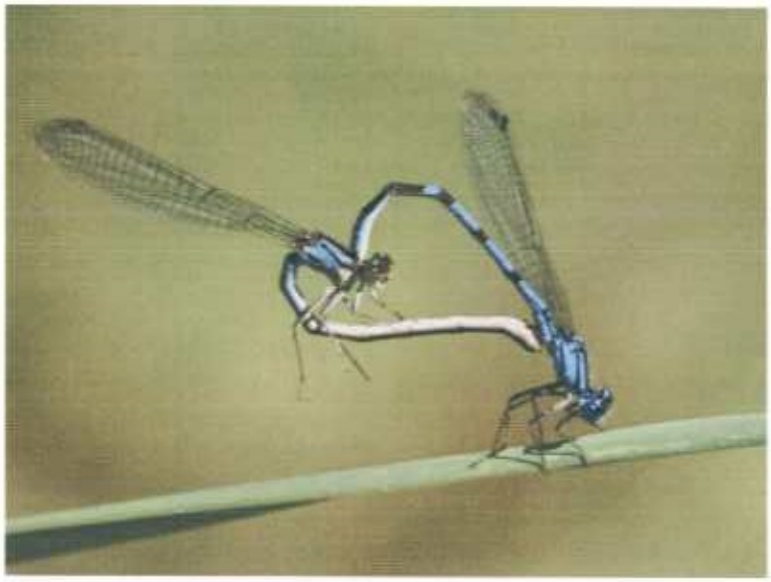
Eco-watch: Biodiversity Baseline Survey on Dragonflies in Hong Kong Wetland Park

St. Paul's Co-educational College



Members:

1A 陳炯燊 CHAN KWING SUN
李哲元 LI CHIT YUEN
鄭穎彤 CHENG WING TUNG
黃彥嵐 WONG YIN NAM
1C 陳蔚程 CHAN WAI CHING
1D 簡志翔 KAN CHI CHEUNG
陳穎汶 CHAN WING MAN
1E 文展鞍 MAN CHIN ON
石栩瑩 SHEK HUI YING
4A 楊譽勳 YEUNG THEODORA
4B 陳潤賢 CHAN YUN YIN
4E 葉紹東 IP SIU TUNG
關詠珊 KWAN WING SHAN
4F 黃恬兒 WONG TIM YEE DELORES

Content

I. Introduction

Wetlands are a major source of water for humans. Humans have depended on wetlands since the ancient times. Wetlands provide a favourable habitat for different species of animals and plants and are responsible for demonstrating the biodiversity in the ecosystem. For example, wetlands are essential nesting, feeding and wintering sites for water birds such as the endangered black-faced spoonbill. Secondly, by absorbing the force of strong winds and tides, wetlands protect terrestrial areas adjoining them from storms, floods, and tidal damage. Furthermore, the plants in wetlands help to filter pollutants in the water. All these functions of wetlands give us the intention to investigate the ecosystem in wetlands. We have chosen the Hong Kong Wetland Park as the site of investigation.

The Hong Kong Wetland Park is located at the northern part of Tin Shui Wai, New Territories. The 61-hectare Hong Kong Wetland Park demonstrates the diversity of the Hong Kong's wetland ecosystem and highlights the need to conserve them. It presents an opportunity to provide an education and recreation venue with a theme on the functions and values of wetlands for use by local residents and overseas visitors.

Dragonflies and Damselflies are organisms which depend on wetlands as their habitat. Therefore, we have chosen them as the target of this investigation. We have conducted a Dragonfly survey in order to study their living environment and habits.

II. Our survey

The following are the details of our investigation

Date: 7th May, 2006

Time: 10:00a.m -4:00p.m

Maximum temperature: 30.2℃

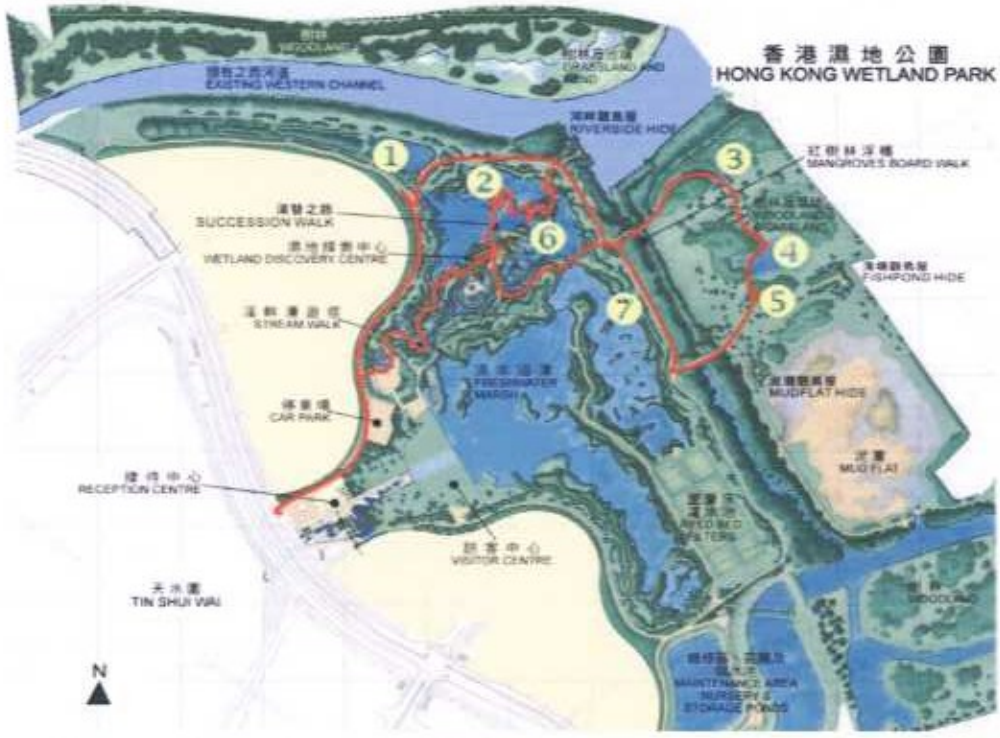
Minimum temperature: 26.6 ℃

Relative humidity: 69% - 88%

Rainfall: 0mm

i. Result

Location & Environment of Habitat



The map of Hong Kong Wetland Park

Hong Kong 蜻蜓 Dragonflies

The habitats of dragonflies in the Hong Kong Wetland Park

1. Stream

Water Depth : 16 cm
Salinity : 0%

2.Marsh

3.Pond

Water Depth : 32 cm
Salinity : 0%

4.Pond

Water Depth : 64 cm
Salinity : 0%

5.Woodland

Water Depth : 0 cm
Salinity : --

6.Marsh

Water Depth : 140 cm
Salinity : 0%

Each part of location have different characteristics, such as water depth and salinity. These locations attract different types of Dragonflies. The factors affecting habitats of Dragonflies will be discussed later.

The list of Dragonflies we saw in different habitiats were recorded, as shown in the table below.

Name	Number	Location	Conservation status in HK
1. Variegated Flutterer 班麗翅蜻	10	all locations	Common
2. Common Bluetail 褐斑異痣蟌	4	1,3	Abundant
3. Blue Dasher 藍額疏脈蜻	4	1,3	Common
4. Asian Amberwing 黃翅蜻	4	4	Abundant
5. Crimson Darter 紅蜻	4	1,3	Abundant
6. Orange-tailed Sprite 琉球橘黃蟌	3	1,3,6	Abundant
7. Asian Pintail 錐腹蜻	3	3,6	Common
8. Green Skimmer 狹腹灰蜻	3	3,5	Common
9. Orange-tailed Midget 杯班小蟌	2	1,6	Abundant
10. Common Flangetail 霸王葉春蜓	2	2,6	Abundant
11. Pied Percher 截斑脈蜻	2	3,6	Common
12. Pied Skimmer 玉帶蜻	2	4	Common
13. Scarlet Basker 赤斑曲鈎脈蜻	2	6	Common
14. Eastern Lilysquatter 黑背尾蟌	1	6	Rare

Table 1: List of species of Dragonflies recorded in Hong Kong Wetland Park

The total number of different types of Dragonflies found in Hong Kong Wetland Park are summarised in the following chart.

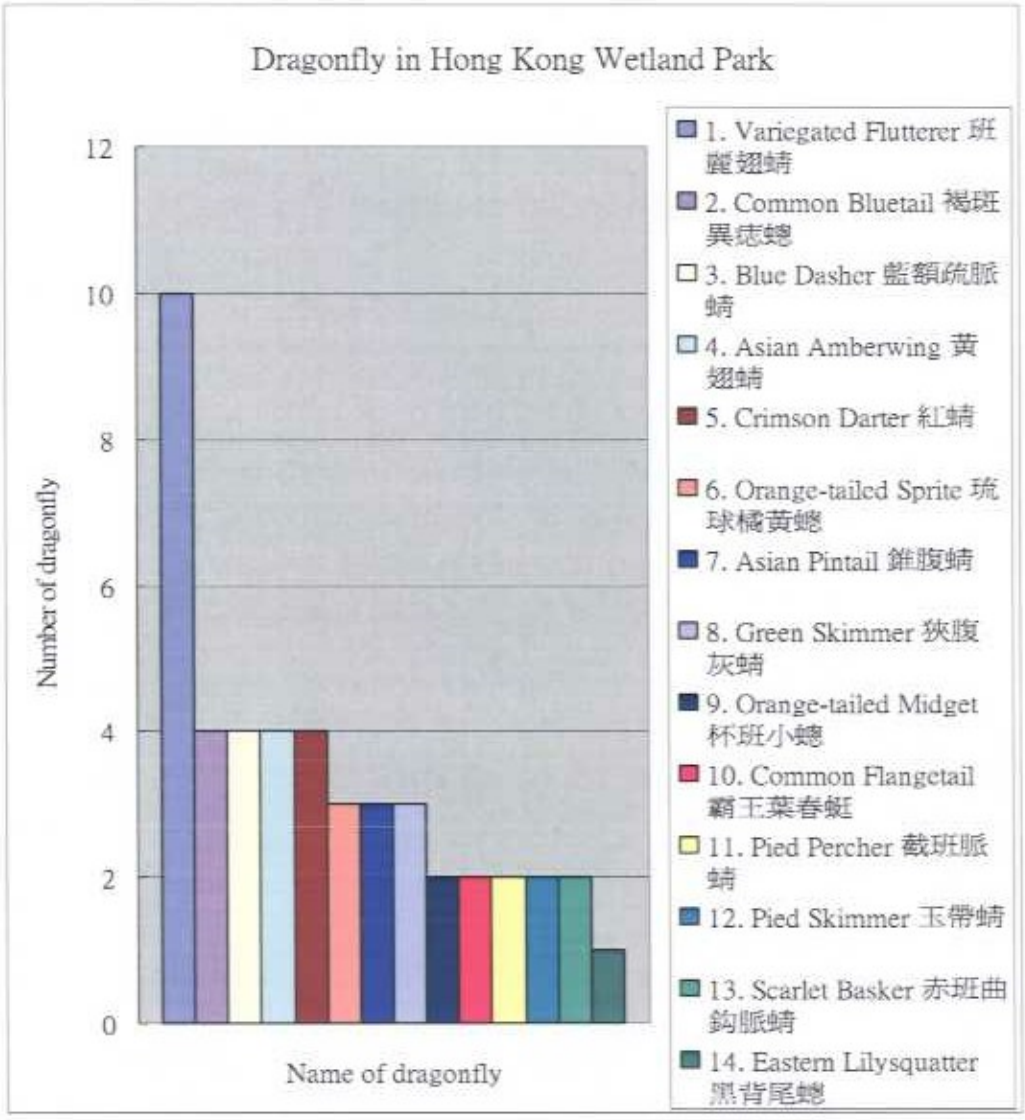


Chart 1: Different types of Dragonflies in Hong Kong Wetland Park

ii. Analysis

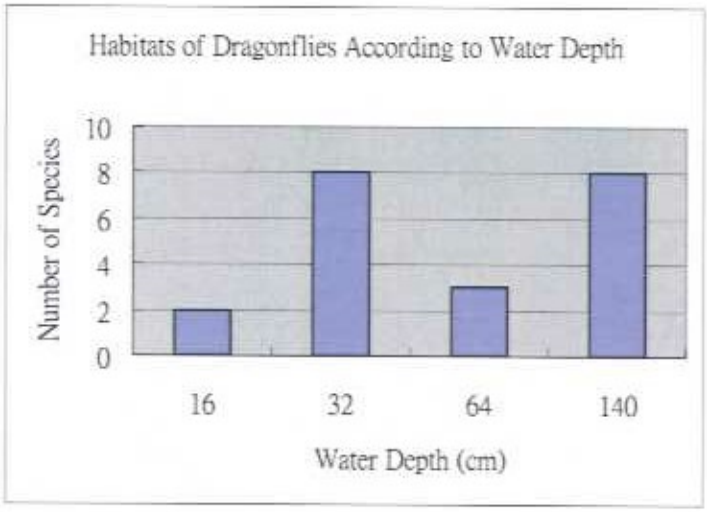


Chart 2: Habitats of Dragonflies according to Water Depth

There is no obvious and direct relationship between the water depth and the number of species. Maybe there are other factors affecting the number of species of Dragonflies. For example, water pH, water quality, mineral content, water movement, and presence of predators, etc.

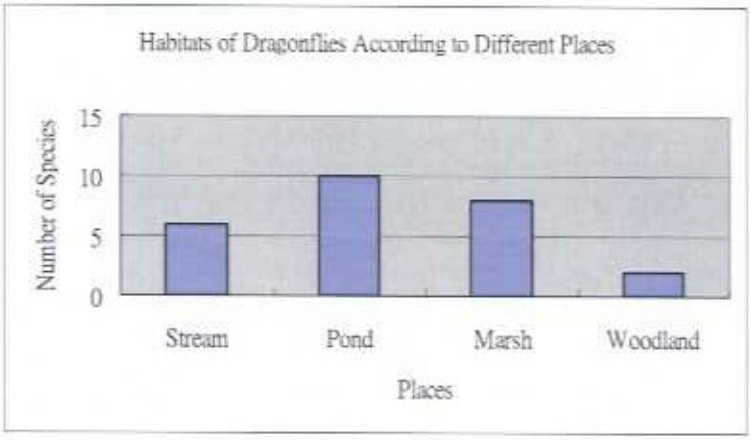


Chart 3: Habitat of Dragonflies according to Different Places

Dragonflies like to live at places where there is much water, such as ponds, as water is essential for life. It also provides food, water, birthplace and habitat for larvae.

Summary

According to the above analysis, most species of Dragonflies live at fresh water ponds. A possible explanation for this is fresh water ponds provide different types of Dragonflies not only food and water, but also habitat and breeding site.

We noticed that different species of Dragonflies favours different locations as their habitats, for instance, eastern lilysquatter are always found in ponds with lilies and pied skimmer are always found near deep ponds next to woodland. However, some Dragonflies can be found everywhere, such as variegated flutterer.

The Dragonflies like staying at the places they have chosen. We have seen common bluetail, crimson darter and variegated flutterer flying back to their original spot for several times. This is because Dragonflies think the spots they have chosen are the best spots, either for catching prey or mating. So they tend to fly back to their original spots after they left.

iii. Our Observation

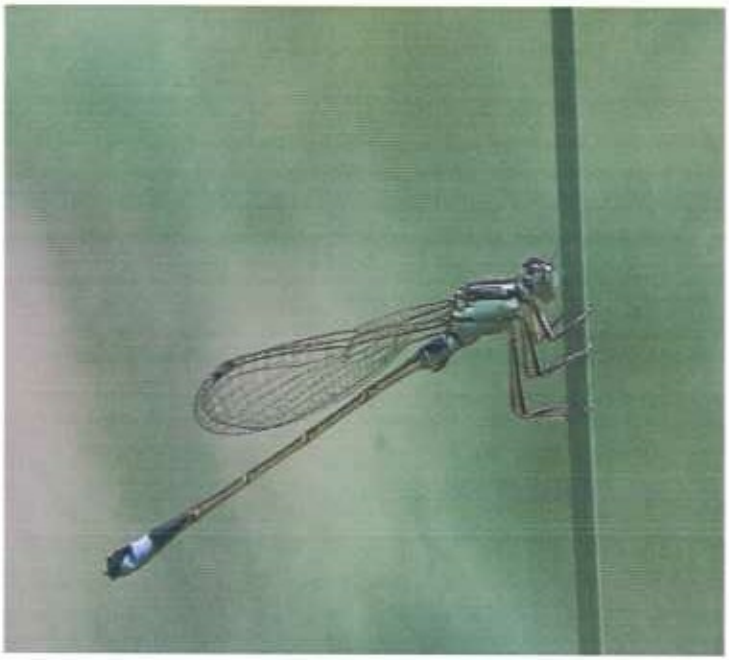
Part 1. Dragonfly Most List in Hong Kong Wetland Park

1. The most commonly found Dragonfly and Damselfly in Hong Kong Wetland Park:

Variegated Flutterer (*Rhyothemis variegate aria*) 斑麗翅蜻

Family	Libellulidae (蜻科)	
	Male	Female
Description	Abdomen + Anal Appendages 26mm - 27mm Hindwing 36mm - 38mm	Abdomen + Anal Appendages 22mm - 24mm Hindwing 34mm - 37mm
Breeding sites	marshes, ponds and tanks	
Special features	Variegated Flutterer looks like a butterfly and there will be many of them in late summer.	
Status and distribution in Hong Kong	Common and widespread.	
Remarks	Variegated Flutterer always hovers at low altitude over wind-sheltered locations close to the breeding sites. They often fly in groups.	

Common Bluetail (*Ischunura senegalensis*) 褐斑異痣蟌



Family	Coenagrionidae (蟌科)	
	Male	**Female**
Description	Abdomen + Anal Appendages 21mm - 23mm Hindwing 13mm – 15mm	Abdomen + Anal Appendages 22mm - 24mm Hindwing 14mm - 16mm
Breeding sites	Ponds, tanks, rivers, streams	
Special features	The head and thorax are black and blue, the abdomen is black in colour. There is the blue tip at the end of abdomen. They usually rest on the plants either in the middle of ponds or at the water edges.	
Status and distribution in Hong Kong	Abundant. Widespread throughout Hong Kong in all wetland habitats except fast flowing waters.	
Remarks	It is quick to colonise and is often found in ornamental ponds in urban areas. It can also tolerate brackish water conditions and highly saline salt pans and hot sulphurous springs in Africa.	

2. The biggest Dragonfly we found in Hong Kong Wetland Park:

Crimson Darter (*Crocothamis servilia servilia*) 紅蜻

Family	Libellulidae (蜻科)	
	Male	**Female**
Description	Abdomen + Anal Appendages 24mm - 35mm Hindwing 27mm – 38mm	Abdomen + Anal Appendages 25mm - 32mm Hindwing 32mm – 37mm
Breeding sites	static water, eg. ponds, shallow pools	
Special features	Whole body is crimson in colour .It is highly sensitive to movement and able to track prey and predators at some distance. It perches upon some sunny prominence whence they seize smaller insects or chase away competitors.	
Status and distribution in Hong Kong	Abundant in Hong Kong	
Remarks	It is a medium-sized, brilliant red species which favours cultivated areas, ponds and marshes in the New Territories.	

2. Some special Dragonfly and Damselfly we found in Hong Kong Wetland Park

Pied Skimmer (*Pseudothemis zonata*) 玉帶蜻

Family	Libellulidae (蜻科)	
	Male	**Female**
Description	Abdomen + Anal Appendages 28mm - 33mm Hindwing 38mm – 42mm	Abdomen + Anal Appendages 28mm - 33mm Hindwing 38mm – 42mm
Breeding sites	reservoirs, ponds, tanks, marshes	
Special features	An unusual coloured black and white medium-sized libellulid	
Status and distribution in Hong Kong	Fairly common and widespread	
Remarks	The sub-adults are found in woodland adjacent to the breeding sites. The males are also known for tussling for territory at the water margins of breeding sites.	

Hong Kong 蜻蜓 Dragonflies

Asian Pintail (*Acisoma panorpoides panorpoides*) 錐腹蜻

Family	Libellulidae (蜻科)	
	Male	**Female**
Description	Abdomen + Anal Appendages 15mm - 18mm Hindwing 16mm – 21mm	Abdomen + Anal Appendages 15mm - 18mm Hindwing 17mm – 22mm
Breeding sites	heavily weeded ponds or swampy areas	
Special features	The abdomen which tapers markedly from segments 5-7 to a form a narrow tip.	
Status and distribution in Hong Kong	It is common and is widespread in weedy ponds and marshes.	
Remarks	It is a small and fairly common libellulid. The flight is weak and short. It is rarely found far away from their breeding sites.	

Hong Kong 蜻蜓 Dragonflies

Eastern Lilysquatter (*Cercion melanotum*) 黑背尾蟌

Family	Coenagrionidae (蟌科)	
	Male	**Female**
Description	Abdomen + Anal Appendages 21mm - 24mm Hindwing 14mm – 17mm	Abdomen + Anal Appendages 22mm - 25mm Hindwing 14mm – 17mm
Breeding sites	Lily ponds, streams and rivers	
Special features	This little blue damselfly is mainly light blue with patchy black at the back.	
Status and distribution in Hong Kong	Uncommon, only found in Hong Kong Wetland Park and Shek Kwu Chau.	
Remarks	They were discovered in Hong Kong in 1997 at Shek Kwu Chau, where pairs were observed in tandem and females were seen to oviposit in lily leaves.	

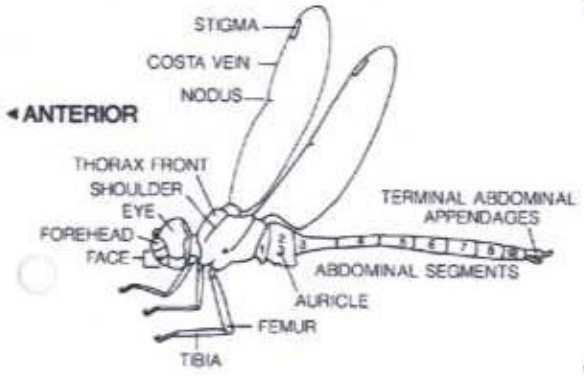
Part 2. Interesting facts about Dragonflies and Damselflies

1. What are the differences between Dragonfly and Damselfly?

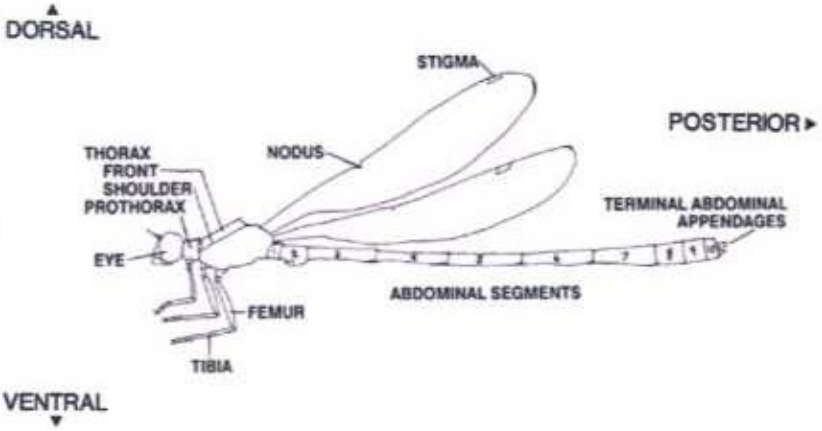
The following are the general difference of Dragonflies and Damselflies.

Dragonflies	Damselflies
Eyes touch on top of the head	Eyes are well separated
Forewings & hindwings are of different shape	Forewings & hindwings are of similar shape
At rest, the wings are held away from the body	At rest, the wings are held close to the body

PARTS OF A DRAGONFLY

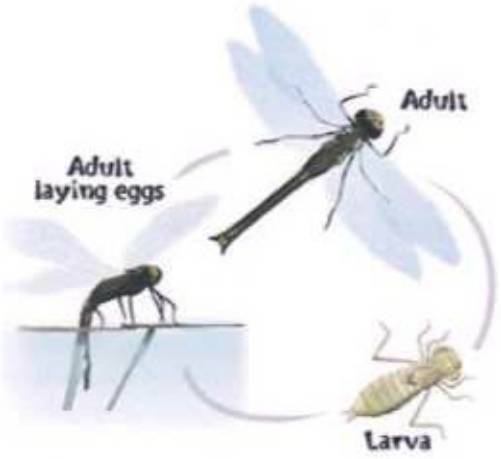


PARTS OF A DAMSELFLY



2. What is the life cycle of Dragonfly and Damselfly?

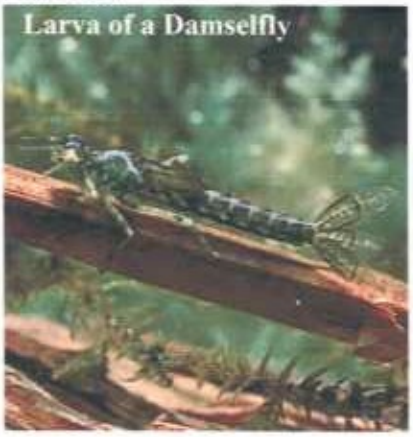
The Dragonfly and Damselfly life cycle consists of three stages - egg, nymph (or larva) and adult. Their eggs are deposited directly onto aquatic plants or dropped into the water. Dragonflies and Damselflies begin life as a nymph living underwater. When the nymph is completely grown and ready to become an adult, it will crawl up the stem of a water plant and emerge out of the water. When the Dragonflies and Damselflies have successfully mated, the female will look for a suitable pond where she will lay her eggs and the cycle begins again.



STAGE 1: EGG → NYMPH

At one end of the egg there is a minute which the larva will later hatch. In some species the eggs are surrounded by a jelly-like substance that enables the eggs to attach themselves to the leaves of plants or to stones and rocks under the water, so preventing them from sinking into the mud or being swept away by fast-flowing water. Although some species over-winter as eggs, most eggs start to develop soon after they have been laid and the larvae hatch out one to three weeks later.


Larva of a Dragonfly


Larva of a Damselfly

STAGE 2: NYMPH → ADULT

Like all Arthropods, the developing larva must repeatedly shed one outer casing in order to grow a new one. Periods between these moults are called "instars". By the time the aquatic larva reaches its final instar, it will have developed all the organs and other attributes that will be needed to sustain life as a winged terrestrial insect.

The larvae of Dragonflies and Damselflies are aquatic and breathe through gills. In most Damselflies, these take the form of three leaf-like appendages at the tip of the abdomen, whilst the gills of Dragonflies are projections within the rectum. Both respiratory systems also serve the larvae as means of moving around in the water: Damselflies' appendages are used as rear paddles and the pump that ventilates the Dragonflies' rectal gills provides a spectacular jet propulsion.


Dragonfly larva feeding on small fish

The nymphs of Dragonflies and Damselflies eat other aquatic creatures, such as fish-spawn and tadpoles. The nymphs of larger species will even eat those of the smaller ones. However, they have to beware of predators like fish and frogs


Exuvia

This nymphal stage can last for as long as four years for some species. Many species overwinter as nymphs in ponds and marshes and emerge in the spring as adults.

When the nymph is ready to change from an underwater predator into an aerial one, the adult Dragonfly or Damselfly emerges from the skin of the nymph. This discarded skin is called the exuvia and can be seen still clinging to stems long after the adult has emerged. After emerging from skin, the Dragonfly body and wings grow rapidly as it pumps fluids into to them. The new adult will hunt and often eat on the wing.

3. How do Dragonflies mate?

To mate, a male Dragonfly grips a female with appendages on his abdomen, and may carry her in tandem in flight. The male grabs hold of the female's head, and the female bends her body forward to touch the base of the male's abdomen. The two Dragonflies lock together in a mating grasp that looks like an intricate heart shape.

Two mating common bluetails (top: male)

Two mating Green Darners (left: male)

The male Dragonfly is unique among insects in having its genitalia on the second segment of its abdomen. The sperm is brought forward from the back of its abdomen, and inserted into the female through a penis that may resemble a brush, a ball, or other strange shapes. The function of this bizarre-shaped organ probably includes ridding any previous male's sperm from the female.

Will Dragonflies of different species mate?

No. Two Dragonflies can only mate when they belongs to the same species. It is because the appendages at the end of the abdomen of the male Dragonfly, can only grab hold of the head of the female Dragonfly of the same species. This is similar to the key-lock hypothesis.

4. How do Dragonflies breed?

There are two methods of Breeding of the Dragonflies:

1) Exophytic

These lack functional ovipositors and merely deposit their eggs directly onto the surface of the water or into mud at the water's edge. The eggs of exophytic species are broad and elliptical.

This method is usually practiced by the Dragonflies belong to the families of Libellulidae, Gomphidae and Cordulegastridae. During this trip, we only saw this breeding method since most Dragonflies we saw belong to Libellulidae.

This figure shows a Crimson Darter (*Crocothamis servilia servilia*) flying over the water surface, trying to find a suitable place for lying eggs. During this journey, we discovered some species other than Crimson Darter practice this method. One of the examples is an Asian Pintail (*Acisoma panorpoides panorpoides).* We saw it wandering around the water lily and dipping its tail quickly onto the water surface.

2) Endophytic

Dragonflies insert their eggs into plant material above or below the surface of the water. The eggs of endophytic species are long and cylindrical.

This method is only practiced by the Dragonflies belong to the families of Aeshnidae, Neopetaliidae and Petaluridae. However, we didn't see any members of these families on that day.

This Yellow Emperor Drangonfly, which belongs to Aeshnidae. Its wingspan is 105mm.

Costal Petaltail (*Petalura litorea)*

They are one of the very rare species and only found in Southeast Queensland. Their wingspan is quite large---about 190 mm. It is a member of Petaluridae.

5. What do Dragonflies eat?

Dragonflies mainly eat other flying insects, especially midges and mosquitoes. They also take butterflies, moths and smaller Dragonflies. There is a kind of Asian species which even takes spiders from their webs!

Larvae are small and they live in water. They eat almost any living things that is smaller than themselves. The larger Dragonfly larvae are able to catch and eat small fish or fry. They usually eat bloodworms or other aquatic insect larvae.

As Dragonflies eat mosquitoes, can we use Dragonflies to control mosquitoes or other flying pests?

For sure, Dragonflies eat large numbers of flying pest species, but it is indeed not feasible using them to control pests. A number of studies have already been carried out and these studies result show that only in very restricted and tightly controlled environments, Dragonflies or their larvae, are able to control the number of pest. In open areas, we cannot ensure that the Dragonflies that are introduced to a pest rich habitat will stay there. Obviously, they will leave the pest rich habitat if the other aspects of the environment are not suitable for them. Then we will have to change the environment to accommodate these Dragonflies. This will involve a lot of investment.

III. Conclusion and Reflection

The Hong Kong Wetland Park is really a good place for different species of dragonflies, as it provides different unique environment and habitats for different species of dragonflies. We learnt more about dragonflies and damselflies, not only their names, but also their special shapes, sizes, features and their habits. We also have the chance to see 14 different species of dragonflies, which we wouldn't have seen in normal circumstances. Apart from all we have learnt, we also had an unforgettable trip, as we were so lucky to have seen dragonflies mating right in front of our eyes during our trip.

Apart from learning about the biodiversity, we also realized the importance of conserving and protecting the environment; otherwise, organisms, not only dragonflies and damselflies, will become extinct and disappear from the world. Not only the ecosystem is damaged, but our next generations will lose the chance to appreciate the organisms: they could not learn the organisms in real life, but only from pictures or television programmes. Therefore, everyone should take part in saving and protecting the Earth.

IV. Reference

Books:
Field Guide to the Dragonflies of Hong Kong
Websites:
http://en.wikipedia.org/wiki/Dragonfly
http://www.abc.net.au/science/scribblygum/february2005/
http://www.cirrusimage.com/dragonfly_green_darner.htm
http://powell.colgate.edu/wda/Beginners_Guide.htm

V. Acknowledgement

Wholeheartedly thanks are given to Dr Tam Tze Wai (Nature Conservation officer of Agriculture, Fisheries and Conservation Department) for his valuable and expert teaching on dragonflies during our trip.

Sincere thanks are given to Ms Lau Oi Ha and Mrs Lam Wong Suk Kwan for their valuable comments and advice, also for their support throughout the whole trip.