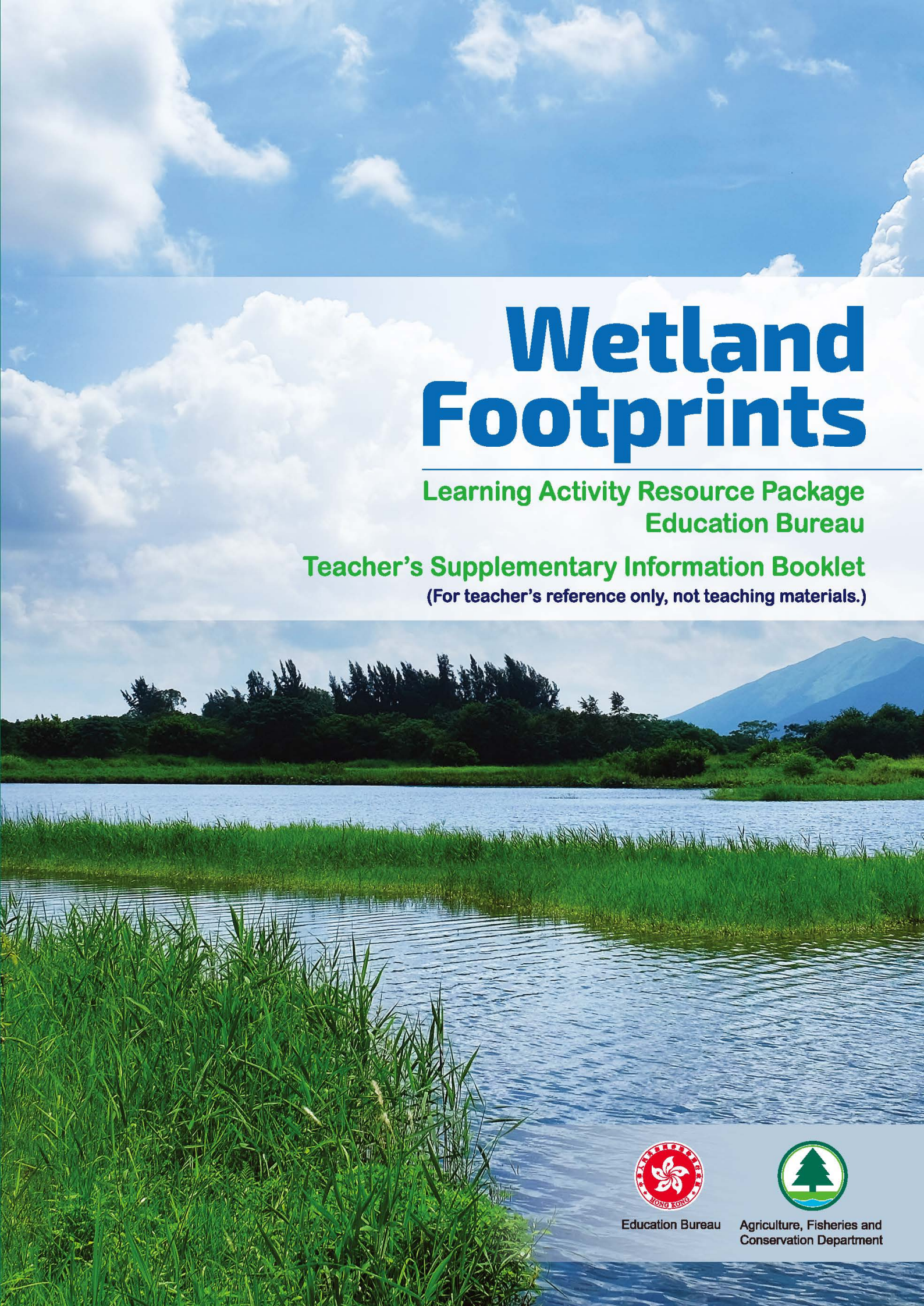

Wetland Footprints

Learning Activity Resource Package
Education Bureau

Teacher's Supplementary Information Booklet

(For teacher's reference only, not teaching materials.)

Education Bureau

Agriculture, Fisheries and Conservation Department

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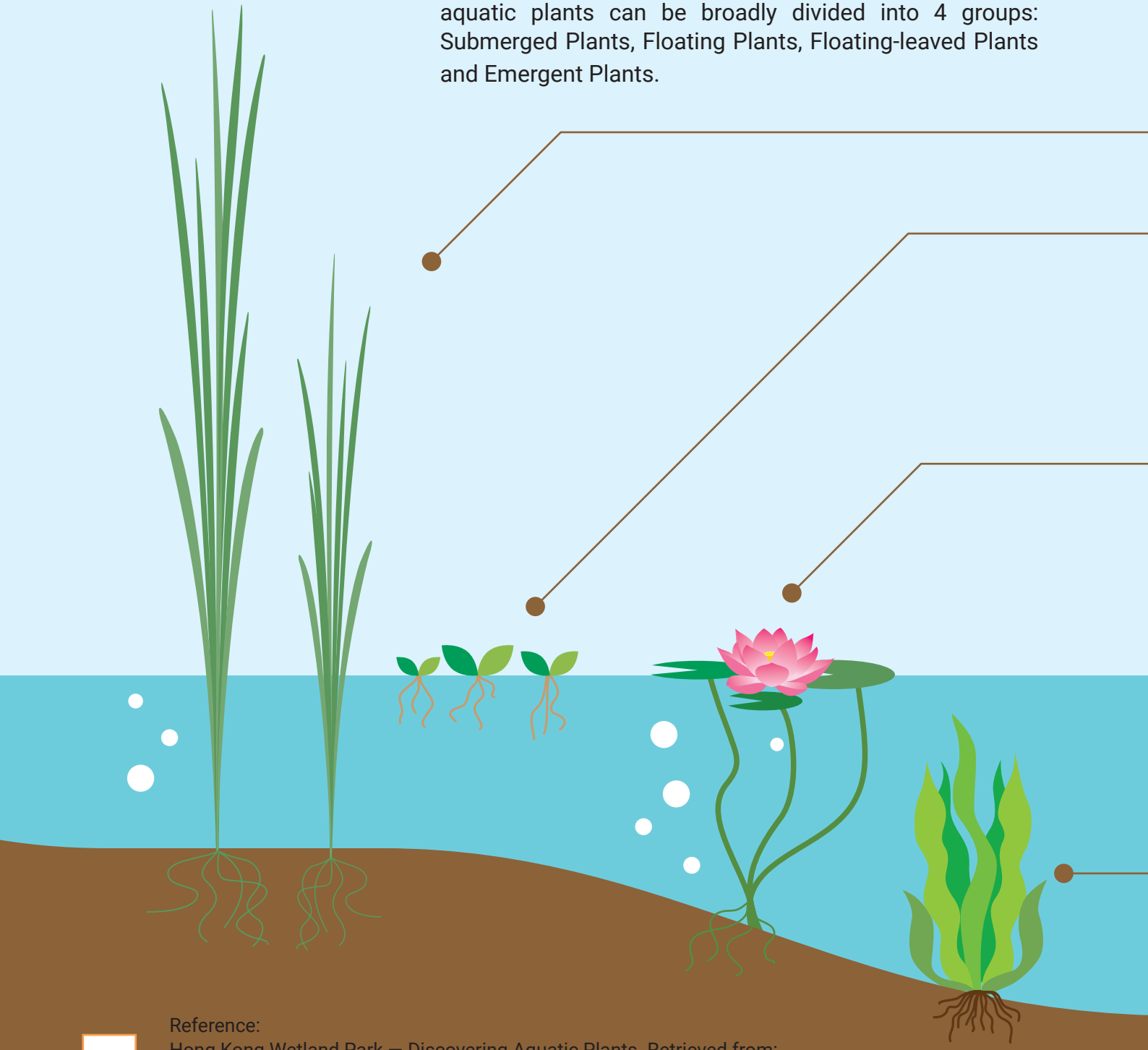
I Objectives

1. Deepen teachers' understanding of aquatic animals and plants.
2. Facilitate teachers' checking of information on aquatic animals and plants.
3. The information contained in this booklet should not be used as teaching materials as it does not suit the level and learning ability of children.

II Aquatic Plants

A. Introduction

Location:	Life Zone / Dipping Pond
Exploration focus:	Aquatic plants in the pond
Definition of aquatic plants:	Aquatic plants are plants that are adapted to the water environment. There are many kinds of aquatic plants. According to the position of their roots, stems and leaves, aquatic plants can be broadly divided into 4 groups: Submerged Plants, Floating Plants, Floating-leaved Plants and Emergent Plants.



Reference:
Hong Kong Wetland Park — Discovering Aquatic Plants. Retrieved from:
http://www.wetlandpark.gov.hk/en/download/pamphlets_aquaticplant.asp

Emergent plants:

They inhabit in shallow water. Basal portions of the plants submerge but the upper parts of stems and the reproductive organs rise above the water surface.

Plants to explore:

Frail Horsetail

Malacea Galingale

Myriophyllum aquaticum

Small Yellow Bladderwort

Water Shamrock

Indian Lotus

Floating plants:

The plants are free-floating on water surface and usually small in size. Their roots are either absent or not attached to substrates.

Floating-leaved plants:

Their roots anchor in substrate. Their flat leaves are usually circular in shape and supported by a long petiole.

Plants to explore:

Myriophyllum aquaticum

Water Poppy

Water Shamrock

Water Lily

Submerged plants:

The whole plant submerges in water. Most of them root in substrates but some rootless species are free-floating in water.

Plants to explore:

Myriophyllum aquaticum

B. Features, morphology and reference pictures

Myriophyllum aquaticum (Parrot Feather)

Myriophyllum aquaticum (Parrot Feather) - Features and Morphology

1. *Myriophyllum aquaticum* is submerged/ emergent/ floating-leaved plants. It has both emergent leaves and submerged leaves. The stem is cylindrical and has branches.
2. Leaves are arranged around the stem on the same level.
3. Submerged leaves grow into a comb, emergent leaves are in a feather-like arrangement, near the top upright, lower half flat, needle-shaped leaflets are green and white.
4. Flowers are white and tiny and not easy to be seen. They are attached to the emergent leaves. They blossom from March to May.
5. It looks like a fox's tail.
6. Purpose: It is an ornamental aquatic plant and suitable for planting in fish tank.

Reference:

葉彥、葉國樑、陳栢健及梁海菊 (2015)。《香港水生植物圖鑑》。香港：漁農自然護理署。
(Available in Chinese only)

Utricularia bifida (Small Yellow Bladderwort)

Utricularia bifida (Small Yellow Bladderwort) - Features and Morphology

1. Small Yellow Bladderwort is an emergent plant, with the majority of the plant body immersed under water.
2. It does not have real roots, the apparent ‘leaves’ and ‘roots’ are actually modified stems assuming their roles.
3. During flowering period, the slender inflorescences would emerge above the water surface with small yellow flowers.
4. It has an interesting Chinese name ‘Earpick Plant’, referring to its earpick-like fruit with peduncle.
5. Flowering and fruiting are from August to the following January.
6. It is carnivorous, its capsule insect trap attached to the “leaves” and stems above, only about 1 mm large and is not easy to be seen, whenever tiny animals swim by, wtih the trap door triggered, the prey will be sucked into the bladder.

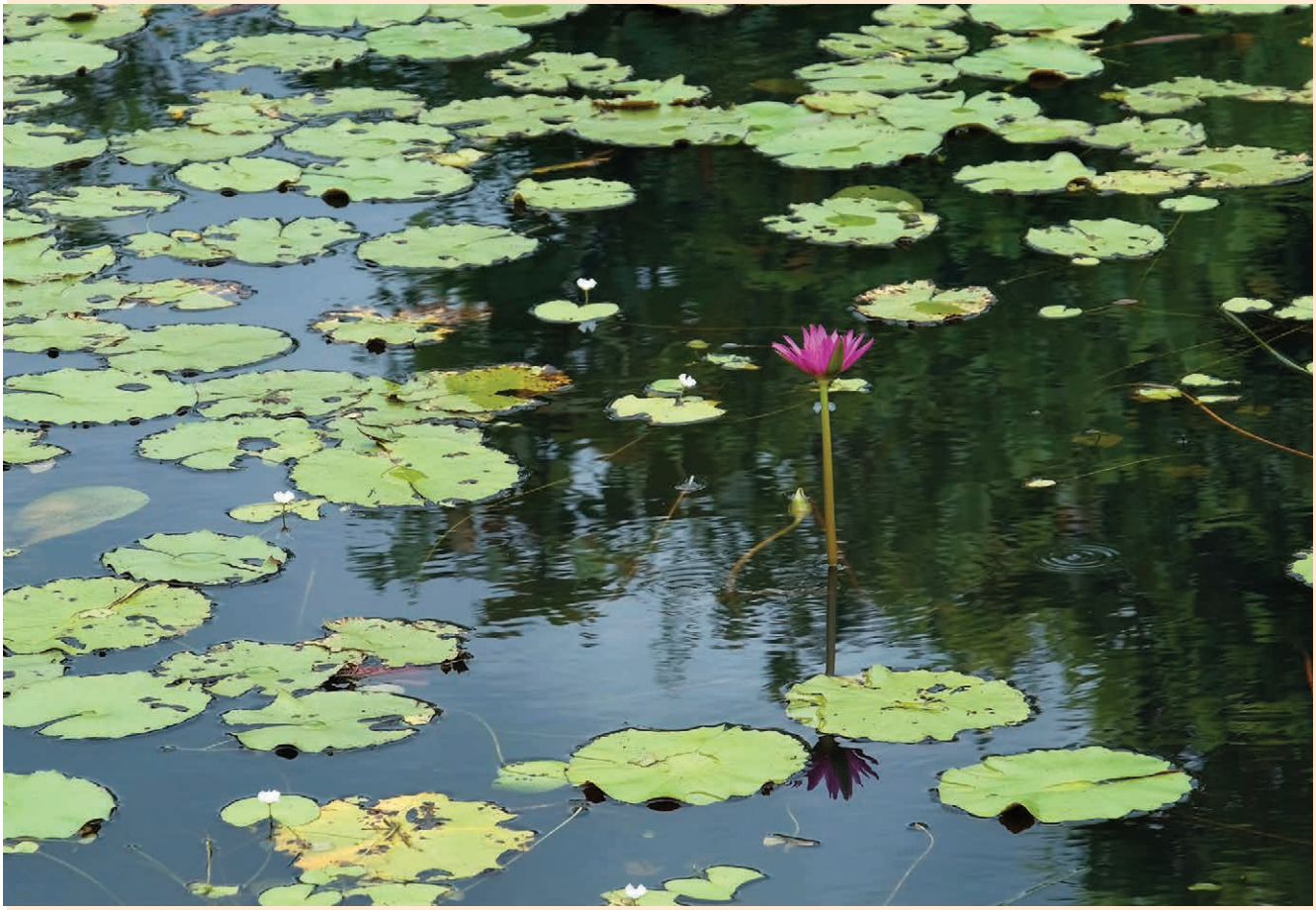
Reference:

葉彥、葉國樑、陳栢健及梁海菊 (2015)。《香港水生植物圖鑑》。香港：漁農自然護理署。
(Available in Chinese only)

Hydrocleys nymphoides (Water Poppy)

Hydrocleys nymphoides (Water Poppy) - Features and Morphology

1. Water Poppy is a floating-leaved plant. However, when the water is too shallow and/or too squashy, it grows above water.
2. Leaves are thick, waxy, shiny, oval and heart-shaped.
3. Floating leaves are thin, elliptical or oval; emergent leaves are alternative. It has long petiole.
4. The petiole has partitions and the bottom of the leaf has floating cells. The vein structure is sponge-like and all these make the leaves floatable.
5. Purpose: It is an ornamental aquatic plant.



Nymphaea spp. (Water Lily)

Nymphaea spp. (Water Lily) - Features and Morphology

1. Water Lily is a floating-leaved plant. It has floating leaves connected to the underwater rhizome.
2. The rhizome is thick.
3. Floating leaves are oval elliptical, with incomplete rim. Submerged leaves are membranous and vulnerable.
4. Leave margins are entirely smooth or have triangular tooth.
5. Flowers are small. Some bloom near the water surface while some grow above water. After the flower died, it would not keep expanding into lotus seed head.
6. Flowers are small and have different colours - white, pink, purple, purple red, yellow etc. Some have aroma.
7. It blossoms from May to October.
8. Purpose: It is for making tea or Chinese medicine.

Reference:

葉彥、葉國樑、陳栢健及梁海菊 (2015)。《香港水生植物圖鑑》。香港：漁農自然護理署。
(Available in Chinese only)

Tip of the stem

Stem: straight, hollow, having internodes

Equisetum debile (Frail Horsetail)

Equisetum debile (Frail Horsetail) - Features and Morphology

1. Frail Horsetail is an emergent plant and looks like a pen inserting into the soil.
2. The ball-shaped part at the tip of the stem is for reproduction.
3. It has an erect, hollow and distinctly jointed stem. It is green and rough with small ring-shaped connate leaves.
4. Leaves are deep brownish with a white tip. The leaves are reduced to small and scale-like and are attached at each node.
5. Frail Horsetail grows rapidly and can develop an extensive network of underground rhizomes.

Slender and spreading bracts

After dried up, it can be used as rope or making household products

Cyperus malaccensis (Malacea Galingale)

Cyperus malaccensis (Malacea Galingale) - Features and Morphology

1. Malacea Galingale is an emergent plant.
2. Its stem is triangular and smooth.
3. There are stems with 3 slender and spreading bracts (not leaves), bracts long spreading spikelet, and each spikelet having small flowers.
4. Its stem is made of tough fiber. The dried stems can be used for tying or weaving into household goods.
5. During the Tuen Ng Festival, they are used for tying rice dumplings or tying seasonal hairy crabs during autumn and winter.

Reference:
Hong Kong Wetland Park — Discovering Aquatic Plants. Retrieved from http://www.wetlandpark.gov.hk/en/download/pamphlets_aquaticplant.asp

Nam Sang Wai River Education Trail. Retrieved from https://www.dsd.gov.hk/others/NSW/9_Short_leaved_e.html

Marsilea quadrifolia (Water Shamrock)

Marsilea quadrifolia (Water Shamrock) - Features and Morphology

1. Water Shamrock is an emergent or floating-leaved plant.
2. The leaves are composed of four leaflets in a cross shape. The leaflets, when arranged together, resembles the Chinese character「田」(field).
3. It has no flower and fruit.
4. The leaves fold together at night.
5. Purpose: It is a greenery plant, which can be used as aquatic greenery plant, food and for medical use.

Reference:

葉彥、葉國樑、陳栢健及梁海菊 (2015)。《香港水生植物圖鑑》。香港：漁農自然護理署。

(Available in Chinese only)

Nelumbo nucifera (Indian Lotus)

Nelumbo nucifera (Indian Lotus) - Features and Morphology

1. Indian Lotus is an emergent plant, with round, umbrella-like leaves floating on water surface or above water. It is planted in pond. Above the leaf surface is a layer made up of wax. This waxy layer, on which water is condensed into fine water droplets, functions to prevent the leaf surface from being wetted.
2. Flowers are big and bloom above water. Petals are pink or white.
3. The rhizomes grow in soil horizontally. The tuber is thick and has holes to facilitate respiration.
4. It blossoms between June and August. Fruiting period is from August to October.
5. When the flower's petals fall, they are replaced by a flat-topped seed pod (like a shower head).
6. The Lotus seeds beneath seed pods reach maturity, as the seed pods fade to dark brown. There are ten to twenty lotus seeds in each seed pod.
7. The de-shelled lotus seed is white. The green germ inside lotus seed tastes bitter.
8. Purpose: It is used as food.

Reference:

葉彥、葉國樑、陳栢健及梁海菊 (2015)。《香港水生植物圖鑑》。香港：漁農自然護理署。
(Available in Chinese only)

Nepenthes mirabilis (Pitcher Plant)

Nepenthes mirabilis (Pitcher Plant) - Features and Morphology

1. Pitcher plant grows in warm and moist places and is herbaceous. To adapt to grow in places where the soil is poor in nutrients, it has a huge cage (i.e. pitcher) to trap the prey.
2. The pitcher is borne at the end of a tendril, which grows as an extension to the midrib of the leaf. If no pitcher is developed, the tendril can help the plant to climb up.
3. Pitcher is cylindrical, oval, ball-shaped, funnel-shaped, etc. Leaves are usually elliptical. The pitcher is for catching insects. The prey is trapped inside like a cage. Its Chinese name represents its similarity to a pig cage.
4. The lid is oval or heart-shaped to prevent rain drops from entering inside. The mouth of pitcher cup is the entrance of trap.
5. It has flowers and fruits.
6. Ants are the most common prey. Flying insects, flies, spiders, crickets will also be lured, but not for mosquitos.
7. After a prey has fallen into the pitcher, the lip will not be closed as people may think. The pitcher is waxy and slippery to prevent the prey from climbing out.
8. If no prey is caught, it can still carry out photosynthesis to survive.

Houttuynia cordata (Fishwort)

Houttuynia cordata (Fishwort) - Features and Morphology

1. Fishwort is an herbaceous plant that grows in warm and moist places.
2. Leaves are alternate and heart-shaped with a fishy smell. It grows rapidly. It can become invasive and difficult to eradicate.
3. Flowers are greenish yellow. There are 4-6 bracts.
4. It blossoms in summer.
5. Purpose: It may be used as tea leaves, in cooking and for medical purpose.

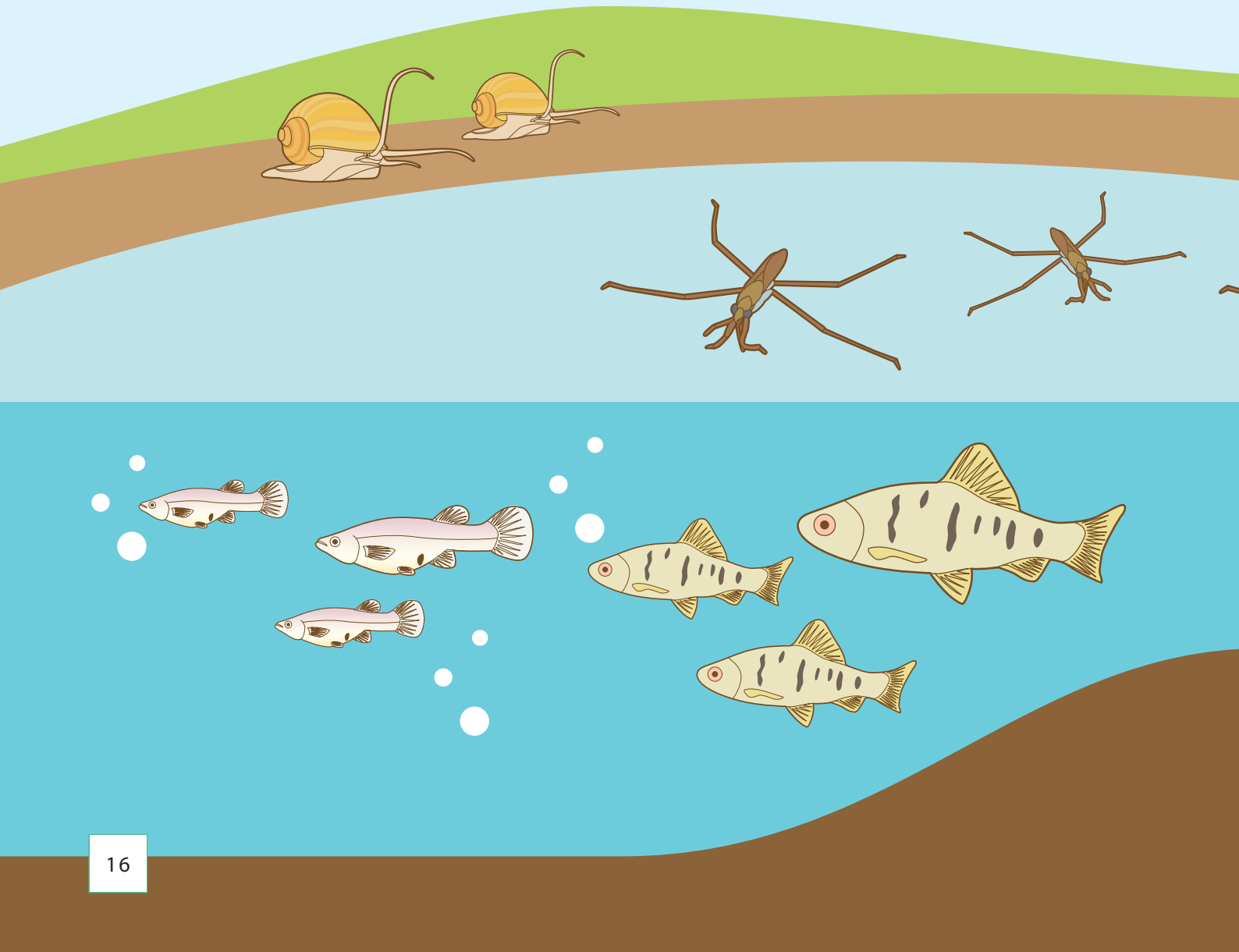
III Aquatic Animals

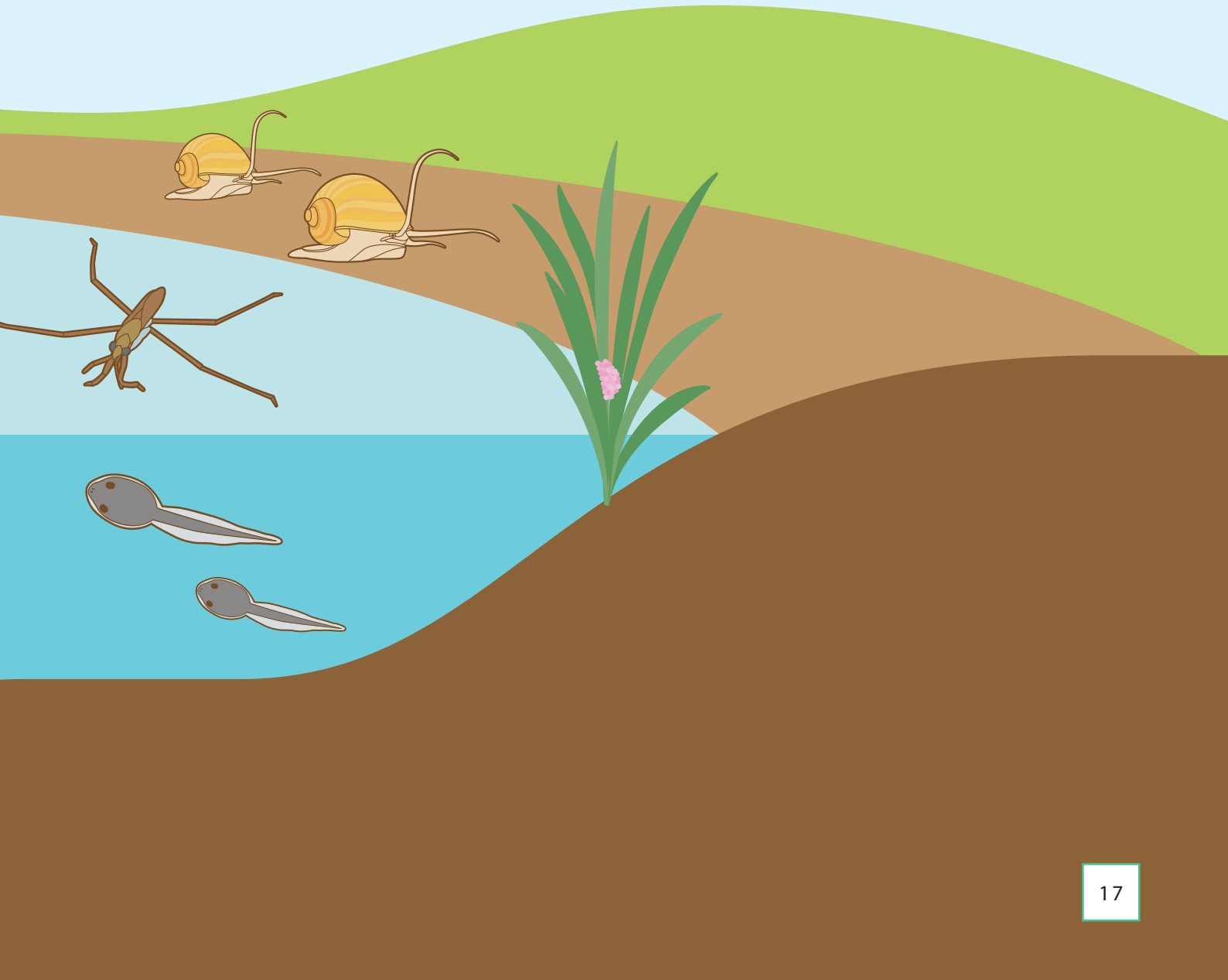
A. Introduction

Location: Life Zone / Dipping Pond

Exploration foci:

1. It is easy to trace the footprints of aquatic animals when staying close to the pond.
2. Common aquatic animals include Golden Apple Snail, dragonflies, damselflies, Water Skater, tadpoles and different fishes like Chinese Barb and Mosquito fish.
3. Pay attention to the activities of aquatic animals near the water's edge, on water surface and in the water.
   - When making an observation along the water's edge, dragonflies are found resting on plant stems.
   - Water Skater is floating and jumping on water surface.
   - Chinese Barb and Mosquito fish are swimming while Golden Apple Snail is crawling in the water.





B. Features, morphology and reference pictures

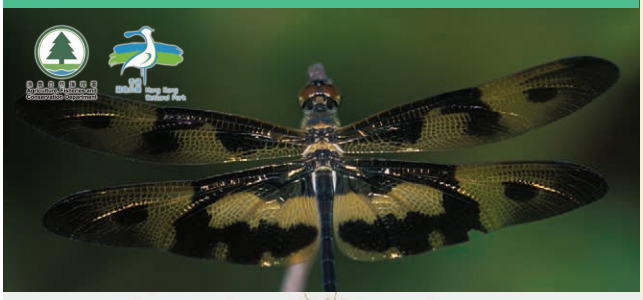
Pomacea canaliculata (Golden Apple Snail)

Pomacea canaliculata (Golden Apple Snail) - Features and Morphology

1. The snail body is greyish brown with dark spots.
2. The shells are short and globular with 4 to 5 whorls.
3. They have huge appetite for aquatic plants and consume most of the aquatic plants vigorously menacing their survival.
4. Females lay egg masses of up to 500 eggs once a week. Eggs are laid on stems of emergent plants to avoid predators like fish to increase the hatching success.

Reference:
Hong Kong Wetland Park - Alien Species in Hong Kong Wetland Park. Retrieved from http://www.wetlandpark.gov.hk/images/wcms/Factsheet%2019.pdf

Dragonflies



Damselflies

Dragonflies/ Damselflies

Dragonflies/ Damselflies - Features and Morphology

1. Dragonflies and damselflies are carnivores. They are important in maintaining the ecological balance as they prey on insects such as mosquitoes, flies and aphids.
2. They have slender bodies and can fly swiftly. Their forewings and hindwings can beat out of phase so that they can fly horizontally and vertically.
3. They have large and sharp compound eyes, providing them with 270-degree field of vision and the ability to detect pray 40m away.
4. Courtship and Mating: Mature male dragonflies frequently employ flight display or perch at notable point in their territory to show off their bright body colour to attract females. Some of them hide in aquatic plants during mating so as to minimise the disturbances from other males.
5. Egg Laying: On egg laying, some species dip their abdomens into water to lay eggs; some drop the eggs freely onto mud at the water edge; some use their sharp ovipositors to cut open aquatic plants and lay eggs in the plant tissues; others submerge themselves to lay eggs. Several hundreds to thousands of eggs per brood can be laid. It takes 5 days to several months for hatching.
6. Larva: Larvae generally live in water and breathe by gills. They prey on different aquatic animals like small fishes and tadpoles. The duration for larval development may last for three months to four years or above.
7. Emergence: Most of odonates emerge in spring, so the shredded moult is usually seen affixed on aquatic plants in spring.

Reference:

Hong Kong Wetland Park - Wildlife Highlights – Dragonflies and Damselflies. Retrieved from http://www.wetlandpark.gov.hk/images/wcms/Factsheet%208.pdf

Hong Kong Wetland Park – An Encounter with Odonates. Retrieved from http://www.wetlandpark.gov.hk/en/download/pamphlets_odonates.asp

Gerriade spp. (Water Skater)

Gerriade spp. (Water Skater) - Features and Morphology

1. Water Skater rests on the surface of calm or slow-moving water. It usually lives in clean ponds, lakes and reservoirs.
2. It has a long and slender body. It is very light in weight.
3. It has a pair of compound eyes with excellent eyesight.
4. Its body is black and is around 22mm long.
5. The front legs are short for capturing prey. The middle and hind pairs of legs are long and have hair covered with a waxy substance that enables them to float.
6. It produces ripple during movement to give signals to other Water Skaters not to invade its area.
7. The hair on legs can detect insects dropped into water. It feeds on the dead fish or the live and dead insects by means of its tubular mouthpart for sucking body juice of its prey.
8. It is harmless to human. It helps pest control and is food for fish.

Tadpoles

Tadpoles - Features and Morphology

1. Male frogs produce calls for courtship.
2. After mating, female frogs lay eggs into water. Female frogs do not stay to look after the eggs.
3. The black dot inside the eggs are tadpoles.
4. The eggs float on water to absorb heat from sunlight.
5. Eggs hatch into tadpoles in about two weeks and tadpoles swim in the water.
6. Tadpoles have a round head and are black in colour. It is difficult to find their eyes and mouth.
7. After four weeks, tiny teeth grow in their mouth and they eat algae and tiny aquatic animals. (Tadpoles are one of the food of odonatan larvae)
8. Their hind legs start to grow after ten weeks and their front legs start to grow after twelve weeks.
9. The colour of tadpoles changes from black to green or dark brown.
10. After fourteen weeks, its tail becomes shorter as a young frog.
11. After sixteen weeks, adult frog can jump out from water.

Reference:

Her, C. F. (1999). *The Tadpoles grow up*《小蝌蚪長大了》. Taipei: Chin-Chin.

Tranter, E. (2016). *Franklin Frog*. London, United Kingdom: Nosy Crow.

Puntius semifasciolatus (Chinese Barb)

Puntius semifasciolatus (Chinese Barb) - Features and Morphology

1. The body is covered with golden scales. It has red eyes and red fins.
2. It has dark vertical bands on the body.
3. It has barbels.
4. It lives in freshwater, streams, ponds and pools.
5. Omnivore. It feeds on worms, small crustaceans, insects, plant matter and detritus.

Gambusia affinis (Mosquito fish)

Gambusia affinis (Mosquito fish) - Features and Morphology

1. Its body is short and it has a large abdomen and an upturned mouth.
2. It has a sturdy body. Males are smaller and slimmer than females.
3. Adult Mosquito fish can eat a lot -- it feeds over one hundred mosquito larvae a day. It also feeds on zooplankton, beetles and other invertebrates.
4. The temperature begins to rise in the end of spring and early summer. Larvae of mosquitoes grow in swamps and pond, providing adequate food for Mosquito fish. The temperature is appropriate and the season is the best for breeding. Males and females chase and mate.
5. Except cold intolerant, Mosquito fish can survive in relatively inhospitable environments, for example water of high salt concentrations (up to twice that of sea water), water of low oxygen concentrations and water containing organic waste, pesticides, herbicides and phenols etc. Mosquito fish can even survive for a short period when the water temperature is up to 42°C. Its mouth is evolved to be upturned to breath above water when oxygen level is low in water.

Conclusion

Benefits to humans and impacts on local ecology: They are resistant to pollution, have strong adaptability and high reproductive capacity. They are able to eliminate the mosquito and other mosquito larvae. However, Mosquito fish are alien species, omnivorous and highly foraging and therefore often compete with native freshwater fish for food and habitat, affecting the survival of native species.

Some information and pictures are provided by Hong Kong Wetland Park, Agriculture, Fisheries and Conservation Department.