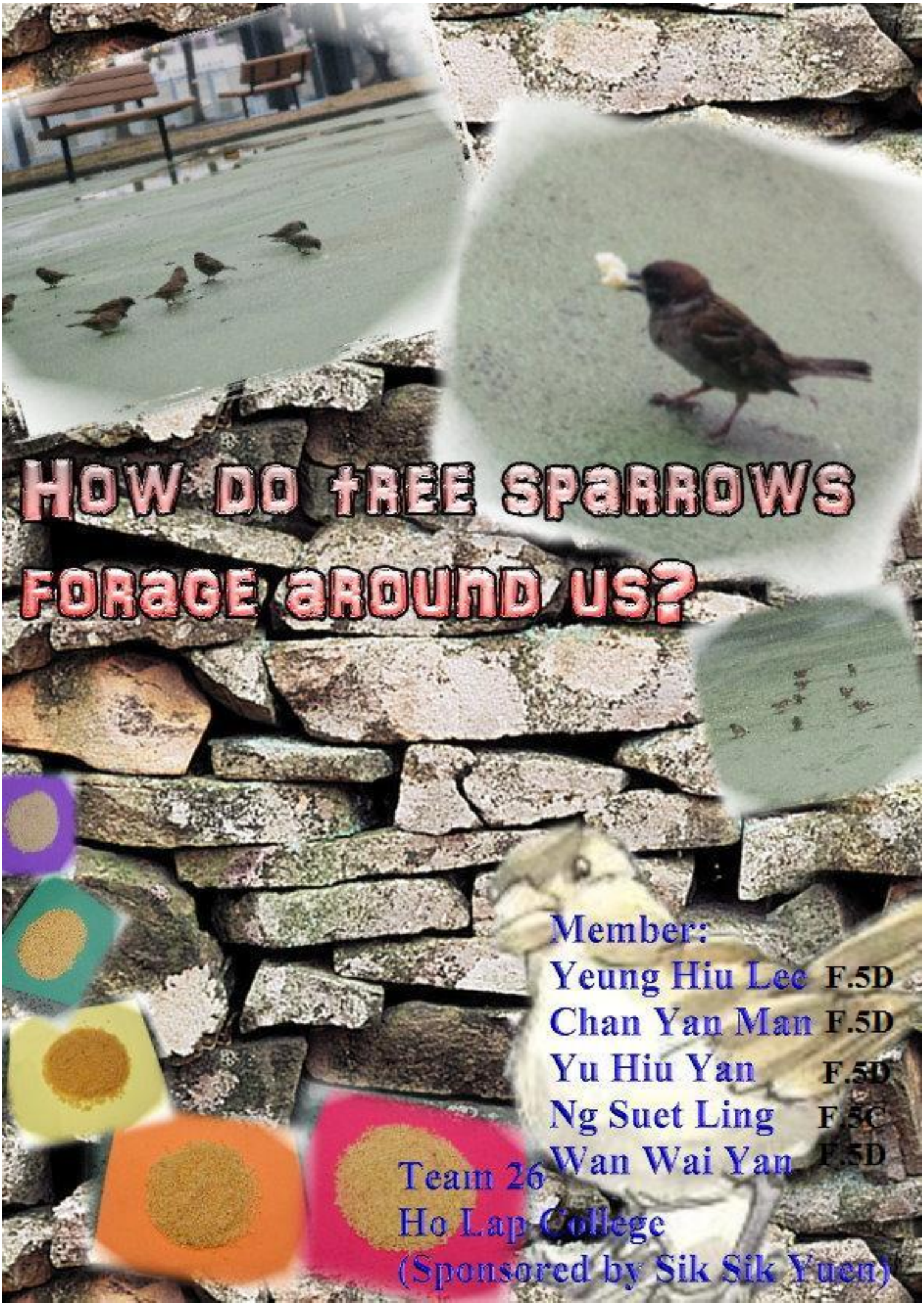


How do tree sparrows forage around us?

Member:

Yeung Hiu Lee F.5D

Chan Yan Man F.5D

Yu Hiu Yan F.5D

Ng Suet Ling F.5C

Wan Wai Yan F.5D

Team 26

Ho Lap College

(Sponsored by Sik Sik Yuen)

Content

Abstract

In Hong Kong, we can see many sparrows either in park, in housing estates, in schools or even on streets. They nest on trees or eaves of buildings. We are able to have a close look when they feed on ground. We are curious about their feeding behaviour and hence we are going to investigate the foraging habit of the tree sparrows.

In our investigation, we are going to

1. test whether the sparrows eat the food (millet) in containers or not;
2. test which feeding conditions the sparrows prefer
   A. the material of the feeding surface,
   B. the colours of the feeding surface
   C. the density of food on feeding ground

We performed our experiments in Kai Tak East Playground early in the morning using common millet as the bird's food. We used equal amount of common millets in all the set up in the same experiment. Then we measured the weight of millet eaten by sparrows in each set of experiment, that was a quantitative way to assess the feeding habit of them. At the same time, we tried to observe any special behaviour when they were feeding, that was a qualitatively way of study.

After several mornings experiments and observation, we collected the following results:

Result of experiment 1: The tree sparrows did not feed on food in containers.

Possible explanation: It may be due to that they are highly vigilant and they may treat food in containers as a trap. They always safegaurd themselves from any risk of being caught.

Result of experiment 2 A : (i). The tree sparrows preferred feeding on food scattered on paper rather than on other materials tested: plastic and aluminium foil.
(ii) The amount of food being eaten is much less than the case when the food is scattered on natural ground.

Possible explanation: The feeding ground surface materials provide a different background perception to the tree sparrows. Besides, the aluminium foil and the plastic materials may also reflect light which scare them away. These environments are strange to them and they dare not to encounter any risk of danger and hence the amount of food eaten is much less than the case when they are scattered on natural ground surface.

Results of experiment 2B: Using 7 different colour papers (as in Experiment 2A results showed that paper is the most acceptable materials) the amount of food being eaten in all 7 coloured-paper are similar.

Possible explanation: The sparrows have no particular preference to different colors of feeding ground.

Result of experiment 2C: More food was eaten when the food was scattered at low density than at high density.

Possible explanation: Sparrows usually forage in flocks. Food concentrated in a small area just allows a few sparrows feed at a time. Their main diet, seeds and grains are dispersed sparsely in nature. They prefer a natural situation in their feeding.

As a conclusion in our investigation, we find that the sparrows only feed on ground when they think it is safe. They would feed at similar time every day. They prefer to feed in a natural way – food (grains or seeds) scattered sparsely on natural ground surface rather than food kept in containers, or food put on any special surface with any colours or even much food is provided in a concentrated pack form. They are highly vigilant and have a great sense of team spirit.

We think these tree sparrows cannot survive when caged as they do not eat the grains kept in container. They will certainly die of starvation. Nevertheless it is illegal to catch and keep the sparrows as pets.

Introduction

A) Background of investigation

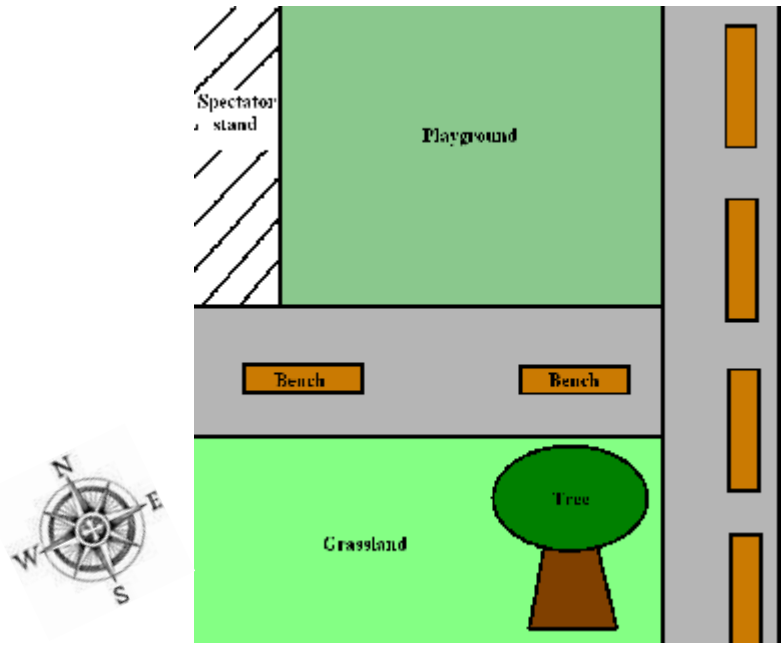
Every day, we can see sparrows and hear the song of them around us, but we may not be aware of them. One day, one of our group mates saw two sparrows chasing a piece of bread in Kai Tak East Playground on the way back to school. She tried to feed them by putting the bird feed on a lid. Surprisingly, the sparrows did not eat the food even after half an hour. Some elderly told her that sparrows did not eat food in any containers. Then, she scattered the food on the ground. The sparrows came and ate. We were curious about this phenomenon and we decided to investigate the foraging habit of sparrows.

B) Objectives of investigation

1) To test whether the sparrows eat food in containers or not.
2) To find out which feeding conditions the sparrows prefer, including
   (A) colors and (B) material of surface the food put on, and
   (C) density of the food.
3) To observe the behavior of the sparrows while foraging.

C) Background information of the study area

We carry out our investigation at Kai Tak East Playground in San Po Kong. Although the playground is located near the industrial area, many sparrows are found living there under the noisy condition and the human interference. It consists of a 7-A size soccer pitch and 4 basketball courts. The eave of the sports centre and trees provide shelter for the sparrows. There are palm trees and *Bauhina variegata* in the playground. Most sparrows stay on the *Bauhina variegata* in between the sports centre, basketball courts and soccer pitch. They forage in the open space.



D). Background information of sparrows

Name: Eurasian Tree Sparrow (*Passer montanus)*
Length: 12.5cm-15cm
Weight: 24g
Characteristics: Brown head, white cheeks marked with a black patch. Lores , throat and bill black. Upperparts brown with dark stripes. Underpart pale grey, flanks brown. Often twitter. Give continued short 'jag' calls. Juvenile has paler cheek patches and is duller overall.
Habits: Often in groups jumping and feeding on grounds. Favor aggregate around human's living places.
Distribution: A common and widespread resident found in fields.
Nest site: Appear to be in man-made structures, almost in building.

Eurasian Tree Sparrow is the most common sparrow in Hong Kong. Tree sparrows occurs whatever man is present, from intensively developed urban areas, through suburbs, village areas, farmland and open storage sites to reclaimed land. The corollary to this intense association with man is that it is entirely absent from woodland, shrubland and even grassland where this is remote from permanent human presence as in upland areas. On the offshore islands, the Tree Sparrow's distribution exactly mirrors the location of villages, including small isolated settlements on Po Toi and Dong Ping Chau. The one exception to this species' total dependence on man occurs in the Deep Bay marshes where it feeds extensively on grass seeds on fish pond bunds, around gei wai and on the edges of reed beds. (Summers-Smith 1988)

Materials, Methods and Results

We had our experiments from 18 March to 28 March, and 3 April. The venue was the Kai Tak East Playground. The experiments were carried out in the morning because there is less human interference in that period of time, so that tree sparrows would not be scared away and could forage freely.

Reminder:

In the following experiments,

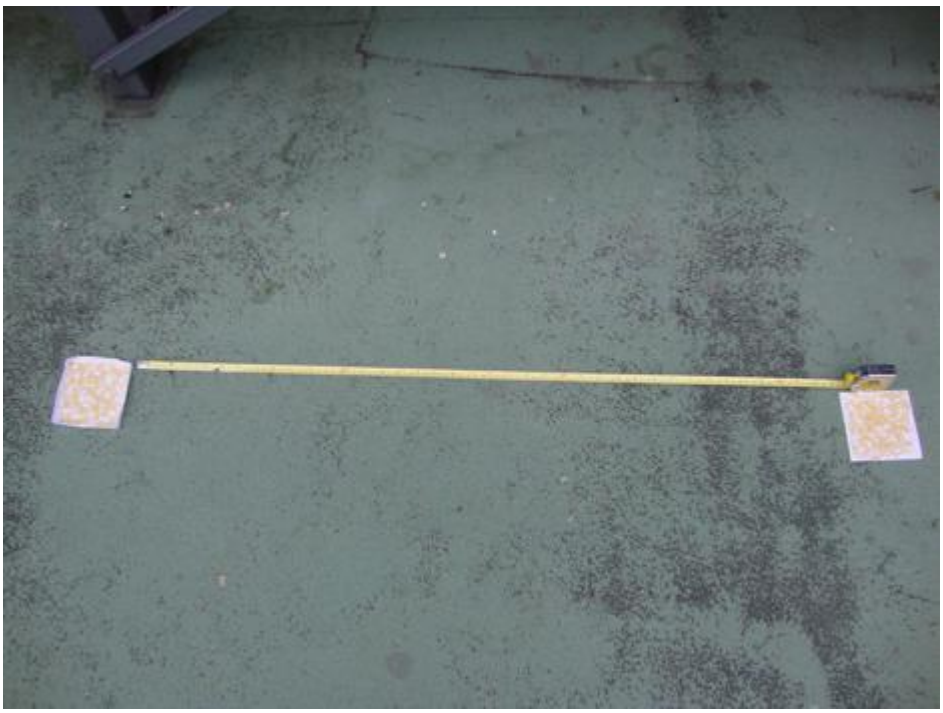
i. Common millet is always evenly distributed within a container/ material/ coloured paper/ specified area;
ii. Common millet spread on the ground randomly should not be added into the set up to minimize error in weighing;
iii. Unless other specified, the duration of every experiment at least last for 25 minutes;
iv. Every set up is 1 m apart from the others;
v. Observation is done at least 10 m away from the whole set up to reduce disturbance to the tree sparrows.

Date	Time	Aims	Venue	*Weather Condition	
				Temperature	Relative Humidity:
18/3/2011 ~ 24/3/2011	6:30am-7:30am	1. General observation 2. Trial tests	The Kai Tak East Playground	/	/
25/3/2011	6:23am-6:50am	Test whether Tree Sparrows feed on food inside containers		14.3C	45-68%
26/3/2011	10:30am-11:44am	Test which kinds of material of the feeding ground the tree sparrows prefer		16.0C	47-71%
27/3/2011	6:17am-7:39am	In order to get more accurate result, second test of testing which kinds of material of the feeding ground the tree sparrows prefer was carried out.		13.5C	60-81%
28/3/2011	6:39am-7:17am	Test which kinds of colour of the feeding ground the tree sparrows prefer		14.1C	42-70%
3/4/2011	7:00am-7:52am	Test which density of food distribution the tree sparrows prefer		18.6C	55-87%

*Weather condition was recorded from the daily weather report delivered by Hong Kong Observatory. Minimum air temperature was taken as the investigations were carried out on the early morning.

Experiment 1: Test whether sparrows eat food inside containers

Date: 25/3/2011
Time: 6:23am-6:50am
Venue: Kai Tak East Playground
Materials:
10 x10 cm white paper
10 x 10 cm container with height of 1 cm (made up of white paper)
2 x 6 g of common millet
Measuring tape
Method:
A white paper container and a piece of white paper, each with dimension 10x10 cm, were placed on the ground with 1m apart. Both of them contain equal mass (6g) of common millet.



Result:
The common millet on the paper was all cleared after 6 minutes, while that in the container remained untouched after 25 minutes.

Interpretation:
We have found that sparrows do not eat food inside container even if the quality and quantity of food are the same. This suggests that sparrows are highly vigilant. When food is being put in a container, they may treat the food as a trap as there is a great difference between the normal feeding environments. Facing the risk of being caught or predated, sparrows choose not to feed on food in containers.

Experiment 2: Test which feeding conditions the sparrows prefer

A) Materials of feeding ground

Date: 26/3/2011

Time: 10:30am-11:44am

Venue: Kai Tak East Playground

Materials:

one 7x7 cm plastic plate

one piece of 7x7 cm aluminium foil

one piece of 7x7 cm white paper

3 x 6 g common millet

Measuring tape

Method:

Equal masses of common millet (6 g) are placed on 3 plates of different materials with dimensions 7 cm x 7 cm, including plastic, aluminium foil and paper (white in colour) as shown in fig.01. Record the change in mass of common millet on the four test materials.

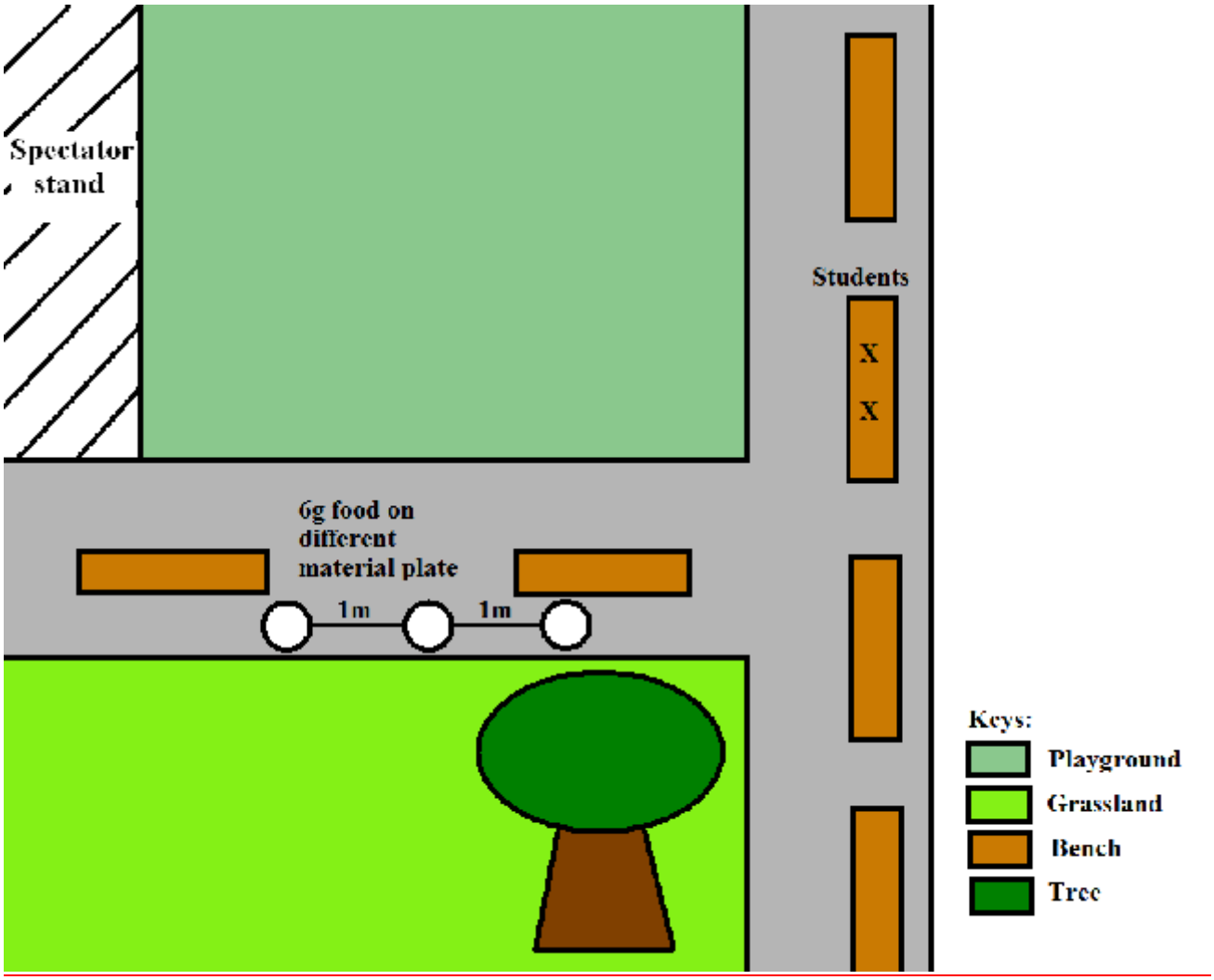


fig.01

Result:

Experiment 2A: Change in mass of common millet on different material plate

Material	Aluminium foil		Plastic (acrylic)		Paper (white in colour)	
Trial	1	2	1	2	1	2
Original mass (g)	6	6	6	6	6	6
The mass left (g)	5.95	5.91	5.78	5.82	5.35	5.27
The mass eaten (g)	0.05	0.09	0.22	0.18	0.65	0.73
Average mass eaten(g)	0.07		0.20		0.69	

Interpretation:

The amounts of common millet eaten in the set-up of plastic and aluminum foil are more or less the same, while that in the set-up of paper is less than the others.

However, as compared with experiment 1, the amounts of food eaten in all the set-up are significantly less than that in experiment 1.

Sparrows do not eat food placed on plastic plate and aluminium foil, probably due to the light-reflecting property of these two materials. The light reflected may scare away sparrows. Paper does not reflect so much light, which looks like the natural feeding ground the most, so sparrows are less alert and prefer this material of feeding ground most.

The amount of food eaten in this experiment was very little, most likely ascribed to the different time (10:30am – 11:44am) of the day. *(Refer to limitation E)

B) <u>Colours of feeding ground</u>

<u>Date:</u> 28/3/2011

<u>Time:</u> 6:39am-7:17am

<u>Venue:</u> Kai Tak East Playground

<u>Materials:</u>

Red paper (10x10cm)	x1
Orange paper (10x10cm)	x1
Yellow paper (10x10cm)	x1
Green paper (10x10cm)	x1
Blue paper (10x10cm)	x1
Purple paper (10x10cm)	x1
White paper (10x10cm)	x1
6 g common millet	x7
Measuring tape	x1

<u>Method:</u>

Equal volumes of common millet (6g) are placed on 7 different coloured-papers (including red, orange, yellow, green, blue, purple and white).

Each paper is placed 1 m apart and stuck on the ground by sellotape as shown in fig.02.

Record the change in mass of common millet on the seven coloured paper.

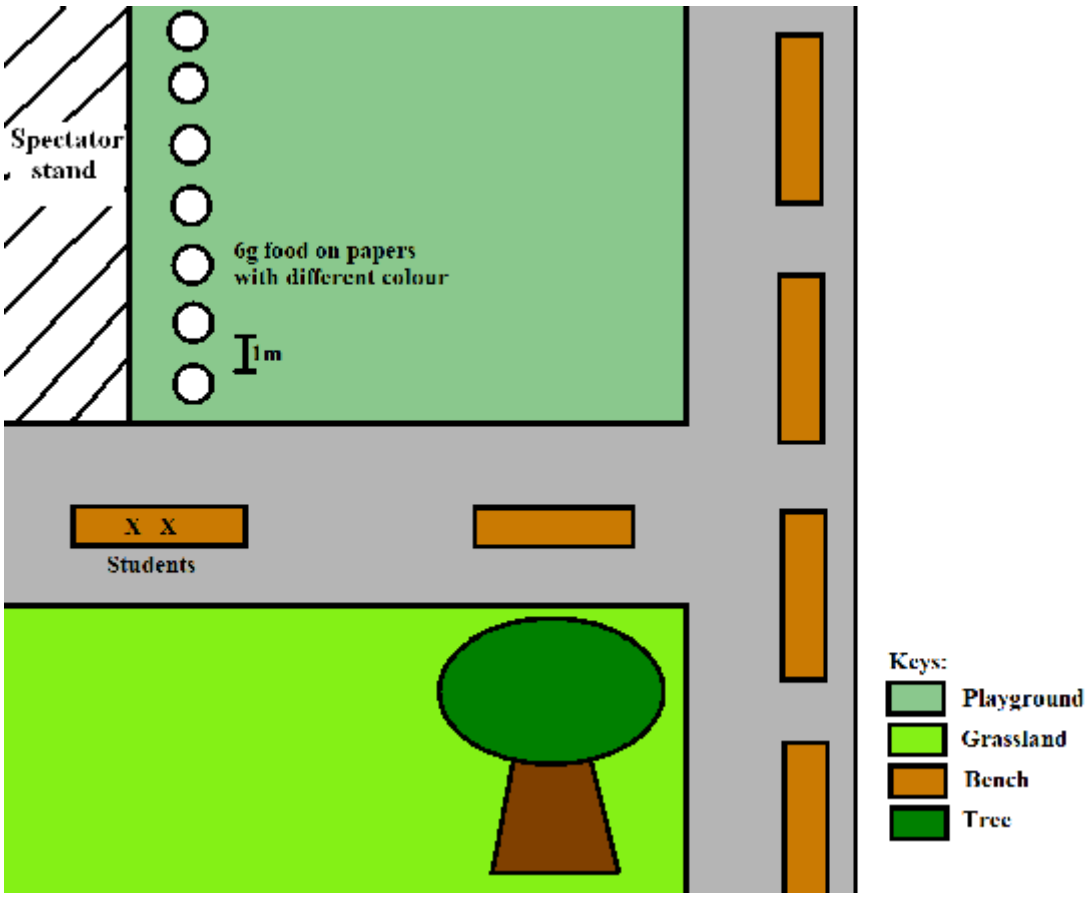


fig.02

Result:

Due to windy condition on that day, common millet on coloured paper was blown away. The mass of common millet left cannot be measured.

Instead we have recorded the visting pattern of sparrows. Result was as follows:

Experiment 2B: Visiting pattern of sparrows to different colours of feeding ground

Paper colour		Red	Orange	Yellow	Green	Blue	Purple	White
The chronological order of first visiting sparrow	Trial 1	6	3	7	4	2	1	5
	Trial 2	2	7	6	3	1	4	5
Number of sparrows come close to the paper	Trial 1	3	2	2	3	2	4	6
	Trial 2	3	2	4	3	4	3	3

Interpretation:

The visting pattern of sparrows to different colours of feeding ground shows no significant difference and hence no special pattern inferred. Based on this result, we believe that sparrows have no particular preference in colours of the feeding ground.

C) **Density of food distribution**

Food density refers to the amount of food found in a specific area. (i.e. g/cm3)

This experiment is divided into 3 parts

Date: 3/4/2011

Time: 7:00am-7:52am

Venue: Kai Tak East Playground

Material:

(1) 1g, 2g, 3g, 4g, 5g of common millet

(2) 1g, 3g, 5g, 7g of common millet

(3) 10g, 20g, 40 g of common millet

Method:

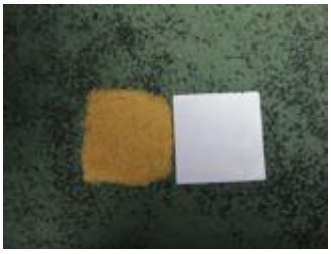
(1) 5 different masses of food (1g, 2g, 3g, 4g, 5g) are placed in 5 separate area of 11cm x 11cm as shown in fig.03. Record the preference of sparrows to different density of food.

(2) Considering that the position of the set-up may affect the preference of sparrows, the experiment is repeated. The set-ups are placed in random order. The intervals of mass difference of common millets are also enlarged to obtain a more obvious result. (3g, 1g, 7g, 5g)

(3) Since the result in (2) is not significant, we carried out one more experiment with a larger interval of mass difference of common millets. (10g, 20g, 40g)

Fig.03





Result:

Experiment 2C:

Mass of food in a fixed area	1g	2g	3g	4g	5g
The chronological order of finishing food (1: first finished, 5: last finished)	2	3	5	4	1

Mass of food in a fixed area	3g	1g	7g	5g
The chronological order of finishing food (1: first finished, 4: last finished)	2	1	3	4

Mass of food in a fixed area	10g	20g	40g
The chronological order of finishing food (1: first finished) / : no millet eaten	1	/	/

Interpretation:

Sparrows have no particular preference in low food distribution density.(1g-10g / 100cm^2) But when the density becomes too high (20 g/100cm^2 or above), sparrows do not eat the common millet.

Sparrows prefer more scattered food (with lower density) because sparrows are used to eat scattered grains, seed or even food remains left by human which is scattered. More diffused food means a higher level of safety. Also, as sparrows usually forage in flocks, concentrated food placed in a small area just allows a few (around 5) sparrows feed on the food at a time. Thus, sparrows prefer scattered food to concentrated food.

Observation of behaviours

A) Vigilant

In Kai Tak East, the sparrows stay on trees or the eave of the sports centre most of the time except when they are foraging on the ground. This could prevent them from being discovered by human or predators.

Vigilant to feeding environment

When they're foraging, they are of high vigilant. They will ensure the environment is safe before they feed on food. During the first experiment(test for container), only two sparrows came near to the set-up and look around in the first minute while other 21 sparrows just stay on the tree. The two sparrows quickly flew away. 7 minutes later, other 3 sparrows came close and quickly flew away again. There is no sparrows came afterwards.

At 10:00, we spread some millet around the container. After 20 seconds, 9 sparrows came close to the container and gradually increased to at least 26 sparrows. They started eating the food outside the containers as scattered food is safer to them.

When they were eating, they would suddenly flew away. After a few seconds, we could see someone passing through the court. Their sudden action is probably due to slight vibration or sound being detected by the sparrows but not by human. The sparrows are highly vigilance to the changes in the environment.

Vigilant to sound or vibration

Sparrows in different places show different levels of vigilance. Sparrows in Kai Tak East Playground and Morse Park No.4 would fly away when they are 2-3 meters close to people. But the sparrows on the street in San Po Kong would fly away until they are around 0.5 m close to people. The pedestrian flow on the street is much higher than that in the parks. So, when sparrows are used to live in places with more human interference, they will be less vigilant to human.

B) Herd instinct

Tree sparrows are social animals. They highly interact with other members of its species, which forms a recognizable and distinct society. As a result, we always see that sparrows appear in a group in our lives. (http://en.wikipedia.org/wiki/Social_animal)

Based on our observation, tree sparrows have a great sense of team spirit. They have division of labour. Every sparrow has its own role. Some are "leaders" while some are "followers".

For instance, in our experiments, when we placed the millets of high density on the ground (as shown in fig. 04), instead of just spread it randomly, sparrows did not come directly in a group. A

series of “unexpected” responses was observed as shown in the followings.

First, 1 to 3 sparrows flew over the millets and stopped at about 0.5 m apart from the millets. They did not move further close to the food, but observed the nearby environment carefully and walked around. They were the “leaders” in the group. Their role was to ensure the environment was safe for other sparrows to enjoy their food later on. After 1 to 2 minutes of the serious inspection, they flew back to their “house”. Then, more and more sparrows got down the tree and they “communicated”. They seemed ready to fly to the food. Suddenly, leaders flew to the food and gradually others followed, too. Number of sparrows was more than 20 at its peak. Next, leaders ate the millets on the edges and quickly bounced outwards. Followers also did the same, in which after a small group of sparrows (3-5 sparrows) finished eating, it got out and another group came and replaced. This repeated for several times. It stopped and flew away until the loosen millets at the edges were all eaten, forming a stack of millets with no loosen millets on the edges. It was believed that the phenomenon was due to limited space around the millets. This act shows their team spirit definitely. They would share food with their members, but not occupied it oneself.

Apart from that, sparrows follow the lead when foraging. In our observation, when a group of sparrows was foraging in the same direction, another sparrow flying in an opposite direction would change its direction after landed. It started foraging in the same direction as the group. This act tells us that sparrows act in a group rather than in one individual. It may because of higher security when in a group.

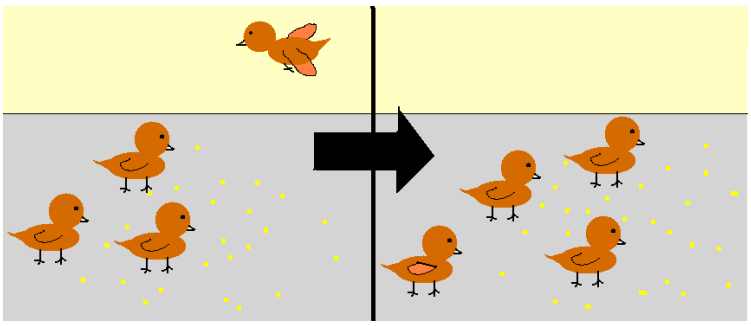


fig. 04

C) Relationship with other species of birds

Sparrows would follow Spotted Dove to forage. Sparrows originally flew near the common millet but took no action. But after a Spotted Dove fed on the millet, sparrows start eating near the Spotted Dove. A possible explanation is they felt safe when seeing the dove feeding with no danger.

Their relationship is competition since their food source is similar. When food is abundant, they forage together. But if the Spotted Dove flapped its wings indicating the possession of the millets, then the sparrows would fly away to 1m apart immediately. Only when the dove flew away then the sparrows returned after around 15 seconds. So, it is estimated that sparrows would be less competitive than Spotted Dove in foraging.

Spotted Dove (*Streptopelia chinensis)*

Length: ~33 cm
Characteristics: with broad collar of black and white spots on the hind-neck, with much white in the corners
Sound: Coo-who-coo
Food: grass seeds, insects, grains and other vegetation
(http://www.answers.com/topic/spotted-dove#ixzz1IlCnw3cW)

Limitations

A) Loss in amount of common millet
Some of the common millet was blown away by wind ascribed to their light weight.
Also, there were other species of birds ate the common millet in our set-ups.
These changing environmental factors are difficult to control in outdoor, making the result less accurate.

B) Insufficient time
The time length of each experiment lasts for about 30 minutes, which may not be long enough to observe the foraging habit of sparrows in detail. For instance, in experiment 1, the container with common millet inside was put on the ground for 20 minutes. The result only shows that sparrows do not eat food in containers after a short period of time, but whether they would eat the food after a long period of time when they've got used to the presence of containers is still a mystery.

C) Apparatus
In experiment 2A, the thickness of different material plates are not uniform. The plastic plate is of 3mm while that of paper and aluminium foil is around 0.01 mm. Thickness may also be a factor affecting sparrows to choose to eat which feeding ground.

D) Location

All the experiments and observations were carried out in Kai Tak East playground. However, foraging habit of sparrows in different regions may differ. Sparrows in area with less human interference may be even more vigilant. For example, sparrows in rural area may prefer lower density of food distribution than sparrows in urban area.

E) Body condition of sparrows

Experiment 2A starts at 10:30 am, which is later than the other experiments. At this time, it is supposed that sparrows had already fed on food.

Also in experiment 2C, as the experiment is divided into 3 parts, sparrows may gradually get full as time goes by. Sparrows ate less in the latter part of the experiment.

The difference of amount of food in different set-ups becomes less significant when sparrows are full.

Conclusion

From our investigation, we have found that wild tree sparrows are of high vigilance. They can survive in urban areas by living and foraging in groups. So, not disturbing sparrows is the best way to conserve them.

Reflection

After the investigation, we found that there were different species of birds living in the urban area. We think that the human activities has disturbed or changed the living habits of the birds. For example, the main food source of the Tree Sparrows is the food remains from human instead of grass seed or grains. Besides, most of the Tree Sparrows live in the residential area in Hong Kong rather than the rural areas. Tree sparrows in Hong Kong closely live with human. Though they are in a large population, not in a state of being endangered, still we have to protect and conserve them.

In addition, at the later part of our investigation, we were told that feeding the birds in the public area was illegal. Hence we stopped our investigation as we were warned by the security guard in Kai Tak East Playground. As feeding the wild birds may spread infectious diseases like H5N1, we would not recommend others to feed the animal of the natural environment after the investigation.

We could enjoy the beautiful song of the birds and appreciate the beauty of nature if they are not disturbed or interrupted by us. Let’s work hand in hand to conserve the beautiful world.

Bibliography

Books:

1. Carey, G.J., Chalmers, M.L., Diskin, D.A., Kennerly, P.R., Leader, P.J., Leven, M.R., Lewthwaite, R.W., Melville, D.S., Turnbull, M., and Yeung, L. 2001. *The Avifauna of Hong Hong.* Hong Kong Bird Watching Society, Hong Kong
2. The Hong Kong Bird Watching Society Ltd., 2004. *香港鳥類圖鑑,* Wan Li Co. Ltd., Hong Kong
3. Henry T.H. Lui, 2006. *Birdwatching in Farmland and Open Fields,* Jan K. C. Chan and Hong Kong Discover y Ltd, Hong Kong

Websites:

1. Hong Kong Observatory

http://www.hko.gov.hk/contente.htm

2. Wikipedia---Eurasian Tree Sparrow

http://en.wikipedia.org/wiki/Eurasian_Tree_Sparrow

3. Wikipedia---Social Animals

http://en.wikipedia.org/wiki/Social_animals

4. Hong Kong Bird Watching Society

http://www.hkbws.org.hk/

5. Wikipedia--- Spotted Dove

http://en.wikipedia.org/wiki/Spotted_Dove