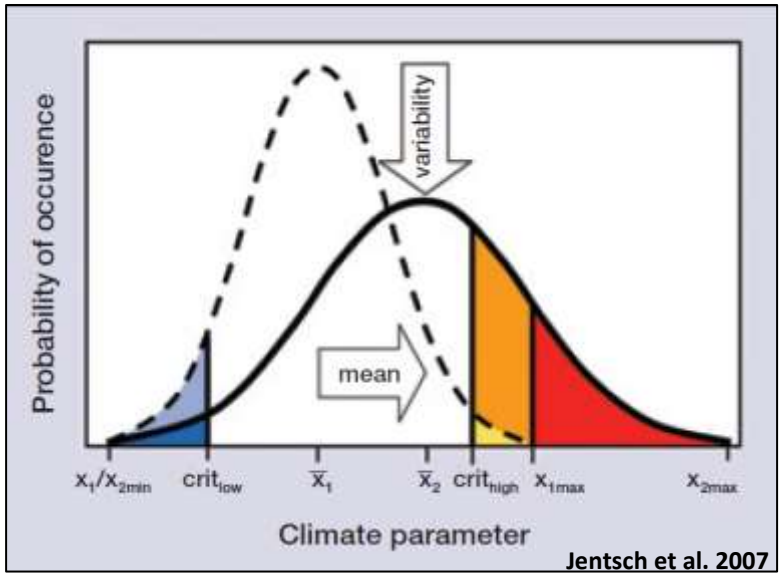
- Short reproduction generation
- Small, fairly easy to raise
- Inexpensive
- Small, previously sequenced, genome



Selection to Variable Temperatures

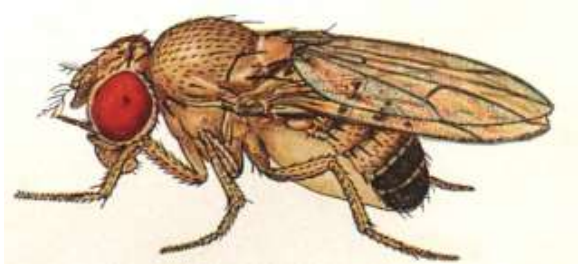


Huey and Kingsolver (1993)

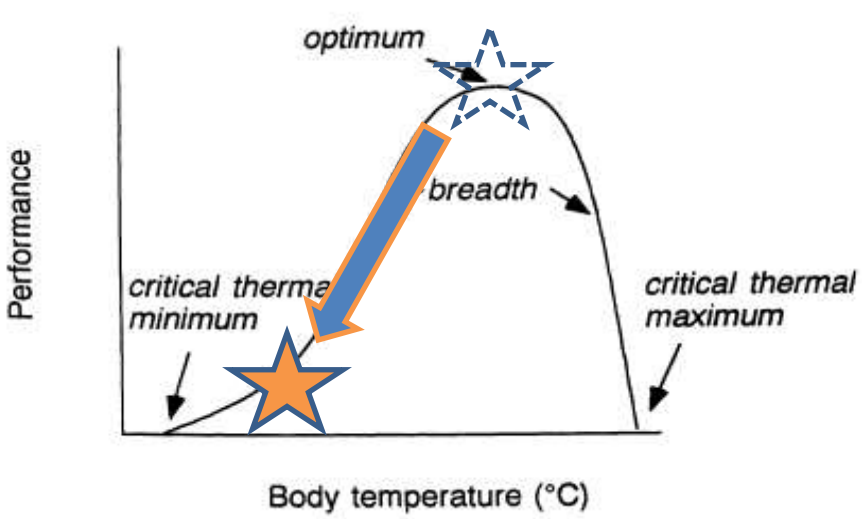


Jentsch et al. 2007

Ethan Siegel



Selection to Variable Temperatures



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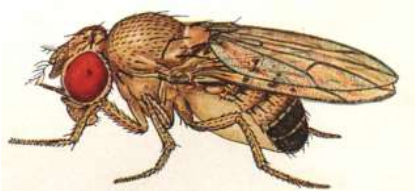
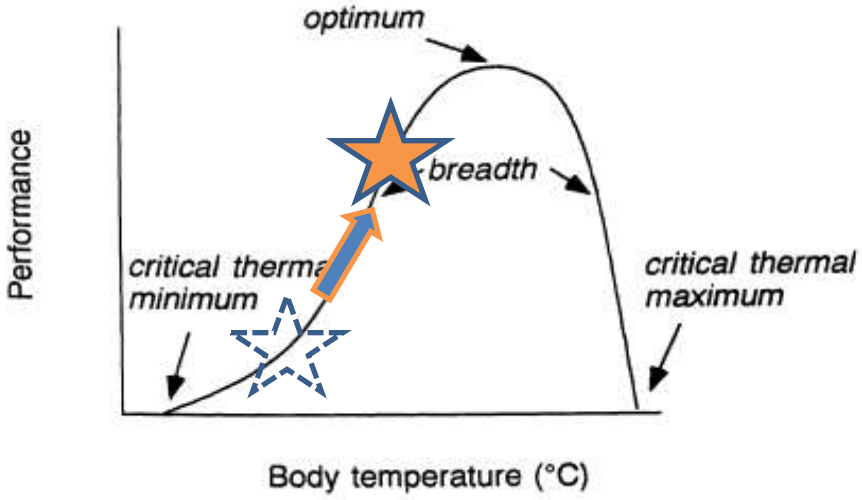


Chill Coma

Selection to Variable Temperatures



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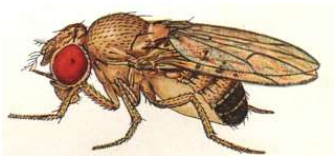


Chill Coma

Chill Coma Recovery

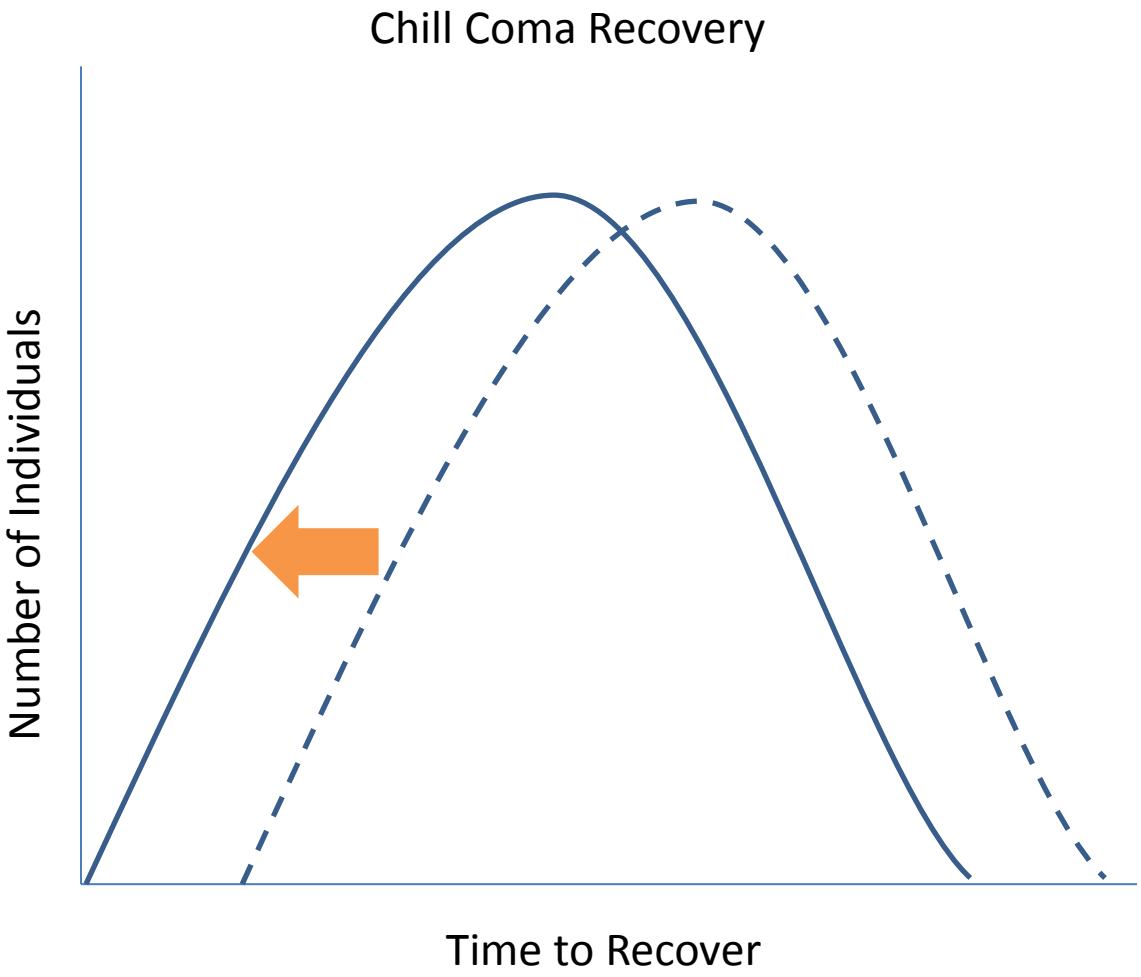
Selection to Variable Temperatures

Temperature Drops

Chill Coma

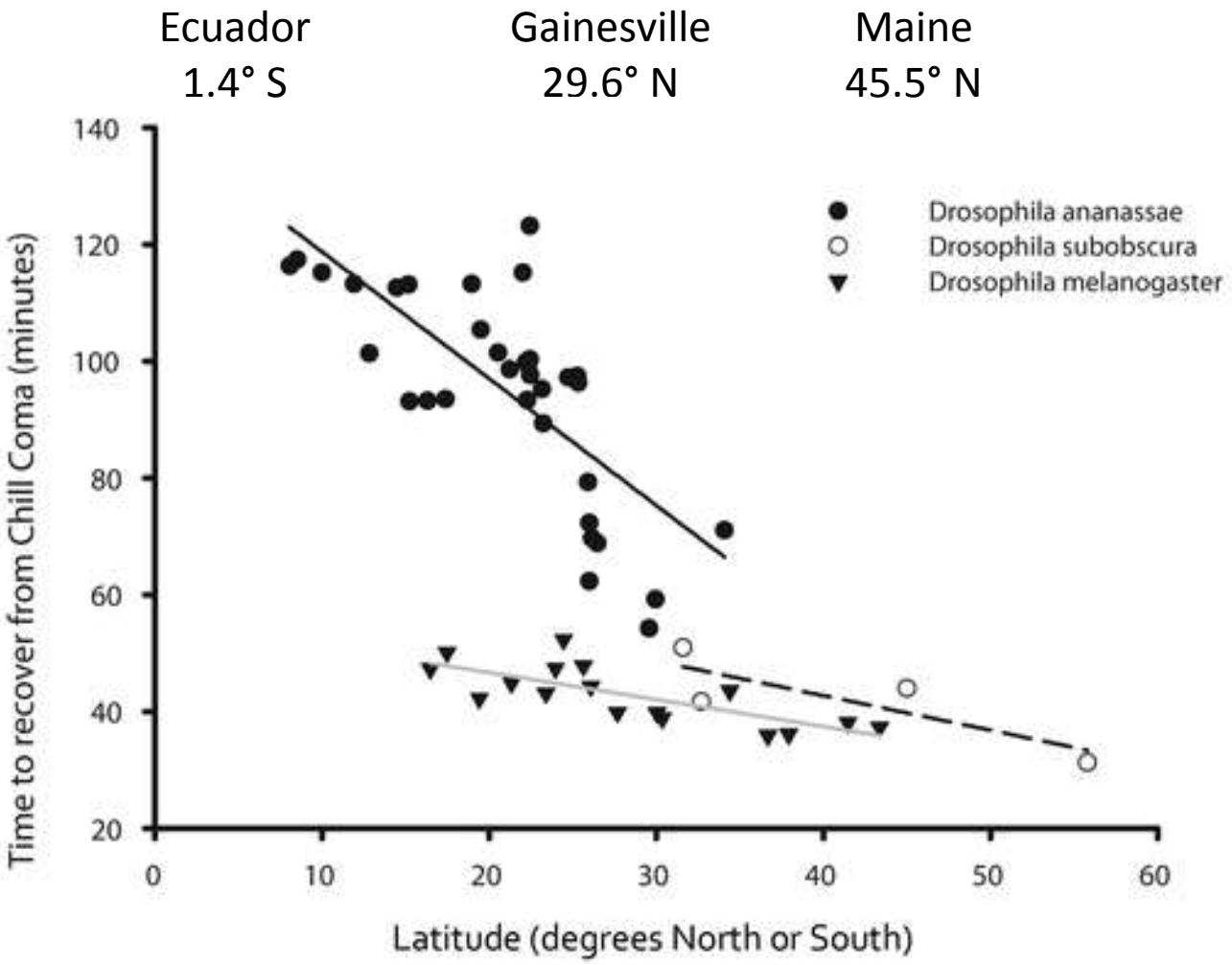
Temperature Returns

Chill Coma Recovery



Chill Coma Recovery

Chill coma recovery times scaled with latitude in *Drosophila* reared at the same conditions.

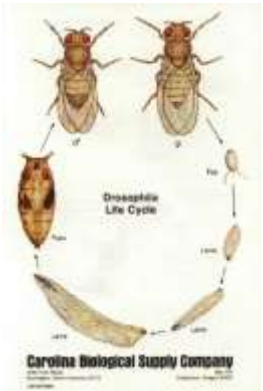


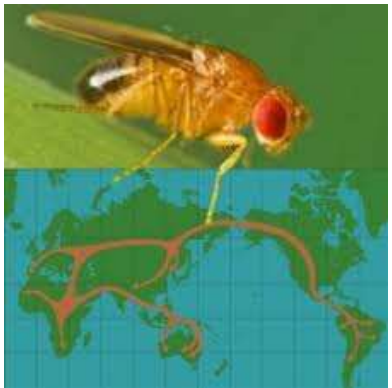
Sinclair et al. 2012

Your mission:

- Determine whether there is sufficient genetic variation in a population of *Drosophila melanogaster* fruit flies for directional selection for cold tolerance to occur.

- <u>How could you do this?</u>



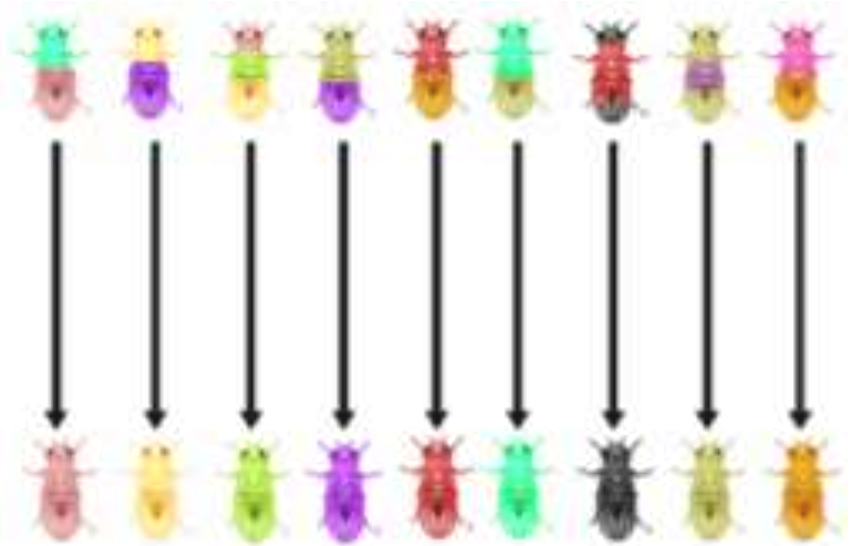


Genetic Variation in *Drosophila*

- Take flies from a wild population and make inbred lines.

- Get rid of genetic variation within each line, but each line is a genetically distinct unit.

- If lines differ in a trait in the same environment, there is genetic variation for the trait.



Cold Tolerance

5 to 7 day old flies

0°C for 3 hours

Chill Coma

Room Temperature

Chill Coma Recovery

Measure chill-coma recovery time

Your mission: Use the *Drosophila* chill-coma recovery assay to determine if there is variation among lines in recovery time (i.e., genetic variation)

Big Question: Is there potential for natural selection for cold coma recovery?

Drosophila chill coma recovery Protocol

1. A facilitator will distribute your fly lines to you. You will get one fly line each person in a single vial. Note the letter on the vial on data sheet.

2. Tap each line/vial of flies into a separate petri dish. Make sure that flies are not touching (if they are, then **VERY GENTLY** push one of the flies with your forceps until they are no longer touching). After the flies are in the petri dishes, immediately start your stop watch.

3. Record time each fly recovers (m:s format). Recovery is determined when a fly can stand up on all of its legs.

4. Once a fly is recorded as recovered, pick it up with forceps (being careful not to touch any of the other flies) and place it in ethanol.

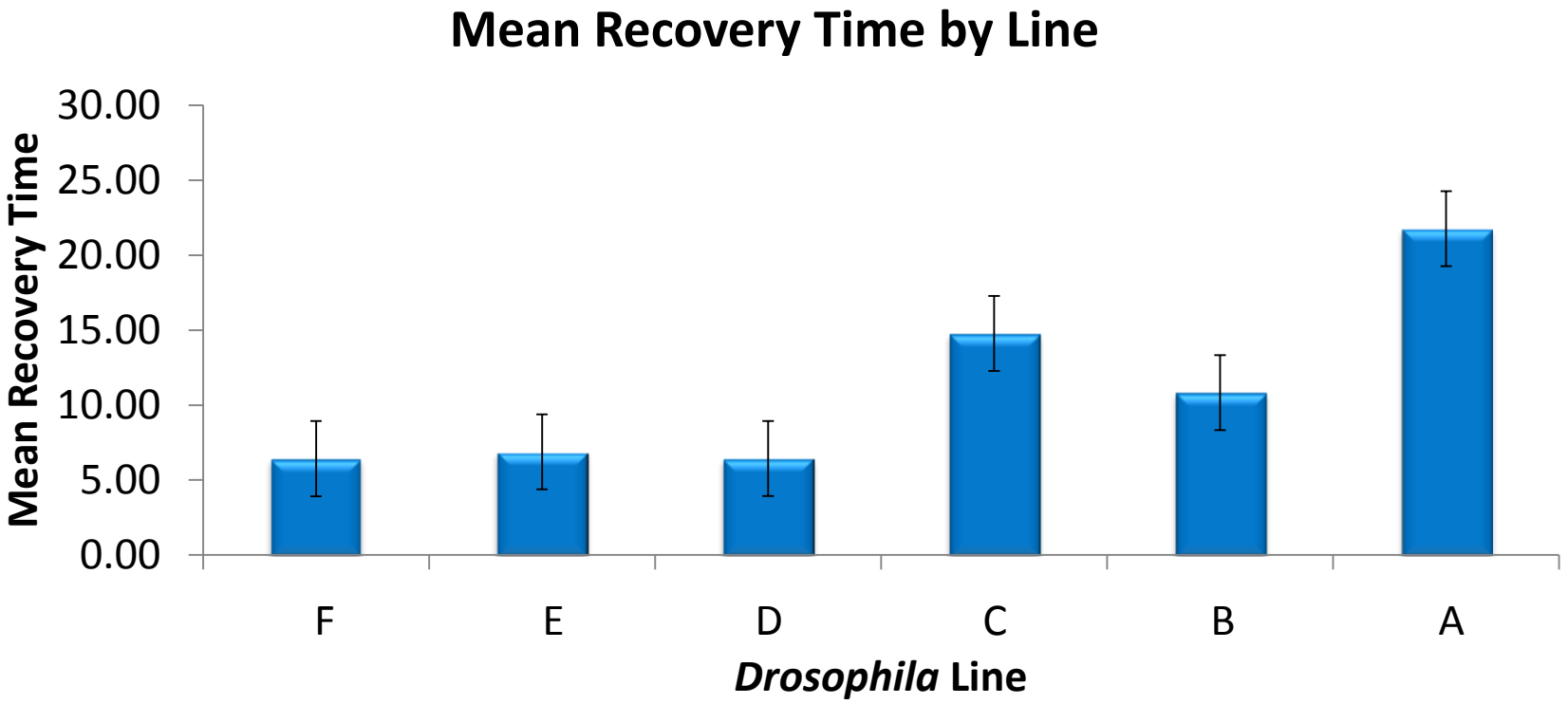
5. Repeat until all flies have been recorded as recovered or verified as dead.

6. Turn in your data sheet to a facilitator once all of the flies in the line have recovered.

Your Data

- What patterns do you see?
- What are possible sources of error?

Your Data with Previous Data

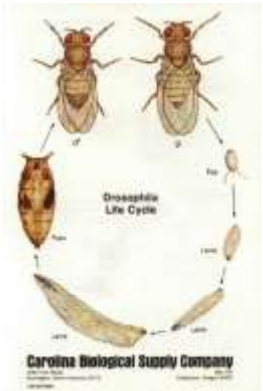


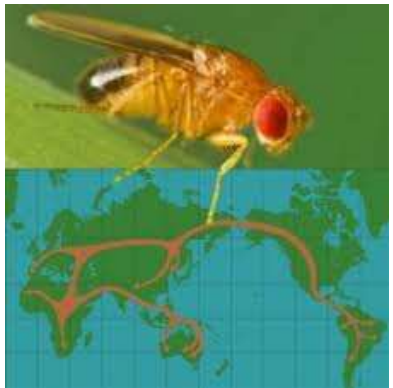
- What can you infer from this data?
- Is there sufficient genetic variation for selection to occur?

Your mission:

- Determine whether there is sufficient genetic variation in a population of *Drosophila melanogaster* fruit flies for directional selection for cold tolerance to occur.

- How could you do this?





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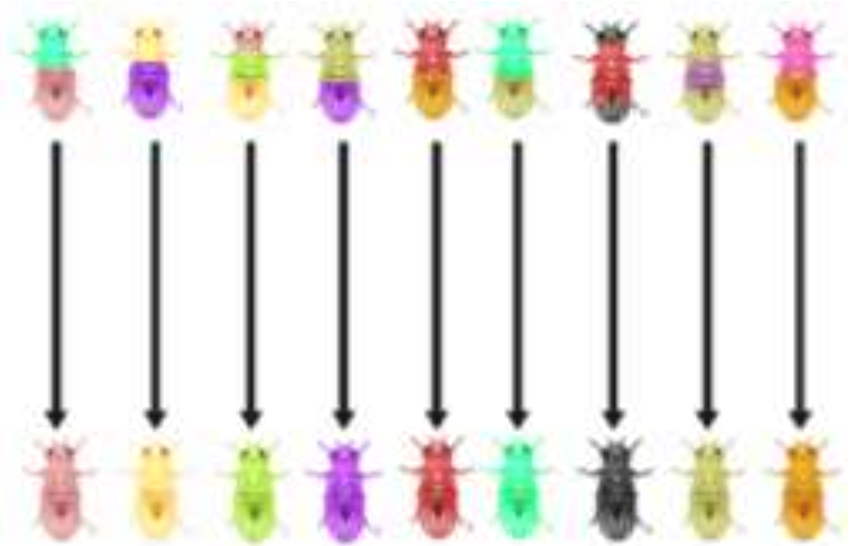
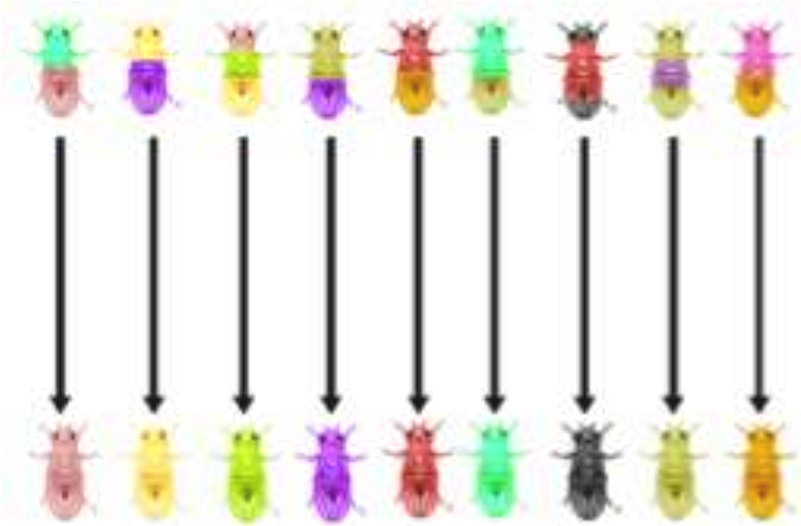
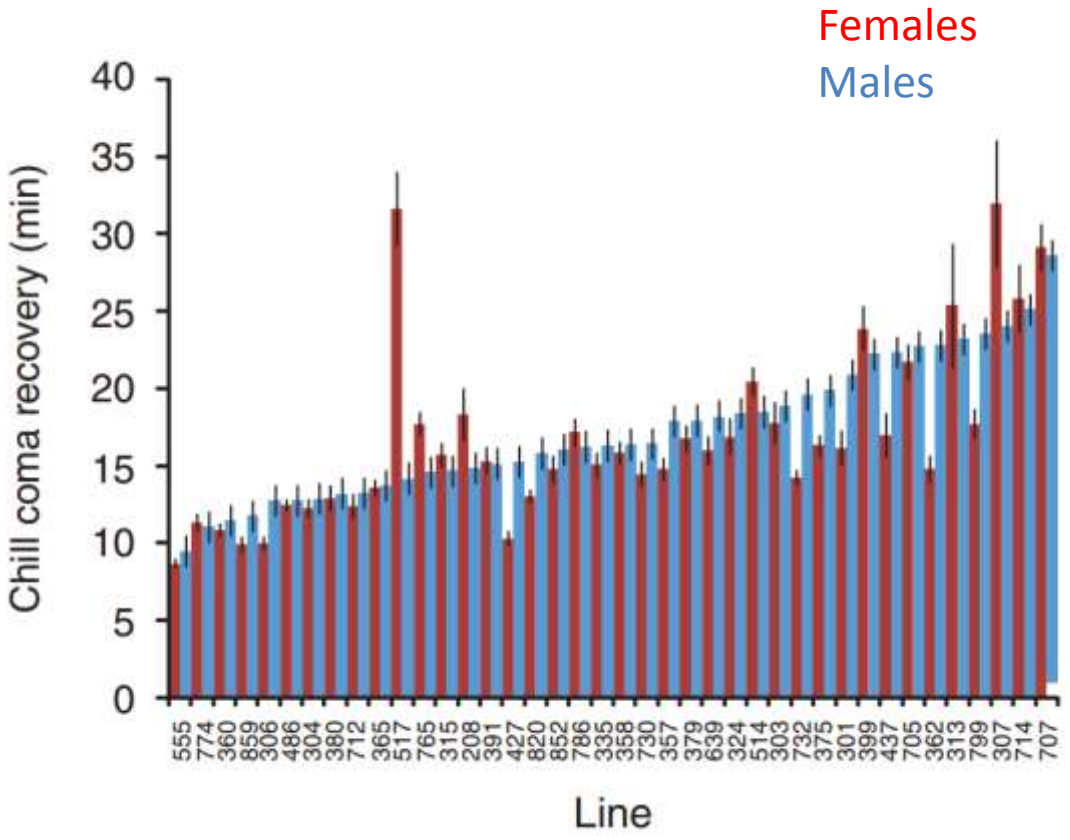


Drosophila melanogaster lines

Drosophila Genetic Reference Panel (DGRP) Lines representing natural standing genetic variation within a single population.



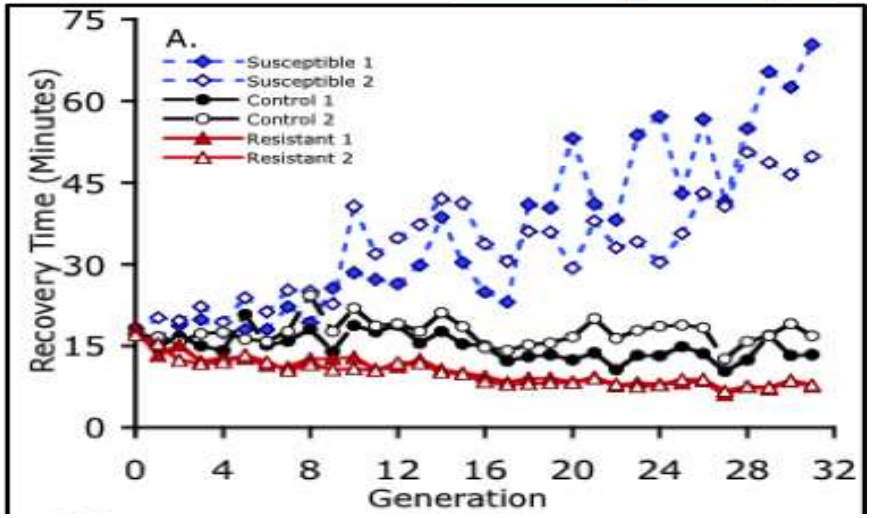
Dr. Trudy Mackay



Ayroles et al. 2009

Genetic Variation in *Drosophila*

- Take flies from a wild population and expose that population to <u>artificial selection</u>.



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5 to 7 day old flies

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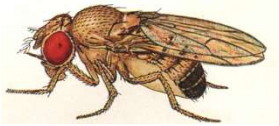
Chill Coma

Room Temperature



Chill Coma Recovery