CHEUNG SHA WAN CATHOLIC SECONDARY SCHOOL 2007-2008

SEARCH FOR NATURE STORIES: INVESTIGATION TOPIC: WATER STRIDER

(Group 9)

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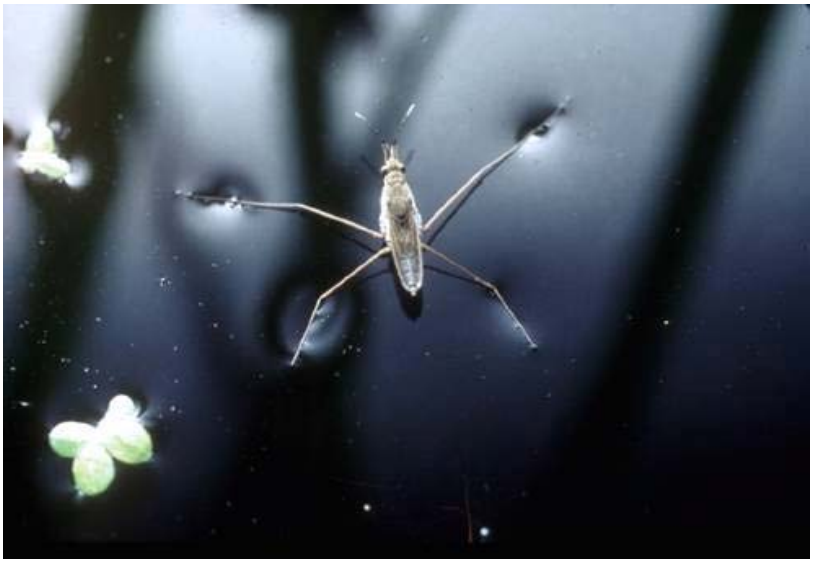


Abstract

On 25/3 and 4/4, we went to Tai Po Kau Nature Reserve. During our field study in fresh water stream in Tai Po Kau Nature Reserve, we found that the fresh water stream is a rich ecosystem which has abundant types of organisms. It is very shady because of many tall trees. There are many fallen leaves on water surface which enrich water so the nutrition level is high. It is also an irregular habitat in which different water currents are found. Water current is a main factor affecting organisms. In the area of quiet water, we found a special organism—water strider. It can move on water surface with a great speed without breaking the water surface.

Reasons and objectives

We wondered if we put something into the water, what the response of striders would be.

And we would like to find out the effect of surface tension on the mobility and floatability of water striders.

A bio-diversity reserve----Tai Po Kau

Water strider found in Tai Po Kau

Investigation 1: To find out how water striders respond to objects going onto water surface

Time & Venue:

5th April, 2008 in school Biology Laboratory

Reasons and Objectives:

When we were at a fresh water stream in Tsung Tsai Yuen, we saw water striders in quiet area of water moving around the water surface very quickly. We wondered if we put something into the water, what the response of striders would be.

We are to find out *reactions* of water striders with different kinds of substance (food and non-food, substances that sink and float) that *go onto the water surface*.

Hypothesis:

1. We expect that water striders only move towards food but not non-edible substances that floats.

2. The water striders are expected not to react with substances that sink.

Apparatus and Chemicals required:

1. Water strider kept in a tank

2. A handle of fish net

3. Bread

4. Ants

5. A small stone

Procedure:

1. Wait until the strider becomes stationary.

2. Insert the tip of the handle of a fish net into the water;

3. Observe its reactions to the objects.

4. Repeat 2. and 3. putting:
   A piece of bread onto the water surface;
   A living ant onto the water surface;
   A piece of bread to sunk;
   A small stone into the water.

Note: All the water striders under study have been *starved for one day.*

Experiment result:

1. The handle of a fish net:

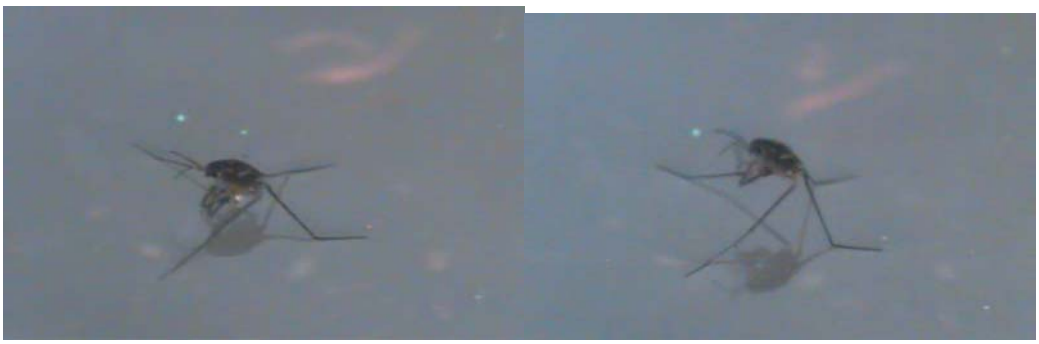
   Response: It moved towards the handle, held it and tried to climb on it.

2. A floating small piece of bread:

   Response: It moved towards it, grabbed it by their front legs and sucked it with their mouth. Vigorous movement of the front legs was observed.

2. A small living ant:

   Response: It did not notice it at first. It then moved around and got near the ant. Then they moved towards it and sucked it with their mouths assisted by their front legs. (Refer to the following photos)



4. A piece of bread that sunk to the bottom:

   Response: No observable response.

5. A small stone:

Response: No observable response

Analysis & Discussion:

Position / Type of Food	Floating	Sunken
Food	Showed response by reaching towards it	No observable response shown
Non-Food	Showed response by reaching towards it	No observable response shown

When water striders react to food floating on water, they will grab the food by their front legs and suck it by their mouth. They then move to another place to continue to suck it by their mouths.

Conclusion

Water striders react with objects, both food and non-food, on the water surface but not that sinks into the water, as they do not dive to find food under water. This might due to the vibration of water when objects are put onto the water surface.

As we observed, they ate edible objects fast. It might because they had starved for one day.

Limitations in doing this experiment:

There are some limitations in doing this experiment.

First, as time was limited, only one water strider was under study. Without testing more striders, the common behaviour of water striders could not be observed.

Second, the experiment was only done in the afternoon. The time to carry out the experiment may vary the response of it because of the biological clock. When the water strider is carried out at night, they may not respond because they will be sleeping.

Third, only the strider under study was starved. A full strider may have slower response to objects getting onto the water surface because it has no immediate need of obtaining food.

Investigation 2: To study the effect of surface tension on the mobility and floatability of water striders

Time & Venue:

5th April 2008 in school Biology Laboratory

Reason ands Objectives:

During our field study in Tai Po Country Park, we found out that water striders are supported by 6 legs and can move on water surface with a great speed without breaking the water surface.

We are to study the effect of surface tension on the mobility and floatability of water striders.

Hypothesis:

Water striders rely on surface tension to move and support themselves on water surface. If the tension is lower, the water striders will be no longer mobile. They cannot stay on surface of water or even sink.

Apparatus required:

1. A beaker

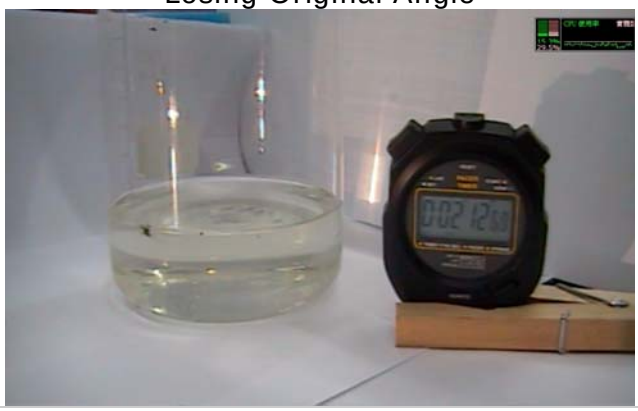
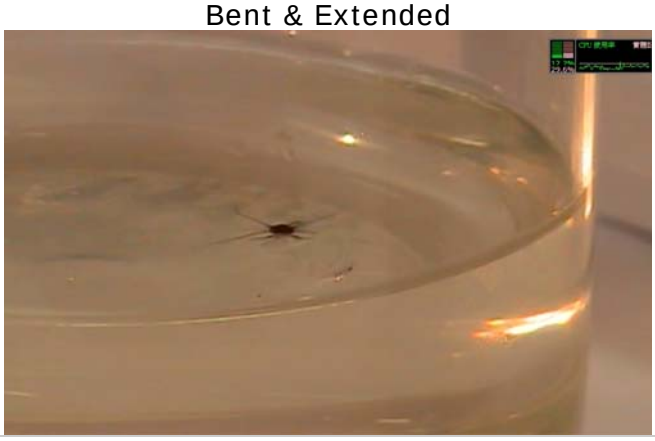
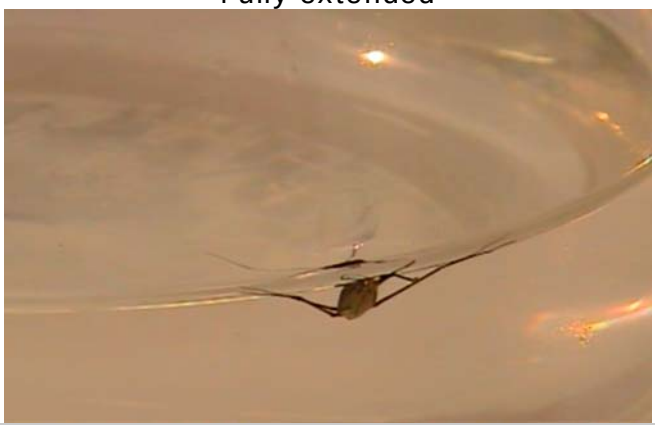
2. A water strider
3. Distilled water
4. Dropper
5. Dilute detergent (1:99 and 1:199)

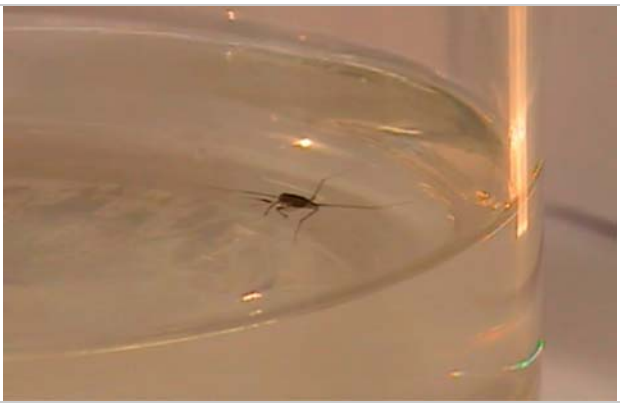
Setup and Procedure:

1 A beaker of dilute detergent was prepared.
2 A water strider was placed in 200ml distilled water
3 Wait until the water strider become adapted to the new condition.
4 It was then added drop by drop per minute into another beaker containing.
250mL distillated water and a water strider
5 Repeat the experiment twice.

Experiment Results:

Test I
1:99 dilute detergent

Time (min)	Response	Body Position(%volume of body below water)	Legs Position
0	Nil	0	Normal
1	Nil	10%	Losing Original Angle
2	Jumps out of Water	30%	Losing Original Angle 
3	Jumps out of Water	70%	Bent & Extended 
4	Struggles by Vibration of Legs	80%	Fully extended 
5	Stay calmly without movement	80%	Fully extended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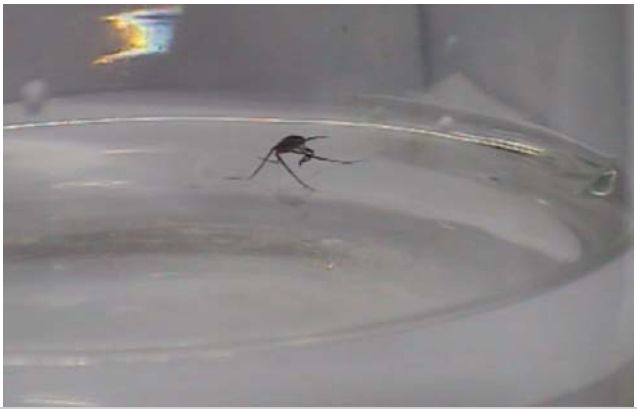
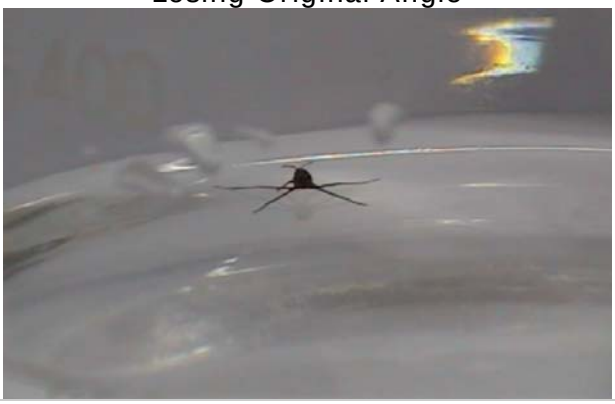
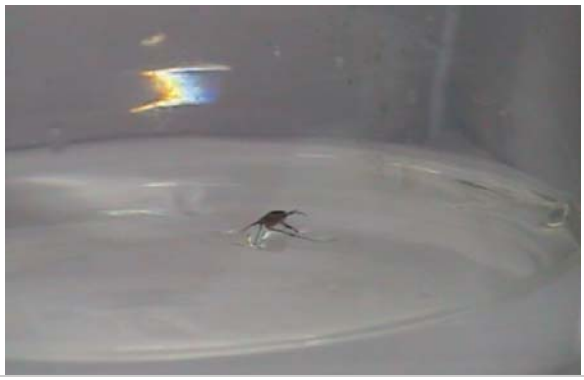
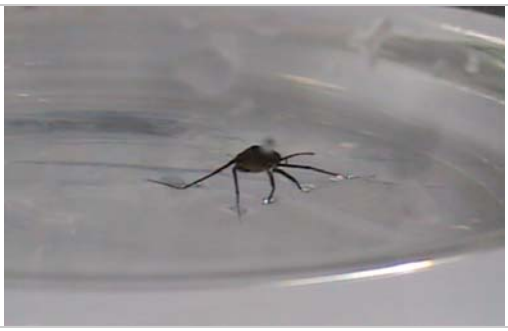
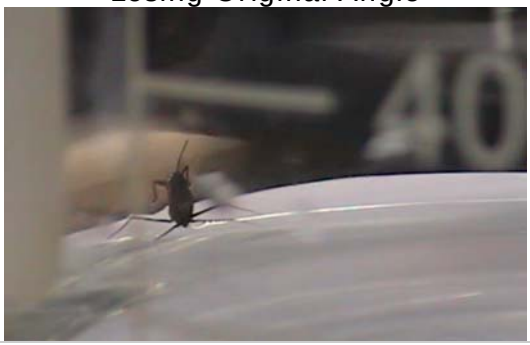
Test II # 1:199 dilute detergent			
Time (min)	Response	Body Position(%volume of body below water)	Legs Position
0	Nil	0	Normal
1	Nil	0	Normal
2	Nil	0	Normal
3	Nil	0	Normal
4	Nil	0	Normal 
5	Nil	0	Losing Original Angle 
6	Jumps out of Water	10%	Losing Original Angle

7	Jumps out of Water	30%	Bent & Extended 
8	Struggles by Vibrating Legs and Immobile	50% **	Fully extended 
9	Stay calm without any movement	80%	Fully extended
10	---	---	---

Test III # 1:199 dilute detergent			
Time (min)	Response	Body Position(%volume of body below water)	Legs Position
0	Nil	0	Normal
1	Nil	0	Normal
2	Nil	0	Normal
3	Nil	0	Normal
4	Nil	0	Normal
5	Nil	0	Normal

			
6	Jumps out of Water	10%	Losing Original Angle 
7	Struggles by Vibration of Legs	10%	Losing Original Angle
8	Struggles by Vibration of Legs	30%	Losing Original Angle
9	Jumps out of Water	50%	Bent & Extended
10	Struggles by Vibration of Legs and Immobile	Immobile 70% **	Fully extended
11	Stay calm without movement	90%	Fully extended
12	---	---	---

* The lower-half of the water strider first sinks into the solution.

** The water strider still struggles but it can only vibrate its legs.

*** The water strider will use its front legs try to push its back legs back to the original angle.

\# Replicas are carried out to increase accuracy of result.

Discussion:

From the result above, it is obvious that water striders are able to stand on water surface because of the surface tension. But do they have the ability to detect changes on the tension forces?

When we dropped a water droplet, the water striders under study usually remained stationary. Besides, when we added a drop of dilute detergent, they tended to move away from it very quickly. The conclusion is concluded as the followings:

1. Their legs can detect changes on the water tension.
2. They have the ability to detect the presence of chemical in the water.

This two topics are very interesting and we will have further experiment to prove this when we have time.

Apart from that, we found that whenever the bodies of the water striders contacted with the water, they jumped to escape from water.

Conclusion:

Summing up, we found out that the water striders have a high sensitivity to changes in water tension. They cannot tolerate a great decrease of surface tension which can be caused by some common pollutants in water, e.g. detergent, oil. In other words, even minor water pollution may be fatal to water striders.

Limitations and improvement:

As you can see, there are some differences between these three tests. For example, the response, percentage volume of body below water or the position of legs. We presume that it is because there are differences in those water striders, such as the mass, length of legs, size etc. To increase the accuracies, we suggested that we can do more tests instead of just 3 tests as a result we can get an accuracy data on how the water tension affect the mobility and floatability of water striders

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THE END