# Investigation on the relationship between water flow rate and the biodiversity and adaptive features of organisms in different water bed substrate composition

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# Independent Variable

* Water flow

1. Put the water flow meter on the surface of the water
2. Record the readings shown on the reader once per minute for five minutes
3. Take the average of the data

# Dependent Variables

* Adaptation of animals to water flow

Counting

1. 5 minutes observation with bare eyes
2. Compare the appearance with the pictorial guide

# Dependent Variables

* Animals species
* Abundance of species

Counting

1. Set up a quadrat at the area
2. 5 minutes counting using bare eyes
3. 10 minutes collect sample from the rocks

# Controlled Variables

* Water depth

1. Use water flow meter
2. Observe the water level on the water flow meter

# Controlled Variables

* River bed substrate

  1. Observe the size of the stones by naked eyes

# Controlled Variables

* light intensity

1. Use light meter
2. Measure 1 min
3. Record the most steady data shown

# Controlle Variables

* Temperature

1. Use digital thermometer
2. Record the data when it is steady

# Assumption

* pH value

1. Assume that the pH value of whole water stream does not varies too much

# Set 1 (stony water bed)

## Result

Calm water stream
0m/s

| Species | No. |
|---|---|
| Goby | 8 |
| Broken-band hillstream | 1 |
| Banded folk-tailed Loach | 1 |
| Large stream snail | 18 |
| Water skater | |
| Bee shrimp | 1 |
| Mayfly Nymph | |
| Sucker belly loach | 3 |
| Caddisfly larva | 1 |

Intermediate water stream
0.2m/s

| Species | No. |
|---|---|
| Goby | |
| Broken-band hillstream | 1 |
| Banded folk-tailed Loach | |
| Large stream snail | 12 |
| Water skater | 3 |
| Bee shrimp | |
| Mayfly Nymph | |
| Sucker belly loach | |
| Caddisfly larva | |

Fast water stream
0.5m/s

| Species | No. |
|---|---|
| Goby | |
| Broken-band hillstream | |
| Banded folk-tailed Loach | |
| Large stream snail | 6 |
| Water skater | 3 |
| Bee shrimp | |
| Mayfly Nymph | 1 |
| Sucker belly loach | |
| Caddisfly larva | |

# Set 1 (stony water bed)

## Analysis

| Water fowl rate m/s | No. of species | No. of individuals | Simpson's diversity Index |
|---|---|---|---|
| 0 | 7 | 32 | 0.652 |
| 0.2 | 3 | 16 | 0.425 |
| 0.5 | 3 | 7 | 0.286 |

The number of species in the intermediate water stream is similar to that in fast water stream.

The biodiversity in the calm water stream is the greatest.

# Set 1 (stony water bed)

## Analysis

* How is biodiversity affected by water flow rate?

1. In fast water stream, the biodiversity is the lowest

   Not all species can withstand the fast water stream.

2. In calm water stream, the biodiversity is the highest

   Calm water provide a relatively steady environment for organisms.

3. The Large stream snail is the dominant species in this stream.

4. The water skater only live in environment with water current

# Set 2 (Rocky water bed)

| Rate of water flow / Name of the species | Slowest ( 0 m/s) | Intermediate ( 0.16 m/s) | Fastest ( 0.42 m/s) |
|---|---|---|---|
| Broken-band Hillstream Loach | 7 | 5 | 0 |
| Large Stream Snail | 71 | 42 | 0 |
| Water Skater | 0 | 1 | 6 |
| Caddisfly Larva | 0 | 1 | 0 |

# Effect of rate of water flow in rocky water bed

* On the total number of individuals

| Slowest | Intermediate | Fastest |
|---|---|---|
| 78 | 48 | 6 |

Slowest > intermediate > fastest

# Effect of rate of water flow in rocky water bed

* On the abundance of species

| Slowest | Intermediate | Fastest |
|---|---|---|
| 2 | 4 | 1 |

Intermediate > slowest > fastest

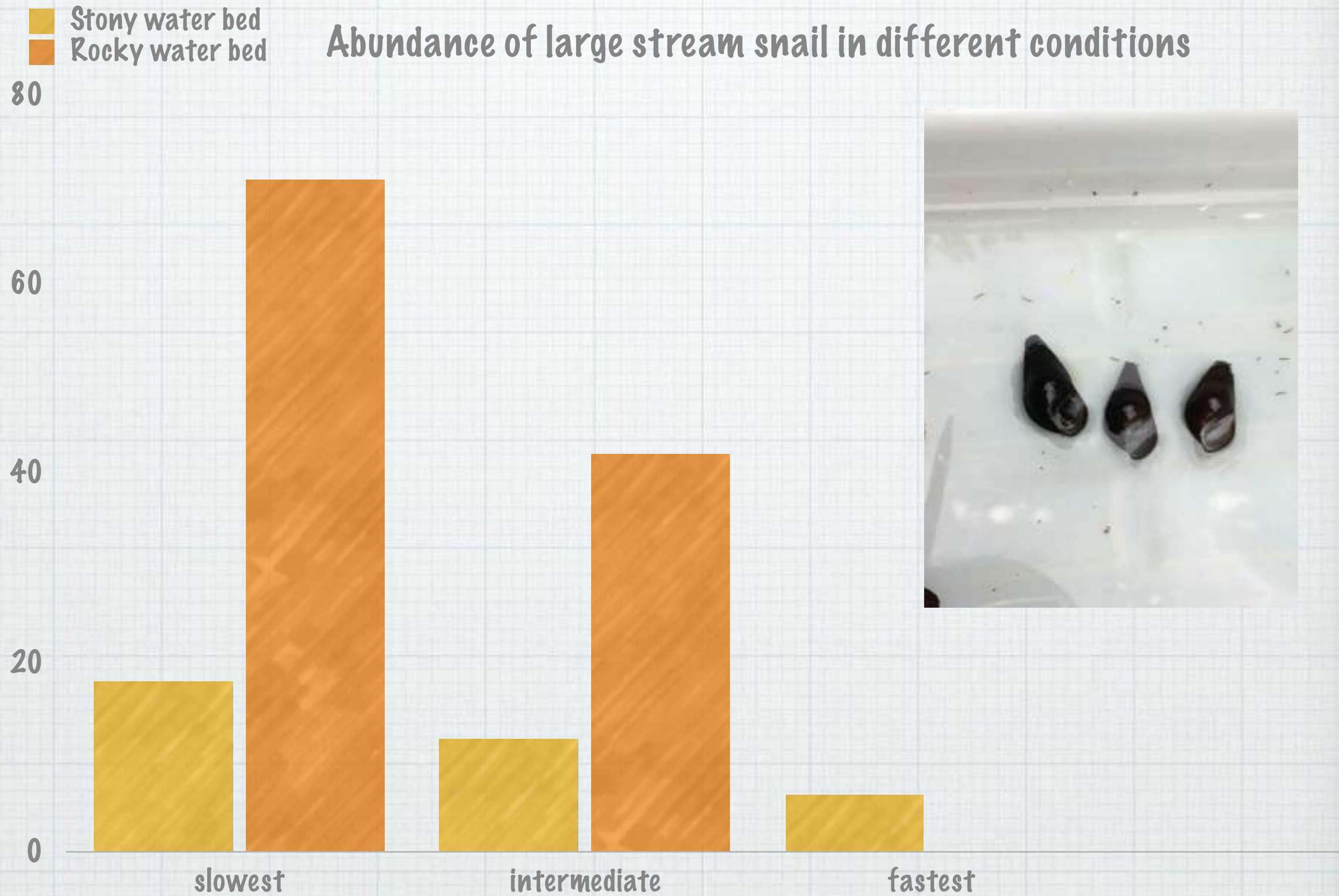
# Effect of rate of water flow in rocky water bed

* On the biodiversity (Simpson's Diversity Index)

| Slowest | Intermediate | Fastest |
|---|---|---|
| 0.166 | 0.259 | 0 |

Intermediate > slowest > fastest

# Large Stream Snail



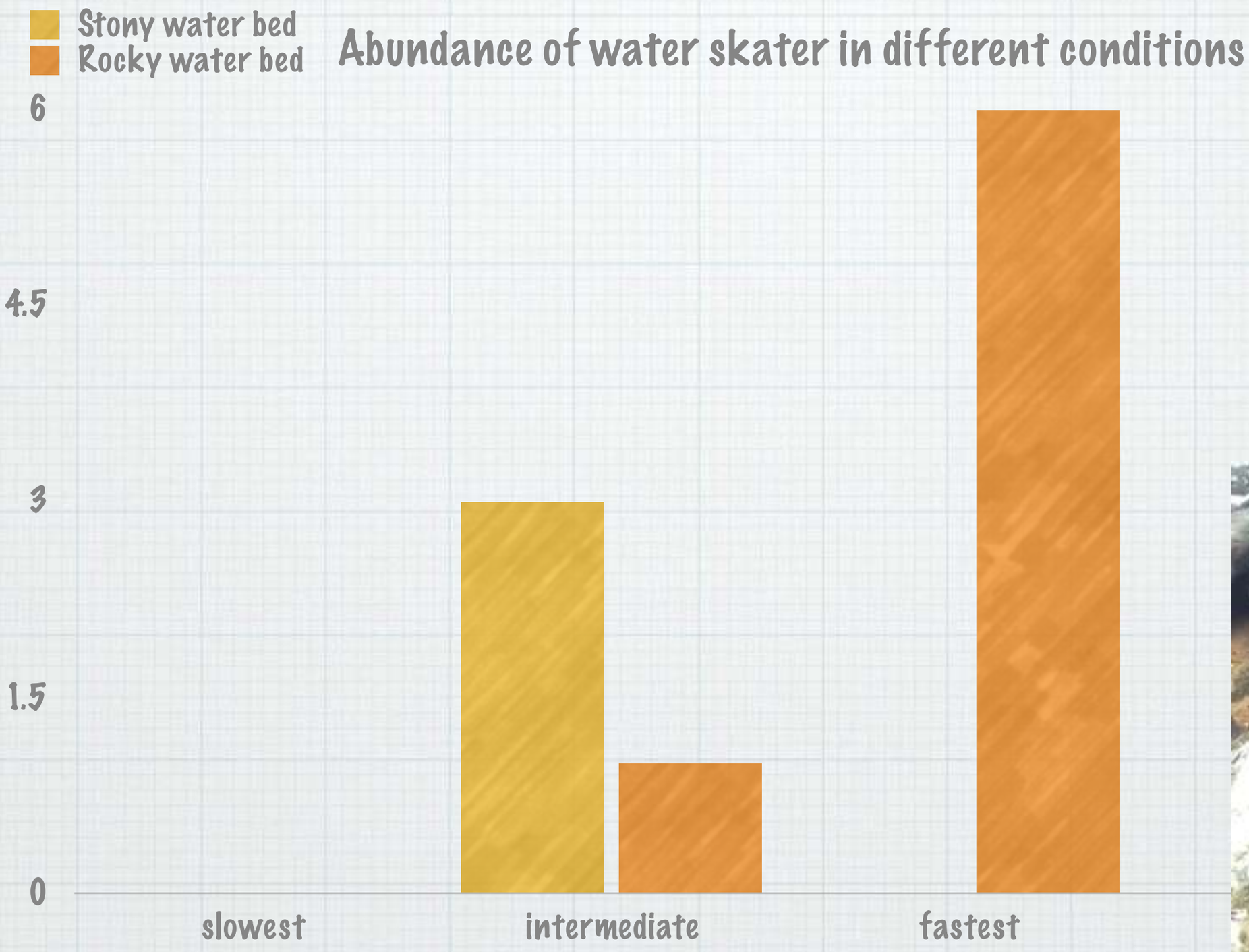
# Large stream snail (dominant species)

Adaptive features:

1. Stream lined shape shell
   Reduce impact of water current
   Provide protection
2. Strong muscles
   Attach to surface of rocks tightly

So it can live in both calm and fast water stream

# Water skater




# Water skater

Adaptive feature:
1. Long splayed paddle
   Allows them to spread their wight evenly over a large surface area
2. Continues movement of the paddle
   Allows them to move fast on the water surface, without being washed away by water current.

That's why they can live in fast water stream

# Conclusion

The lower the water flow rate the higher the biodiversity

# THANK YOU