The mystery of *Pigeon, Columba livia*  
---Why do they live in urban area?

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**Team 10**  
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Abstract

There are many *Columba livia* (also known as pigeon) living in Tai Po market. They are very active in this urban area such as Tai Ming Lane square. In this study, we investigated the relationship between human beings and *Columba livia*, as well as some of their living habits(e.g. way of looking for food). We have performed some questionnaire survey on the responses of citizens towards the existence of *Columba livia*. We have also carried out several experiments, such as sound test, fake food test and distance test etc.

Eventually, we find that the action of the feeder plays an essential role on feeding habit of pigeon. In addition, there is a critical distance for which will threaten *Columba livia* and force them to fly away. Moreover, they do not concern much about the sound of predator.
Reason of investigation

Around our school, we have found a lot of *Columba livia*. However, the *Columba livia* bring many disturbances to the citizens in Tai Po Market. Why are there many *Columba livia*? Why they “love” the urban area but not the natural area? Why the citizens in Tai Po have a totally different views when talking about *Columba livia*, as the droppings of pigeon is unhygienic and may contain H5N1 viruses which may bring life threatens to human beings? We would like to carry out different observations and experiments in order to figure out why *Columba livia* prefer staying in the artificial area (i.e. Tai Po Market, including the park and some buildings) instead of staying in wild environments such as the woodland, as well as the living habit of *Columba livia*. Apart from the choice of the accommodation, we will also figure out the relationship between the *Columba livia* and human beings.

Objective

To figure out the feeding habit or the method to choose food of *Columba livia*
To see if the *Columba livia* leave when their nature hunter’s sound is present (e.g. sound of eagle hunting birds)

Prediction and Hypothesis

1- *Columba livia* stay in urban area due to the construction like the roof?

2- The attraction of *Columba livia* is due to the human construction area and the ease for them to find food.
**Brief introduction of *Columba livia*¹**

Order: Columbiformes  Family: Columbidae

Characteristic: Plumage is variable but usual form is blue-grey with two broad black wing bars.

Natural habitat: Cliffs, caves & eaves

Length: 32 cm   Wingspan: 66 cm   Weight: 300 g   (For adult)

Range: The natural *Columba livia* is a rare bird in China, only occurring in isolated pockets in the north.

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**Experiment 1—distance test**

In this experiment, we will approach to the bird and estimate the minimum distance for human to get close to the pigeon and sparrow (for comparison).

Apparatus required:
A soft ruler

Procedure----
1) Find a pigeon(or Sparrow) that land on the ground.
2) Start approaching near the pigeon(or Sparrow), mark the point you start as ‘S’.
3) Walk until the pigeon(or Sparrow) turn its direction, mark the point ‘A1’.
4) Walk near the bird until the pigeon(or Sparrow) fly away, mark the point ‘B1’.
5) Measure and record the distance between S and A1, S and B2.
6) Find a new landing pigeon(or Sparrow) and repeat steps 1-4, name the point A2.B2 and so on.
Results of test on pigeon:

<table>
<thead>
<tr>
<th></th>
<th>First trial</th>
<th>Second trial</th>
<th>Third trial</th>
<th>Fourth trial</th>
<th>Fifth trial</th>
<th>Sixth trial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recording date</td>
<td>20/3/12</td>
<td>22/3/12</td>
<td>22/3/12</td>
<td>23/3/12</td>
<td>26/3/12</td>
<td>26/3/12</td>
</tr>
<tr>
<td>Closest Distance for human to approach before pigeon fly away</td>
<td>72 cm</td>
<td>No relevant record</td>
<td>No relevant record</td>
<td>72 cm</td>
<td>85 cm</td>
<td>No relevant record</td>
</tr>
<tr>
<td>Closest Distance for human to approach before Pigeon walk in opposite direction</td>
<td>142 cm</td>
<td>14 cm</td>
<td>115 cm</td>
<td>113 cm</td>
<td>115 cm</td>
<td>0-10 cm</td>
</tr>
<tr>
<td>Pigeon’s activity at that moment</td>
<td>Resting, landing</td>
<td>Eating</td>
<td>Resting</td>
<td>Resting</td>
<td>Resting</td>
<td>Eating</td>
</tr>
</tbody>
</table>

Results of test on sparrow:

<table>
<thead>
<tr>
<th></th>
<th>First trial</th>
<th>Second trial</th>
<th>Third trial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recording date</td>
<td>22/3/12</td>
<td>22/3/12</td>
<td>26/3/12</td>
</tr>
<tr>
<td>Closest Distance for human to approach before sparrow fly away</td>
<td>85 cm</td>
<td>182 cm</td>
<td>143 cm</td>
</tr>
<tr>
<td>Closest Distance for human to approach before Sparrow walk in opposite direction</td>
<td>93 cm</td>
<td>182 cm</td>
<td>143 cm</td>
</tr>
<tr>
<td>Sparrow’s activity at that moment</td>
<td>Eating</td>
<td>Resting</td>
<td>Resting</td>
</tr>
</tbody>
</table>
(Both results were recorded in Tai Ming Lane Square)

Experiment 2---Sound test

In this experiment, we will play the sound of different kinds of birds to the pigeon and observe whether the pigeon will leave or continue their action.

Apparatus required:
Eagle sound sample, Pigeon dead sound, other bird’s sound x1

Procedure----
1) Put a loudspeaker on the ground, containing different sound of birds, e.g., eagle, falcon, pigeon etc.
2) Wait for the pigeon to move near the loudspeaker and switch on the loudspeaker immediately.
3) Observe the action of the bird and change to another sound

Result:

<table>
<thead>
<tr>
<th>Trial</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Trial</td>
<td>No reaction of the pigeon for all sound broadcasted</td>
</tr>
<tr>
<td>Second Trial</td>
<td>No reaction of the pigeon for all sound broadcasted</td>
</tr>
</tbody>
</table>
Experiment 3—Fake food test

In this experiment, we will put the fake food on ground which is near the living place of the pigeon. After placing the fake food, we will switch on the camera and observe the choice of the pigeon and hence we can determine whether the pigeon choose food by smell or by sight.

Apparatus required:
Fake food sample x1 Camera x1

Procedure----
1) Put the fake food on the ground where the pigeon usually appear.
2) Put a camera on the ground nearby(around 50cm).
3) Start the camera and observe the choice of the pigeon.
4) Repeat steps 1-3 with a new pigeon.

The method used by *Columba livia* to judge whether an object is edible.

Introduction: As we observe there have always been many pigeons searching for food in the Tai Ming Lane Square. We are curious about by what means the pigeon would regard an object as food.

By our previous observation and tracing, we find that the pigeons would attempt to eat or to eat small object almost in all colours. The food they eat is also in any size equal to or smaller than 2.5 dollars coin. But what really attract the pigeons.

**Hypothesis**

**Part 1**

We suggest that the behavior(throwing or rolling) of the feeder may have some effect on the feeding habit of pigeons.

Aim of experiment: To investigate whether the effect of the behavior throwing or rolling of the feeder on the interest of the pigeons towards the food and whether they carry out trials to judge whether an object is edible.

Procedures:
We project 7 plastic fake foods towards 5 pigeons at the moment. 5 pigeons and some sparrows were gathering on the ground.

Observations: All the pigeons flew away, they didn’t come back to the same region within 15 minutes, but they just stay at a higher place around there such as trees.

Special notes: some sound were produced by pigeons.
**Part2**

We roll 7 plastic fake food towards the pigeons. Observations: All the pigeons approach the food by only 2 of them tried to peck the fake food.

<table>
<thead>
<tr>
<th>Feeder behavior</th>
<th>Projecting the food</th>
<th>Rolling the food</th>
</tr>
</thead>
<tbody>
<tr>
<td>The behavior of the pigeons towards the fake food.</td>
<td>All of the birds fly away.</td>
<td>The birds approach the food and carried out trials.</td>
</tr>
</tbody>
</table>

**Observation on the activities of the pigeon**

In this experiment, we will observe the activity of the pigeon and the relationship between number of the pigeon and different condition.

Apparatus required:
Telescope x1    Light meter x 1    Thermohygrometer x1
### Result:

**S**: School rooftop (Overlooking)  
**M**: Mei Wah Building  
**T**: Tai Ming Lane Square

<table>
<thead>
<tr>
<th>Date</th>
<th>10/03</th>
<th>12/03</th>
<th>13/03</th>
<th>14/03</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Venue</strong></td>
<td>S</td>
<td>M</td>
<td>T</td>
<td>S</td>
</tr>
<tr>
<td><strong>Time</strong></td>
<td>2:20-2:50PM</td>
<td>4:12-4:42PM</td>
<td>8:05-8:35AM</td>
<td>1:25-1:55PM</td>
</tr>
<tr>
<td><strong>Temperature (°C)</strong></td>
<td>15.9</td>
<td>17.7</td>
<td>13.3</td>
<td>16.2</td>
</tr>
<tr>
<td><strong>Relative humidity (%)</strong></td>
<td>59.9</td>
<td>77.5</td>
<td>75.3</td>
<td>77.5</td>
</tr>
<tr>
<td><strong>Light intensity (×100 lux)</strong></td>
<td>76</td>
<td>20</td>
<td>22</td>
<td>97</td>
</tr>
<tr>
<td><strong>Weather condition</strong></td>
<td>Cloudy</td>
<td>Light Rain</td>
<td>Cloudy</td>
<td>Sunny</td>
</tr>
<tr>
<td><strong>Approximate number of Columba livia</strong></td>
<td>20</td>
<td>30</td>
<td>10</td>
<td>45</td>
</tr>
</tbody>
</table>

(As the temperature, humidity and light intensity recorded in these 3 places nearly are very similar, for simplicity, they are taken as the same in the above table)
Common observation on every visit:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>1. When overlooking down from the School rooftop, most pigeons were observed on the roof of the Gold Reserved Court Building.</td>
</tr>
<tr>
<td>2.</td>
<td>Many pigeons stayed at the eaves.</td>
</tr>
<tr>
<td>3.</td>
<td>Pairs of pigeon flapping and kissing in Mee Wah Building.</td>
</tr>
<tr>
<td>4.</td>
<td>Many pigeons were observed near the vent in Mee Wah Building. They went into gap near the vent, and then came out. (seem living there)</td>
</tr>
<tr>
<td>5.</td>
<td>A baby pigeon is observed within a billboard with its parents were looking after in external part of Mee Wah Building near the car park.</td>
</tr>
<tr>
<td>6.</td>
<td>Three nests were found in Mee Wah Building.</td>
</tr>
</tbody>
</table>
Other Observation:

<table>
<thead>
<tr>
<th>Date</th>
<th>Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/03</td>
<td>- Many birds wandering on the ground for searching some food in Tai Ming Lane Square.</td>
</tr>
<tr>
<td>12/03</td>
<td>- No pigeon on the wet ground in Tai Ming Lane Square, which is just being cleaned by the government.</td>
</tr>
<tr>
<td>13/03</td>
<td>- Someone used steel rod beating to produce sound to frighten away the pigeon.</td>
</tr>
<tr>
<td></td>
<td>- After washing of Tai Ming Lane Square, no pigeon are observed on the ground.</td>
</tr>
<tr>
<td>14/03</td>
<td>- No pigeon are observed on the clean ground in Tai Ming Lane Square.</td>
</tr>
<tr>
<td></td>
<td>- When someone threw debris of bread to ground attracting pigeon</td>
</tr>
<tr>
<td>22/03</td>
<td>- Part of bread was thrown by a man and pigeon quickly come and eat</td>
</tr>
<tr>
<td>26/03</td>
<td>- A man feed the pigeon by throwing bread from the rubbish bin</td>
</tr>
</tbody>
</table>
Environment around our school:

There are many buildings in the Tai Po Market. This is a residential area.
**Questionnaire survey**

We have interviewed 20 people.

For question 1(Have you ever being annoyed by the pigeon), all of the people agree that they have been annoyed by the pigeon recently.
For question 2(Do you agree to use some devices to threaten away those pigeon?), the interviewees agree using sound, tools etc to threaten away the pigeon.

![The questionnaire image]
From the interview, some interviewees mentioned that some people in the area have provided food to the pigeon such that even the pigeon meet dangerous, they will not fly away. Besides, as the artificial environment provides a safe environment, the pigeon can be away from other threatens. Moreover, the time they come out most is in the afternoon, this shows that their activity is also match with the activity of human as human are used to being more active in the afternoon as there are largest no. of people in the square, providing a great chance for the *Columba livia* to get food.

**A map to show the sites of our study**

Tai Ming Lane Square----The area for the pigeon to **get food**

Gold Reserved Court----The area for the pigeon to **stay**

Mee Wah Building----The area for the **pigeon to live**
Discussion

1. Distance test

From the distance test, it is obvious that *Columba livia* get used to living together with human beings, human’s action will have only slight effect on them. As when people walk around or towards them, they just walk away with opposite direction casually when the distance between human and them is not so close.

The sense of feeling danger of pigeon is so weak, which can be shown by comparison of pigeon and sparrow. When they are at same condition(eating, resting or searching food) facing people walk towards them, sparrow quickly responds by walking or flying away while pigeon just slowly walk away even when the distance is not so far. It also implied that pigeon are braver than other kinds of birds (living in the urban area) so that they can accept neighboring with human.

Pigeons are even braver when eating, they care about food more than the safety of themselves. As when we walked towards them (much closer than normal distance they can accept) while they were eating, they just showed no fear and no action was done before reaching minimum distance(shown in the table and video recorded). It seems that pigeon just treat human as their safe neighbour.

The pigeon’s attentions are the highest during resting as they used to be hunt by eagle during landing and hunting. However, as the pigeon is being attracted by the provided food, the attention of the pigeon is the lowest as they are now concentrating on the food to fulfill the demand of gaining enough energy.

Besides, the pigeon’s attention rise as human approach and they will usually tends to walk away. This is due to the basic instinct of the pigeon as they will not fly immediately and just wait and observe.

Source of Error: Measurement of the distance
    Speed of the tester approaching to the pigeon

Conclusion:
The *Columba livia* get used to living together with human beings. When a man is approaching a pigeon, it will walk away at a critical distance of 120 cm and fly away at a critical distance of 75 cm.
2. Sound test

In this experiment, we found that there aren’t any special reactions when the samples are played. Hence, we have made some assumptions of the result.

First, as they have never heard about the sound so they have no ‘sense’ of afraid and hence no reactions are carried out.

After discussion, we believe the first assumption is one of the possible reasons as the pigeon are mostly likely to be found the urban area, which their offspring seldom fly back to the nature and therefore the offspring has a smaller probability to meet the nature enemy, like eagle, so when we play the sound, the pigeon has no reaction.

Moreover, they are accustomed to those sound so that they didn't afraid it. For example, as our school also provide and play similar sound, so they may adapt with it.

Source of Error:
--The sound sample is played by us such that the pigeon will not react with human as human have provided food for them hence no reaction is carried out.
--For the pigeon, the sound’s volume is too small to be heard.
Ways of improvement:
--Use a louder speaker

Conclusion:
The *Columba livia* will not leave the area and apply no action even they heard the sound.

3. Fake Food Test

Consider part1

The pigeons may consider the fake food is intentionally throw to them to hurt them. The throwing action might have frightened them. They did not come back to the same region within 15 minutes as they may regard the region as dangerous in part one. A sound with large volume is produced during the impact between the food and the ground. However, this would not be a reason that made the pigeons flew away. It is because in the sound test with great volume has used to force them to move away, but they did not, thus they will not be frightened easily just by the sound produced during the impact.
Consider part2

The pigeons approach the food. This implies that the rolling action can reduce the sense of danger such that the pigeons will not consider the food as harmful and became curious about the food when comparing with the throwing method used in part 1. Some pigeons even tried to peck the food in order to check whether the object is food. This implies that the pigeons would also carry out experiments to check whether the food is edible by determining the hardness of the food. It also shows the different characteristic on dealing with the same things.

4.1 From observation, it seems that much more *Columba livia* stayed and seen in Mee Wah Building (M.W.B.), do they live in there?

**Evidence showing that they live in M.W.B.:**
First, Many pairs of pigeon were seen in the same place in M.W.B. throughout different days’ observation.
Second, interaction between pairs of pigeon were usually seen at M.W.B., such as kissing each other and staying closely, a pigeon flapping onto the back of the another(likely to be sexual intercourse)
Third, a family of pigeon was also observed that a couple of pigeon took care with their chicks.
Fourth, three nests were found.
Fifth, a pigeon took some branches of trees into a vent for several times was video recorded which implied that it was building a nest.
Sixth, the number of pigeon at M.W.B. is much more than other places.
Frequent activities and rich number of pigeon at M.W.B. shows that M.W.B. is home of pigeon.

4.2 But why *Columba livia* choose to live in M.W.B.?

In our observation, M.W.B. has an unusual design with other buildings. The outer wall of building was designed to have eaves which can be a safety place for pigeon to rest, hide away from the rain…………. Naturally, the habitat of pigeon is coastal cliff, design of the eaves share similar structure with the cliff. Thus, pigeon may have an
instinct to live in the eaves.

Presence of the vents also play an important role for attracting pigeon to live in M.W.B., as the vent is even a more protective and safety place for pigeon to live as they can build the nest and take care with their chicks inside the vent with noticed by other.

Moreover, at the base part of M.W.B., there are several restaurants, so pigeon can have a higher chance to obtain food from the leftovers of the restaurants.

Due to safety living condition and abundant food supply, pigeon choose to live here in groups.

5. Effect on cleaning work of the Park

On 13th March, there was a cleaning work in the park. After the day of cleaning, all the birds disappeared in several days. And then they come back.

The park was blockaded, and the cleaners used watering machine and detergent to wash the floor and parterre completely. All the food debris discarded by the citizens were washed away, and as well as any other rubbish, defoliations, which could attract birds come.

On the other hand, there was a big difference before and after the cleaning: the smell. Before the cleaning work, there were some excreta of the birds remain in the parterre and floor, which might be a symbol of the pigeon’s territory.

After the cleaning work, there is strong smell of detergent remained in several days. This may make the birds are not suited to it, which can be a reason of the disappearing of birds.

We can deduce that the smell of droppings in the park and the food sources are the main cause of the birds always gather at the park.

By the way, there is an artificial fountain in the centre of the park, we observed that birds often go to there for drinking water and even cleaning their bodies. It provides a main water source for the birds which are living around Tai Ming Lane.
6. Deduction ‘Tai Ming Lane Square is the area for pigeon to find food’

Tai Ming lane square is a park, surrounded by many buildings, for citizens to rest. It is also a place people have breakfast, lunch or even dinner. After meal by the citizens, usually some of the food debris will be left, and this becomes food of pigeon.

Through our observation, we found that there are often some people feeding pigeon by throwing food debris to the ground. The pigeon tend to become fed by human.

As this park provide most abundant food source in local area, hence pigeon are staying here and recognise Tai Ming Lane Square as area for finding food.

**Limitations of investigations**

In general, most people are not willing to participate in the questionnaire survey. As a result, the sample size is too small and the data is incomplete and insufficient to draw a valid conclusion. Only subjective comment/personal impression can be collected. Besides, it is illegal and unhygienic to feed or to catch pigeon, this narrows the scope of investigation. In doing fake food tests, it is quite difficult to find some fake food which is small and not harmful to pigeon in case of accidental ingestion.

**Suggestions of further investigations**

- To conduct the investigations in other districts to see if similar deductions can be made.
- To carry out the investigations for a longer duration in order to minimise statistical errors.
- To study a natural site where *Columba livia* is found.
Overall Conclusion

We, human beings, have provided a good environment for pigeon to live and stay, for example, the roof and the food. The safety environment provided leads the pigeon become the top of the food chain as the pigeon is away from the threaten of their enemies e.g. eagle and have sufficient food, makes them more concentrated in the artificial environment. Besides, eagle is not commonly found in dense residential area, the pigeon may not be able to identify the eagle’s sound. Hence the survival rate of their offspring will increase which leads to an increase in overall pigeon population.

Bibliography

Book:

1. Book title: A Colour Guide to Hong Kong Birds
   Publisher: J. R. LEE, Government Printer at the Government
   Author: Clive Viney & Karen Phillipps

Websites: