FAUNA IN HONG KONG

STUDENT HANDBOOK

Introduction

Aims and Objectives

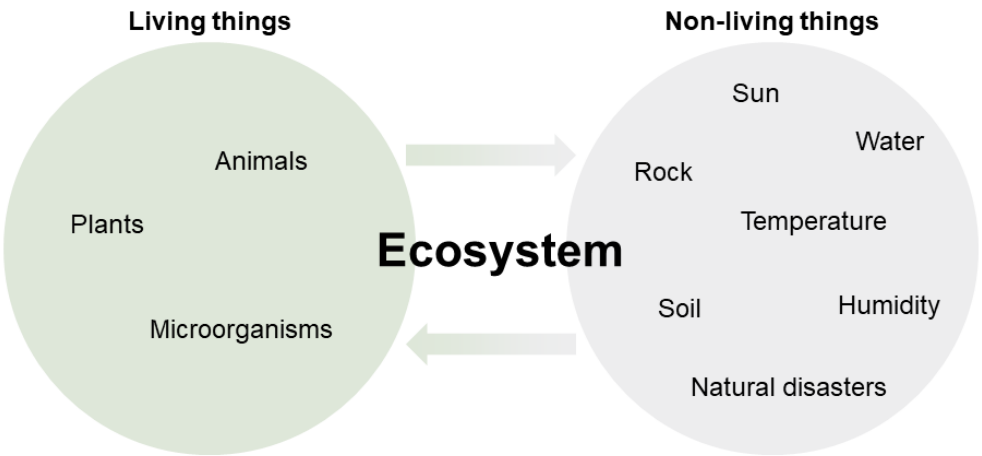
- Explore the interactions between living and non-living things
- Investigate the distribution (分佈) and abundance (豐富程度) of animals living at the field site
- Observe the characteristics of different organisms in an outdoor environment

Background

A habitat (棲息地) is a place that meets the environmental conditions organisms need to survive. For animals, a suitable habitat is a place that can support them to grow and reproduce successfully. This requires a number of basic conditions, such as sufficient water, food, and protection (from predators, weather etc.).

A habitat is composed of both living things and non-living things. Living things are defined by a set of criteria, including the ability to obtain food, respire, move, grow, sense, excrete, and reproduce. On the contrary, non-living things are objects that do not have the characteristics or functions as mentioned above, such as water, rocks, sunlight, air, and soil. Living and non-living things rely on each other and form complex interactions, creating an ecosystem (生態系統).

Scientists spend a tremendous amount of time conducting field observations to understand better how ecosystems work. Field observation helps us obtain first-hand information about the characteristics and behaviour of organisms, and how the organisms interact with other living things and non-living things in the environment. This helps us understand what are needed in the environment to support biodiversity and provide useful information for environmental conservation efforts.



Field trip activities

In the field trip, you will visit Tai Lam Ecological Garden and explore how living things interact with others and non-living things and observe the characteristics of different organisms by carrying out two activities:

Activity 1: Butterflies and Plants	
Study targets:	Butterflies (蝴蝶)
Activity content:	You will observe the plants associated with butterflies' life cycle and the behaviour of butterflies.

Activity 2: Dragonfly and Damselfly Survey	
Study targets:	Dragonflies (蜻蜓), damselflies (豆娘)
Activity content:	You will observe a pond and judge whether that is a suitable habitat for dragonflies and damselflies. You will also survey the abundance of dragonflies and damselflies near the pond.

Wait a minute!

How much do you know about butterflies, dragonflies, and damselflies? Do you know how they look like? Are you familiar with finding and identifying them? If the answer to either question is no, it is time to equip yourself with the knowledge about those insects. Please read **P.3–8** before the field trip to get yourself prepared for the activities

Introduction to Study Targets

Butterflies

Butterflies are insects and belong to the class Lepidoptera (鱗翅目). The word “Lepidoptera” comes from the Latin word for scaly wings, suggesting that adult lepidopterans’ wings are covered with scales. The diverse and beautiful patterns on butterfly wings come from different arrangements and colors of the scales.

The diverse and beautiful patterns on butterfly wings come from the scales.

Butterfly anatomy

Like other insects, the body of a butterfly is divided into three parts, including head, thorax, and abdomen. There are a pair of antennae, a pair of compound eyes, and a proboscis on a butterfly’s head. As for the thorax, two pairs of wings and three pairs of legs can be found.

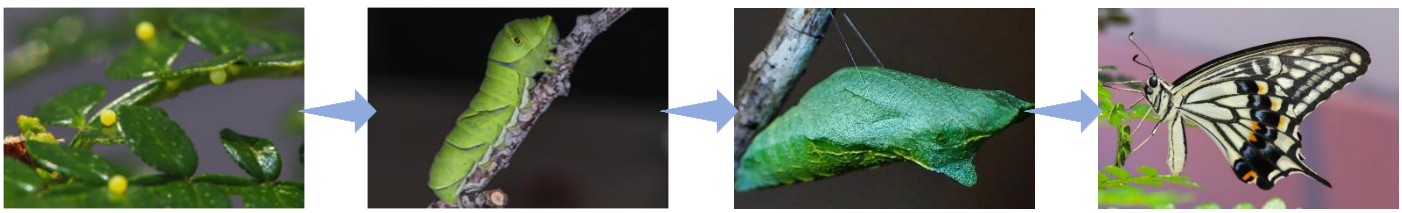
Different physical features of a butterfly.

Different physical features have their own functions, some of which can help butterflies adapt to their environment:

Physical features	Functions
Antenna	• As sensory organs to pick up chemical signals, which help the butterflies to find specific plants and mates. • Help with balance and in detecting motion.
Compound eyes	• Composed of a variable number of small eyes (ommatidia), which help the butterflies to see different directions at the same time, including forward, backward, and above and below the butterflies themselves. • Butterfly eyes can see ultraviolet light, so that the butterflies can see the special markings on some plants and other butterflies which can only be seen in ultraviolet light.
Proboscis	• It is used by the butterflies to feed on nutritive fluids like nectar. • Some flower-visiting butterflies have evolved smoother and tapered proboscises that would allow them to dig deeper into the floral tubes.
Legs	• Help the butterflies to climb and walk. • Butterflies detect plant chemicals through the contact chemoreceptors on their legs to find the appropriate plants for their offspring.
Wings	• Help regulate butterflies' body temperature (e.g. in the morning, some butterflies would open their wings to absorb heat from the sun). • The different colours and patterns on the wings help the butterflies to face the predators and survive by camouflaging the butterflies or warning the predators that the butterflies are poisonous.

Butterfly life cycle

Butterflies undergo a life cycle of four life stages: egg, larva (幼蟲) (caterpillar), pupa, and adult. Butterflies lay eggs on a host plant (寄主植物), a specific type of plant that the caterpillars will eat once they hatch from the eggs. When the caterpillars are full-grown, they undergo a pupal stage to become adults (butterflies). This process is called complete metamorphosis (完全變態).



Egg **Larva** **Pupa** **Adult**

How to identify butterfly species

Despite the wide variety of butterfly species, there are some tricks for you to identify them more easily.

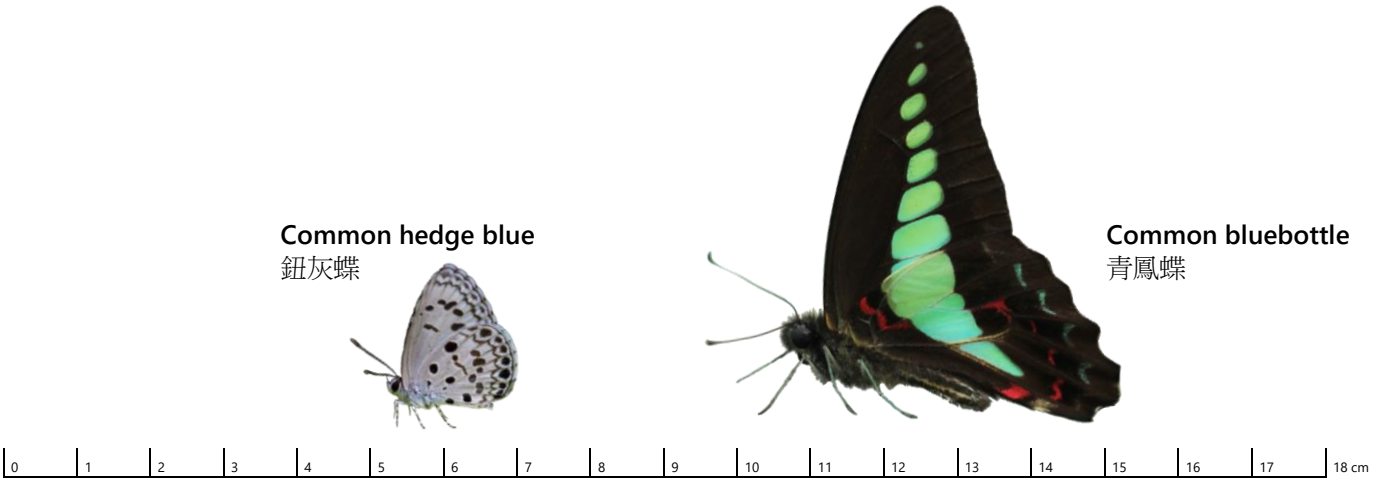
- Patterns on the wings

  The wings are one of the most eye-catching parts of butterflies. Different butterfly species have unique wing patterns, and looking at the patterns can help you identify some butterfly species.

Paris peacock's (巴黎翠鳳蝶) (left) wings are covered with scattered metallic green scales and two large batches of metallic blue scales and red Helen's (玉斑鳳蝶) (right) wings are mainly black with two large patches of white scales.

- Size

  Although butterflies vary in size, different types of butterflies are within a specific range of size. For example, suppose you see a relatively large butterfly (e.g. 5 cm), you can rule out that butterfly being a blue (灰蝶) or skipper (弄蝶) as most of them are relatively small.



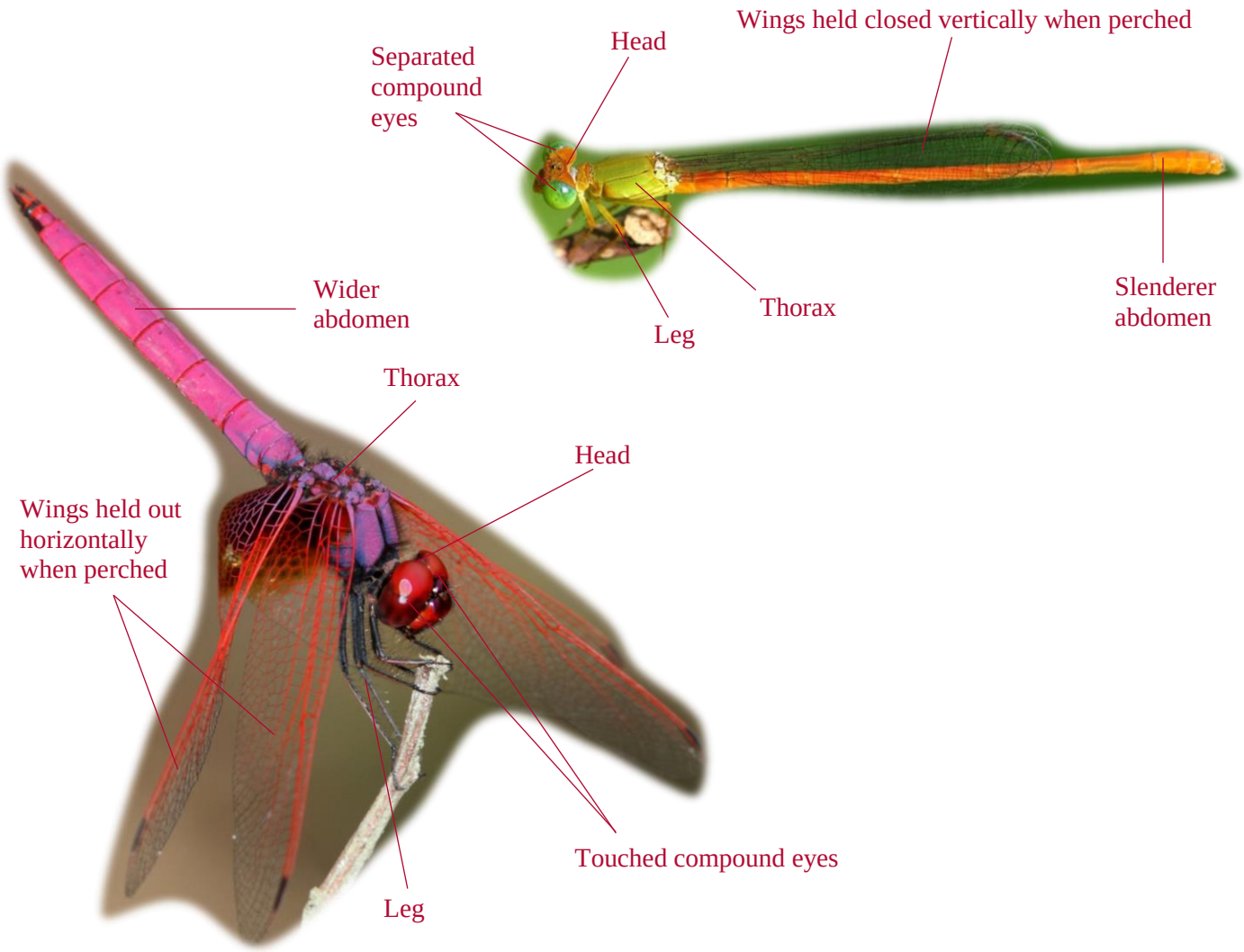
***This is for reference only and does not precisely demonstrate the actual sizes of the butterflies.**

About dragonflies and damselflies

Dragonflies and damselflies are both insects and belong to the class Odonata (蜻蛉目). The word odonate applied to both dragonflies and damselflies. Since they look very much alike, it is tricky to tell them apart. But some of their characteristics are clearly different, and you may find it actually easy to differentiate between dragonflies and damselflies once you have learned those differences.

Dragonfly and damselfly anatomies

The bodies of dragonflies and damselflies are divided into three parts: head, thorax, and abdomen. Like butterflies, you can find a pair of antennae and compound eyes on their heads and two pairs of wings and three pairs of legs on their thoraxes. However, the antennae that are located on dragonflies' and damselflies' heads are relatively small, so you can hardly see them by naked eyes. In comparison, you can distinguish dragonflies and damselflies from other insects by their large compound eyes, large transparent wings, and long and thin abdomens relative to the rest of their bodies.



Different physical features have their own functions, some of which can help dragonflies and damselflies adapt to their environment:

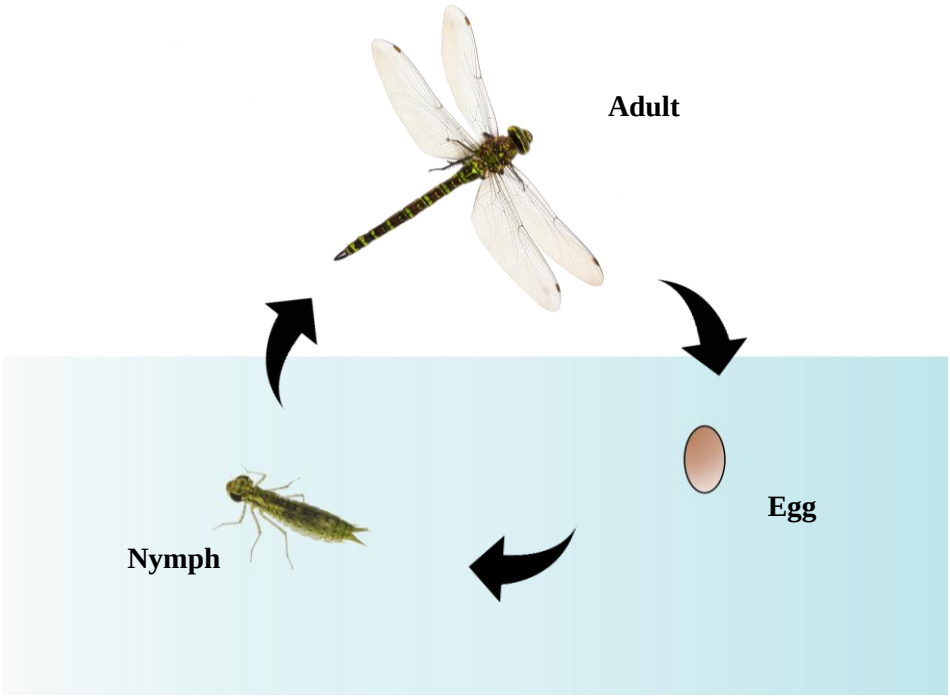
Physical features	Functions
Compound eyes	• The compound eyes of dragonflies are so large that they occupy almost their entire heads, giving them good eyesight and the ability to find and catch preys more effectively.
Legs	• Most dragonflies cannot walk, but their legs are so strong that the dragonflies can use them to capture their preys tightly.
Wings	• Dragonflies can control their wings separately or together, allowing them to fly in all directions, including forwards, backwards, upwards, downwards, and even sideways. • The wings give dragonflies the speed and agility to hunt for preys and escape from predators effectively.

To differentiate between dragonflies and damselflies, you can look at their eyes, bodies, and resting positions:

	Dragonflies	Damselflies
Eyes	Dragonflies' eyes are touched, or nearly touched, at the top of their heads.	Damselflies' eyes are separated on the sides of their heads.
Bodies	The body sizes of dragonflies are generally larger than damselflies. They also have wider abdomens.	Damselflies' bodies are usually smaller than dragonflies. They also have slenderer abdomens.
Resting positions	Dragonflies have unequally sized wings. Their wings held out horizontally (水平地) when perched (棲息).	Damselflies' wings are more equally sized. Their wings held closed vertically (豎直地) when perched.

Dragonfly and damselfly life cycles

Dragonflies and damselflies undergo a life cycle of three life stages: egg, nymph (若蟲), and adult. Since the nymphs of dragonflies and damselflies are aquatic organisms (水生生物) which live and grow underwater, so the adults lay their eggs in water to ensure that their offspring (後代) grow in a suitable environment. Unlike caterpillars, the nymphs do not undergo a pupal stage, but they emerge (羽化) to become adults. This process is called incomplete metamorphosis (不完全變態). Before emergence, they usually climb up the emergent plants (挺水植物) that grow in the water and secure themselves on the stems of those plants. After they emerge and become adults, the life cycle is completed.



How to identify dragonfly and damselfly species

- Determine whether that is a dragonfly and damselfly
  Look at the body and resting position of the wings to determine whether the odonate you are observing is a dragonfly or damselfly. Also, most dragonflies are significantly larger than damselflies.
- Body colours
  The body colours of some dragonflies and damselflies can give you a big hint when you try to identify them. For example, orange-tailed sprite (翠胸黃蜻) can be easily recognized by its green thorax and orange abdomen despite its small body size.

Orange-tailed sprite

Where to find dragonflies and damselflies?

Despite the high flight speed and small size, it is not hard to find dragonflies and damselflies if you know where they like to stay. Some dragonflies like to perch on the top of the emergent plants and some damselflies like to perch on the leaf tip of the waterside plants. You can wait until they stay on those positions and then observe them.

Some dragonflies (left) like to perch on the top of objects (like emergent plants or woods), and some damselflies (right) like to perch on the leaf tip of the waterside plants.

About the Field Site

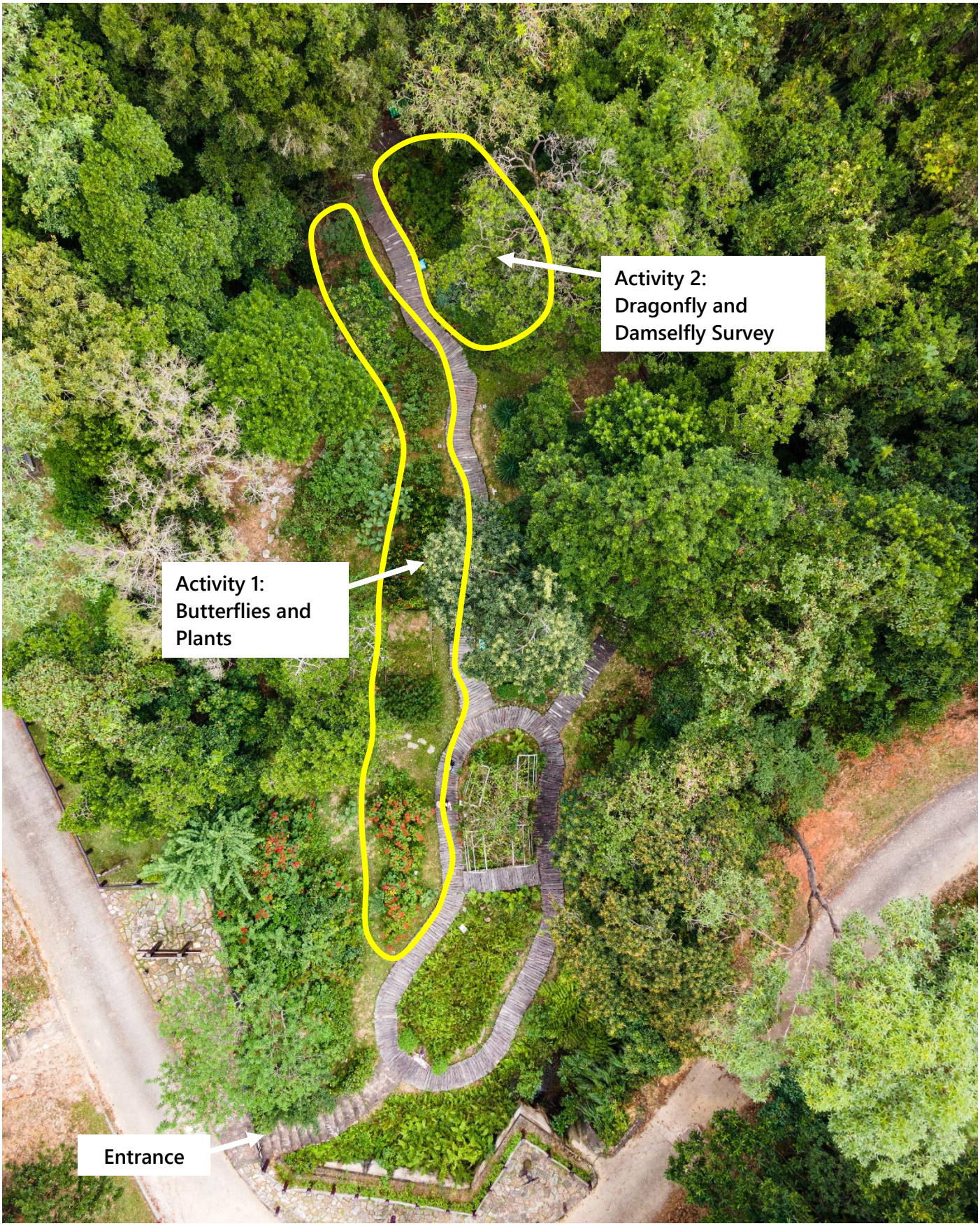
Tai Lam Ecological Garden

Tai Lam Ecological Garden, located on the side of Tai Lam Nature Trail of Tai Lam Country Park, is converted from a stretch of disused farmland with different types of ferns (蕨) and shrubs (灌木) grown along a stream. In addition to the original plants, different native plants (原生植物) grown in the vicinity were also introduced to enhance the biodiversity of the ecological garden. The ecological garden is now composed of five major parts, including:

- Fern Garden
- Butterfly Valley
- Freshwater Ecosystem
- Insectivorous Plants (食蟲植物)
- Plants of Interest

Given that the diverse habitats in Tai Lam Ecological Garden can attract a wide variety of animals, it is an ideal field site for conducting field observations.

Aerial view of Tai Lam Ecological Garden



Places of specific interests

In the field trip, you will spend most of the time in two areas of the ecological garden, which are **the host and nectar plants** alongside the trail and **the pond**. The locations of these two places are marked on the map on **P.10**.

Host and nectar plants

In the ecological garden, host plants and nectar plants (蜜源植物) are planted alongside a walking trail. Host plants are plants that butterfly larvae eat and where butterflies lay their eggs, and nectar plants provide nectar, which is a primary food source for many animals, for butterflies. These plants are essential for the survival of butterflies as they are highly associated with butterfly life cycle.

Think about it:
In what conditions do plants attract more butterflies?

The pond

There are two freshwater habitats in the ecological garden, which are the pond and the stream, and you will spend your time to study the pond habitat. The water depth of a pond is usually shallow. A shallow water body, together with marsh and aquatic plants, constitute a pond habitat, nurturing a variety of life, especially those who spend their time in the freshwater environment during parts of their life cycles (or their whole life cycles), such as dragonflies and damselflies.

Think about it:
In what conditions does a pond attract more dragonflies and damselflies?

Preparation Before the Field Trip

Code of conduct for field trips

1. Follow the instructions of the teachers. Running, yelling, and leaving without permission are not allowed.
2. Wear appropriate clothing, such as light-coloured long sleeved clothing and sneakers.
3. Bring enough drinking water and outdoor equipment including odorless insect repellent and rain gear.
4. Avoid stepping on steep slopes or slippery rocks.
5. Do not eat or pick any branches, leaves, flowers, or fruit of the plants.
6. Minimise your disturbance to the nature when conducting surveys. You should only observe the animals with naked eyes or other appropriate equipment, and avoid touching, disturbing, or hurting them.
7. Cherish the natural environment and take your litter home.
8. Stay calm during an emergency and ask the teachers for help.

Checklist of equipment required for the field trip

It is important to ensure that all equipment is in good condition before and after the field trip.

Your teachers will distribute the equipment to you before the field trip and you will need to keep those in hands throughout the field trip. Please put a "✓" in the box near each item upon checking the items before and after the field trip.

	Before	After
Binoculars		
Magnifier(s)		
Species Identification Guide		
Stationeries *(self-prepared)*		

Record Sheet

Group and field trip information

Group members	*(Your name)*	*(Group member 1)*	*(Group member 2)*
	(Group member 3)	*(Group member 4)*	*(Group member 5)*
Group number			
Date of field trip (DD/MM/YY)	___ ___ / ___ ___ / ___ ___		
Temperature	℃	**Relative humidity**	%
Weather conditions	(e.g. sunny, rainy, windy, foggy)		

A quick guide on the procedures of the field trip

(1) Notes on features of different habitats in the ecological garden

(2) Take turns to carry out two activities in different assigned areas

- Ensure the condition of the equipment required for each activity before starting
- You have about **30 minutes** to complete each activity
- Move and carry out the next activity after receiving the signal from your teachers
- After completing all activities, move to the gathering point as decided by your teachers

(3) Organise the preliminary data with your groupmates

(4) After the field trip, complete the remaining questions

NOTES PAGE

Activity 1: Butterflies and Plants

In the Tai Lam Ecological Garden, you will be able to observe a variety of butterflies and the host and nectar plants that provide butterflies with their basic needs.

Host plants are plants that butterfly larvae eat. Butterfly larvae are picky eaters who only feed on specific plants, so butterflies lay their eggs on those particular plants to ensure that the larvae can have suitable plants to eat. For this reason, host plants are also spawning grounds and homes for butterflies. There are some host plants in the Tai Lam Ecological Garden to attract butterflies. For example, you may find *Asclepias curassavica* (馬利筋), which is a host plant for plain tiger (金斑蝶), in the garden.

Nectar plants are plants that produce nectar. Nectar is one of the primary food sources for many nectarivorous animals (食蜜動物), including butterflies. When it comes to the flowering season, it is common to see many butterflies flying around flowers to enjoy the nectar. Plants do not secrete nectar for no reason, but they secrete it as a food reward for pollinators like butterflies, bees, and some birds to attract them to visit the flowers and pick up pollens. The relationship between the nectarivorous animals and plants is mutualistic (互利的) because both parties are benefited from the interaction.

After knowing the importance of plants to the survival of butterflies, could you imagine the impact of losing those plants on butterflies?

A. Plant Observation

Below are some host and nectar plants that can be found in the Tai Lam Ecological Garden. **You can find the locations of the plants by the signs installed near the plants**. Please spend about **5 minutes** to locate and observe all those plants and **choose one plant** that you think butterflies would like to interact with to study and answer the questions.

赪桐 **Pagoda flower**
Clerodendrum japonicum

馬利筋 **Blood-flower**
Asclepias curassavica

吊裙草 **Retuse-leaved crotalaria**
Crotalaria retusa

龍船花 **Chinese ixora**
Ixora chinensis

假馬鞭 **Jamaica vervain**
Stachytarpheta jamaicensis

野牡丹 **Common melastoma**
Melastoma malabathricum

可愛花 **Blue Eranthemum**
Eranthemum pulchellum

Q1. Describe the characteristics of the plant species that you chose to study by completing the table below.

a) Name of the plant	
b) Parts of the plant that can be found	☐ Root ☐ Flowers ☐ Leaves ☐ Stems ☐ Fruit
c) Leaves	
Circle the drawing that best illustrates the leaf margin.	 **Entire**  **Serrate**
Circle the drawing that best illustrates the leaf shape.	 **Elliptic**  **Lanceolate**  **Ovate**  **Cordate**  **Obovate**  **Orbicular**
d) Flowers	
What is (are) the colour(s) of the flowers? **(If no flowers are found, please write "N/A")**	
e) Fruit	
What is (are) the colour(s) of the fruit? **(If no fruit are found, please write "N/A")**	
f) Have you found any animals on the plants? Where did you find them?	

B. Butterfly-plant Interactions

Butterflies interact with plants in various ways. Looking at what parts of the plants the butterflies stay on and what they do on the plants may give us an insight into why plants are essential for butterflies to survive. In this part, please **observe the behaviour of the butterflies that stay on the plants you chose to study in Part A** and answer the questions.

Q1. You have **20 minutes in total** to observe butterflies that stay on (or touch) the plants. **For each butterfly**, please spend about **a few minutes** to observe:

a) the characteristics of the butterfly

b) which parts of the plants have the butterfly touched

c) the behaviour of the butterfly
(There are three options: feeding, resting, and mating. A brief guide to these butterfly behaviour is provided in the Species Identification Guide.)

Please **record your findings in the table on the next page**. Below is an example showing how to fill in the table if you see a butterfly resting on a leaf with its wings closed.

	a) Characteristics	b) Which parts of the plants did the butterfly stay?				c) Which behaviour did you observe?		
		Leaves	Flowers	Fruit	Stems	Feeding	Resting	Mating
1	Black wings with green patterns	✓					✓	

What if you can barely find any butterflies?

If you barely find any butterflies near the plants you chose to study, you can move to other locations and observe the butterflies that are interacting with other plants. In this case, please record your data in the table on P.21. You should also pay attention to the differences between the plants you chose to study and other plants and think about why some plants attract more butterflies and some attract less.

	a) Characteristics	b) Which parts of the plants did the butterfly stay?				c) Which behaviour did you observe?		
		Leaves	Flowers	Fruit	Stems	Feeding	Resting	Mating
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

	a) Characteristics	b) Which parts of the plants did the butterfly stay?				c) Which behaviour did you observe?		
		Leaves	Flowers	Fruit	Stems	Feeding	Resting	Mating
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Extended table

If you barely find any butterflies near the plants you chose to study, and you move to other locations to continue your observation, please record your data here.

	a) Characteristics	b) Which parts of the plants did the butterfly stay?				c) Which behaviour did you observe?		
		Leaves	Flowers	Fruit	Stems	Feeding	Resting	Mating
1								
2								
3								
4								
5								
6								
7								
8								
9								

Q2. Did you notice any trends? Which part of the plant the butterflies you observed mostly stay and what were they mostly doing?

Q3. According to your observations of the interaction between the butterflies and the plants, provide **one reason** to explain why plants are important for butterflies.

Q4. If all plants in the Tai Lam Ecological Garden were removed, do you think you would still be able to find many butterflies in the garden? Why?

Activity 2: Dragonfly and Damselfly Survey

Have you wondered why dragonflies and damselflies spend most of their time near water bodies?

Water is one of the most important elements for all life forms, but it means more for dragonflies and damselflies. While we mostly see them on land, the odonates actually spend most of their lifetime underwater. The nymphs of dragonflies and damselflies are aquatic organisms that live and grow in a freshwater environment like a pond. When they are mature enough, they leave the water and emerge as adults after climbing up the stems of the aquatic plants.

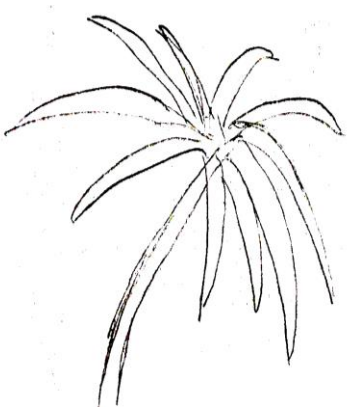
Although dragonflies and damselflies are able to fly after emerging as adults, they will not go far away from water. They hunt and mate near water and lay eggs in the water to ensure their offspring grow in a suitable environment. After hatching in water, the nymphs undergo the same cycle as their parents.

You can find a pond with different aquatic plants in the Tai Lam Ecological Garden. The pond is designed to attract different organisms that inhabit the freshwater environment, including dragonflies and damselflies. During the field trip, let us find out whether the pond successfully attracts the odonates to visit and increases the biodiversity in the garden.

A. Habitat Observation

Water is an essential element for life. However, water alone may not be enough to create a complete ecosystem. An ecosystem is composed of both non-living things and living things interacting with each other. In this part, you will study and observe different constituents of a pond in the Tai Lam Ecological Garden and evaluate whether the pond is a suitable habitat for dragonflies and damselflies.

Q1. Draw **one living thing** and **one non-living thing <u>(except for water)</u>** that you find in the pond and briefly describe what they are.



Example

a) Is it a living thing or non-living thing?
Living thing

b) If it is a living thing, is it a plant or animal?
A plant

c) Where do you find it?
At the edge of the pond

1

a) Is it a living thing or non-living thing?

b) If it is a living thing, is it a plant or animal?

c) Where do you find it?

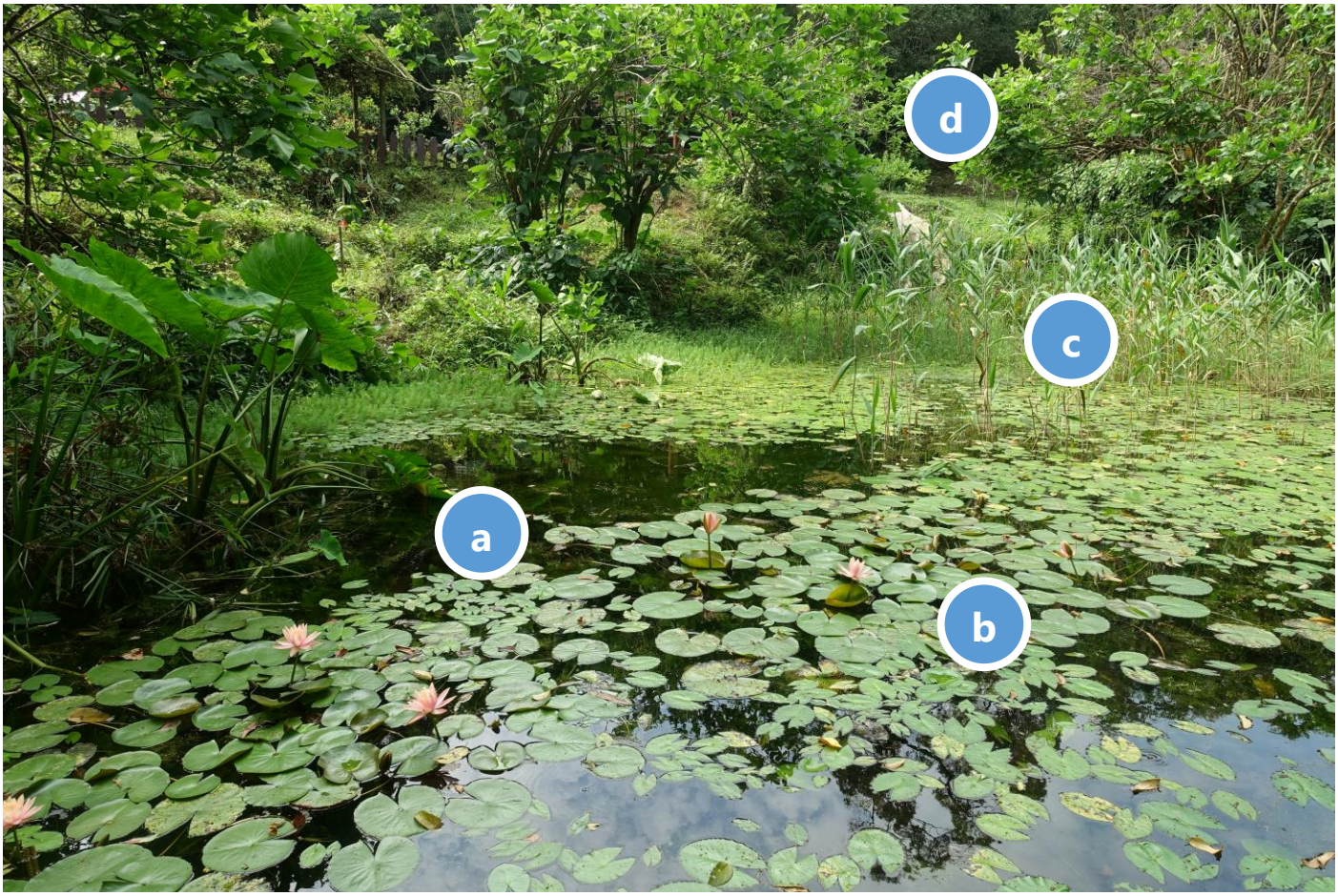
2

a) Is it a living thing or non-living thing?

b) If it is a living thing, is it a plant or animal?

c) Where do you find it?

Q2. While ponds come in different sizes and shapes, dragonflies and damselflies may be more attracted to a pond fulfilling specific requirements suitable for them to breed and raise their young. **Judge whether the pond you are observing contain the requirements** by putting "✓" in the boxes near the options a – d.



☐	a) Water	Dragonfly and damselfly nymphs live and grow underwater, so water is an essential environment for them to survive.
☐	b) Floating-leaf plants	Submerge plants provide a resting place for the female dragonflies and damselflies to stay and lay eggs by pushing their tails down into the water.
☐	c) Emergent plants	The nymphs climb up and secure themselves on the stems of the emergent plants to emerge to become adults.
		Dragonflies like to rest at the top of the tall emergent plants to scan for food or mates.
☐	d) Be in the sun	Dragonflies and damselflies are cold-blooded animals that rely on the solar energy for warmth.

B. Counting Dragonflies and Damselflies

One direct approach to evaluate whether a habitat is suitable for certain groups of organisms to survive is to count their numbers in that habitat. In this part, please observe, identify, and count dragonflies and damselflies found within the pond (including area above the water and any surrounding objects (e.g. rocks, plants)) for **15 minutes**.

Q1. Record your findings in the table below.

Number of dragonflies and damselflies recorded	Record species name if known
e.g. 6 or 𝍸 |	e.g. Orange tailed sprite, Wandering glider

Q2. How many dragonfly and damselfly individuals did you find? Do you think you found more dragonflies and damselflies at the field site than you see in daily life (e.g. in the garden of your school, in the park near your home)?

Q3. Propose **one possible reason** to explain the number of dragonflies and damselflies you found at the field site (e.g. suppose you found/did not find many dragonflies and damselflies at the field site, what factors may favour/hinder their appearance?).