## BTOLOGY EIELD STUDY DAY 2-3 PRESENTATION

TO INVESTIGATE THE VARIETY AND POPULATIONS OFANHMALSPECIES UNDER DIFFERENT WATER FLOW RAT


## INDEPENDENT VARIABLE AN METHODS OF MEASUREMEN

Water flow rate

- Measured by water flow meter
- 3 times, record reading and take average
- 4 localities with difference in water flow rate are selected for investigation



## DEPENDENT VARIABLE ANR METHODS

 OF MEASUREMENT- Number of species and population of each species in the selected areas.



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- $0.5 \mathrm{~m} \times 0.5 \mathrm{~m}$ quadrat



## DEPENDENT VARIABLE AND METHODS

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- $0.5 \mathrm{~m} \times 0.5 \mathrm{~m}$ quadrat
- look for animals in the area included



## DEPENDENT VARIABLE AND METHODS OF MEASUREMENT <br> - Number of species and population of each species in the selected areas. <br> - $0.5 \mathrm{~m} \times 0.5 \mathrm{~m}$ quadrat <br> - look for animals in the area included

- pick up small rocks from the bottom, and look for animals present on the rock surface or under the rock.



## DEPENDENT VARIABLE AND METHODS OF MEASUREMENT

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- Hold animal captured in a plastic sorting tray for identification
- Release all of them to their original micro-habitats
- limited to 20 minutes -> comparable



## CONTROLLED VARIABLES AND METHODS TO CONTROL

-River bed substrate composition:

- Find places with similar bed substrate content



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- Temperature
- Use a digital thermometer



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- Temperature
- Use a digital thermometer
-Light intensity
- Use a light



## CONTROLLED VARIABLES AND METHODS TO CONTROL

-River bed substrate composition:

- Find places with similar bed substrate content
- Temperature
- Use a digital thermometer
-Light intensity
-Use a light meter
-Water depth:
- Use a ruler



# ASSUMPTIONSAND LIMITATIONS 

## Assumptions

- Water at the four localities hàs same pH
-20 minutes is representative enough for counting populations of animal species at a selected area


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- Water at the four locálities has same pH
- 20 minutes is representative enough for counting populations of animals at a selected area


## Limitations

-The investigatión was carried out at a specific time slot (daytime, winter), it may not represent the overall situation

- Apparatus not sensitive enough

OE.g.water flow meter

- Some animals werefiritated during the investigation and escaped from the quadrat


# RESULTS Large <br> Stream 

## Mayfly Nymph

Water penny
Snaild

## RESULTS

LOCALITY
$\begin{array}{cc}A \\ \text { (FAST) } & \text { B } \\ \text { (MODERATE) }\end{array}$
$\stackrel{\mathrm{C}}{(\mathrm{SLOW})}$
(VERY SLOW)

| WATERFLOW <br> RATE (M/S) <br> RIVERBED <br> SUBSTRATE <br> COMPOSITION <br> TEMPERATURE <br> $(\circ C)$ | PEBBLES | PEBBLES | PEBBLES | PEBBLES |
| :---: | :---: | :---: | :---: | :---: |
| LIGHT <br> INTENSITY <br> $($ LUX) | 18.3 | 0.20 | 0.10 | 0.04 |
| WATER DEPTH <br> $(C M)$ | 76010 | 16400 | 18.6 | 18.5 |

## RESULTS

| Locality | $\underset{\text { (Fast) }}{A}$ | $\begin{gathered} \mathrm{b} \\ \text { (Moderā } \end{gathered}$ | $\begin{gathered} C \\ \text { (Slow) } \end{gathered}$ | $\begin{gathered} d \\ \text { (Very slow) } \end{gathered}$ |
| :---: | :---: | :---: | :---: | :---: |
| large stream snail | 7 | 9 | 7 | 3 |
| Mayfly Nymph | 0 | 2 | 2 | 3 |
| water Skater | 0 | 3 | 1 | 1 |
| pond snail | 0 | 0 | 1 | 0 |
| water penny | 1 | 3 | 0 | 0 |
| Bee shrimp | 0 | 0 | 0 | 2 |
| Goby | 0 | 0 | 0 | 1 |
| Number of animals | 8 | 17 | 11 | 10 |
| Number of species | 2 | 4 | 4 | 5 |

## RESULTS

- Consider area A,
- A total of 8 animals, consist of 2 species.
-Large stream snails consist of 87.5\%



## RESULTS

- Consider area B,
-A total of 17 animals, consist of 4 species.
-Large stream snails consist of 52.9\%


## RESULTS

- Consider area C,
- A total of 11 animals, consist of 4 species.



## RESULTS

- Consider area D,
- A total of 10 animals, consist of 5

Species O\%mposition at site D species.
-Large stream snails consist of 30\%


- Large Stream Snail
- Mayfly Nymph
- Water Skater
- Bee Shrimp
- Goby


## ANALYSIS OF RESULTS

Species composition Species composition at site a at site $B$


- Large Stream Snail
- Water Penny
- Mayfly Numph
- Water Skater

Species
composition at site C


- Large stream snail
- Mayfly nymph
- Water skater
- Pond snail

Species composition at site D


- Large Stream Snail
- Mayfly Nymph
- Water Skater
- Bee Shrimp
- Goby


## ANALYSIS OF RESULTS

Effect of water flow rate on number of species
Number of animal species observed decreases with increasing water flow rate.


## ANALYSIS OF RESULTS

Number of animal species observed decreases with increasing water flow rate

- Possible reasons:
- various difficulties - difficult to capture fast-moving microorganisms, easily shoved by water current to other regions, etc.

Effect of water flow rate on number of species


Water flow rate (m/s)

## ANALYSIS OF RESULTS

- some have adaptive features for the fast, turbulent water

Effect of water flow rate on number of species


## ANALYSIS OF RESULTS

- some have adaptive features for the fast, turbulent water
- others can hardly compete with these animals

Effect of water flow rate on number of species


## ANALYSIS OF RESULTS

- some have adaptive features for the fast, turbulent water
- others can hardly compete with these animals
-> only animals with specific adaptive features survive in region with high water flow rate, leading to a smaller number of animal species present

Effect of water flow rate on number of species


## ANALYSIS OF RESULTS



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Number of animals increases by $112.5 \%$ from A to B, then decreases by $41.2 \%$ from $B$ to $D$.


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- $\mathrm{A}(0.04 \mathrm{~m} / \mathrm{s})$ to $\mathrm{B}(0.1 \mathrm{~m} / \mathrm{s})$
- hard to settle down in region with fast water flow
- Difficulties in obtaining food + resisting turbulence causes animals to be washed




## ANALYSIS OF RESULTS

Number of animals increases by $112.5 \%$ from A to B, then decreases by $41.2 \%$ from $B$ to $D$.

- A ( $0.04 \mathrm{~m} / \mathrm{s}$ ) to B ( $0.1 \mathrm{~m} / \mathrm{s}$ )
- hard to settle down in region with fast water flow
- Difficulties in obtaining food + resisting turbulence causes animals to be washed
-> reduces number of animals in region A, and increases number of animals in region $B$.




## ANALYSIS OF RESULTS

## Form B to D

-Region $B$ 's river flow rate > region C \& D

Relationship between water flow speed and number of animals


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-Region $B$ 's river flow rate > region C \& D
-Region B = a more favourable micro-habitat for animals \& adaptive features for fastmoving water.

Relationship between water flow speed and number of animals



## ANALYSIS OF RESULTS

Form B to D
-Region $B$ 's river flow rate > region C \& D
-Region B = a more favourable micro-habitat for animals \& adaptive features for fastmoving water.
-Larger animals ~ weaker against strong water flow
-Animals with the adaptive features can live in the region with moderate water flow without being preyed or washed away.
-Their population then becomes larger

Relationship between water flow speed and number of animals



## ANALYSIS

 RESULTS1) slow water facilitates the growth of algae
2) bacteria on algae consume oxygen to decompose dead body of algae
3) some algae can be toxic
4) organic waste cannot be removed effectively

Result: smaller population of animals in regions C and D .

## CONCLUSION

While the most number of animal species populate in very slow running water (region D), region with moderate water flow (region B) has the largest number of animals.

A number of adaptive features are observed, allowing some animals to flourish in areas with fast and moderate water flow.

Actually, these observations are not solely caused by water flow, but many other interdependent variables, such as distribution of nutrients, presence of predator, etc.


This is the end of our presentation. Thank you for listening.

