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PEST BEHAVIOUR OF ROCK PIGEON (*Columba livia domestica*) IN BANDAR KLUANG, JOHOR

by

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A report submitted in fulfilment of the requirements for the degree of Bachelor of Applied Science (Natural Resources Science) with Honours

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2024

DECLARATION

I declare that this thesis entitled “Pest Behaviour of Rock Pigeon (*Columba livia domestica*) in Bandar Kluang, Johor” is the result of my own research paper except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature :



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Date :

7th August 2024

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“In the name of Allah, The Most Generous and The Most Merciful.”

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Pest Behaviour of Rock Pigeon (*Columba livia domestica*) In Bandar Kluang, Johor.

ABSTRACTS

This research was conducted to investigate and document the pest behaviour of Rock Pigeon and its effect on resident's regular basis in Bandar Kluang. Non-Stratified sampling method were used in choosing the study areas while observation via focal sampling method were utilised to analyse and gain insight of pigeon's behaviour in all 3 hotspots. Pigeon's pest behaviour observation sheets were used to record the bird's behaviour like droppings, cooing etc. Sets of questionnaires were distributed as well to gain more information from residents in the study areas about the pigeons in their neighbourhood. From the observations, Flat Haji Manan experienced the worst pest behaviour exhibited by the pigeons as this hotspot have the highest percentage of pest behaviours occurrence compared to other hotspots, Taman Sri Lambak and Taman Merdeka. The questionnaire unveiled the damages caused by the pigeons to the residents of Bandar Kluang, Johor like faecal matter droppings and nuisance. The birds also caused respondents to suffer from several pigeon-borne diseases like fever, coughing etc. Approaches to mitigate the problems were asked in the questionnaire; nest eradication and shooting were suggested by the respondents as the best way to mitigate the problem caused by the studied species.

Kelakuan Perosak Burung Merpati Batu (*Columba livia domestica*) di Bandar Kluang, Johor.

ABSTRAK

Penyelidikan ini dijalankan untuk mengkaji dan mendokumentasikan tingkah laku perosak merpati batu dan kesannya terhadap kebiasaan penduduk di Bandar Kluang. Kaedah persampelan tidak berstrata digunakan dalam memilih kawasan kajian manakala pemerhatian melalui kaedah persampelan fokus digunakan untuk menganalisis dan mendapatkan gambaran tentang tingkah laku merpati di kesemua 3 titik panas. Lembaran pemerhatian tingkah laku perosak burung merpati digunakan untuk merekodkan tingkah laku burung seperti najis, berkokok dan lain-lain. Set soal selidik telah diedarkan juga untuk mendapatkan lebih banyak maklumat daripada penduduk di kawasan kajian tentang burung merpati di kawasan kejiranan mereka. Daripada pemerhatian, Flat Haji Manan mengalami tingkah laku perosak paling teruk yang ditunjukkan oleh merpati kerana hotspot ini mempunyai peratusan kejadian paling tinggi kejadian perosak berbanding hotspot lain, Taman Sri Lambak dan Taman Merdeka. Soal selidik itu mendedahkan kerosakan yang disebabkan oleh burung merpati kepada penduduk Bandar Kluang, Johor seperti najis dan gangguan. Burung-burung itu juga menyebabkan responden mengalami beberapa penyakit bawaan merpati seperti demam, batuk dan lain-lain. Pendekatan untuk mengurangkan masalah telah ditanya dalam soal selidik; Pembasmian dan penembakan sarang telah dicadangkan oleh responden sebagai cara terbaik untuk mengurangkan masalah yang disebabkan oleh spesies yang dikaji.

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LIST OF SYMBOLS

=	Equal to.
-	Negative value.
%	Percentage.
N	N is the number of items.
σ_i^2	σ_i^2 is the variance of item <i>i</i> .
σ^2	σ^2 is the variance of the total score of all items.



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CHAPTER 1

INTRODUCTION

1.1 Background of Study

According to Maine Agriculture Conservation and Forestry (2022), a pest is any living thing that has a negative effect on humans. It can cause nuisance and disturbances towards humans which frequently lead to discomfort. For instance, according to Purdue University (2014) they can harm humans and animals, destroy our food supplies, and damage buildings.

On the other hand, Rock Pigeon, also known as Common pigeon, is a bird species that belongs to the family of Columbidae. They are commonly seen in urban areas and cities around the world. They usually feed on discarded food and offerings of birdseed. They usually build their nest on buildings and window ledges in urban areas like cities and human settlements. According to The Cornell Lab, (2023), in the countryside, they choose to build their nest on barns and/or grain towers, under bridges and/or natural cliffs.

Pigeons can be considered as pest birds. Due to the strong causticity of their droppings, that may eat away at roofs and other structural material, causing damage worth millions of dollars annually. They also emit spores into the air that humans can breathe in and contaminate food, water, and everything else they meet. Pigeons carry more than 50 diseases like histoplasmosis, chlamydiosis and salmonella which are not good for human health. According to Pierce and McGrath (2022) pigeons are defensive and aggressive in protecting their territories which can be a biohazard to the Aviation/Aerospace industry as they tend to jeopardise airport safety.

1.2 Problem Statements

Rock pigeons have become pests in urban places like cities, residential areas, and human settlements across the world. Pigeons are known to roost on buildings, rooftops, and other structures. Their droppings can seriously harm buildings and infrastructure by corroding metal, stone, and brickwork (Brotherton, 2024). Due to this condition, it has become a pest in the study area due to the unchecked proliferation of pigeons in urban environments leading to a range of problems, such as property damage, health risks, and nuisance behaviour. Nevertheless, there is limited information on the pest behaviour of pigeons and the way to manage them from getting critical and uncontrollable. Learning and understanding the behaviour of pigeons as pests is crucial to conserve the species from extinction even though they cause so many problems.

1.3 Objective:

The objective of this study was to “Investigate and document the pest behaviour of Rock Pigeon and its effect on resident’s regular basis in Bandar Kluang”. This study examined the consequences and impacts of pigeon behaviour on the everyday lives of the residents in Bandar Kluang, Johor.

In this study, observation or a focal sampling method was conducted to gain a better insight of pigeon’s pest behaviour behaviour in the study area. To further understand the bird’s pest behaviour, questionnaire forms were distributed to the residents of Bandar Kluang to figure out best mitigation approach that can be executed to eradicate the occurrence of this pest behaviour problem in the study area.

Through evaluating the relationships between the residents and the Rock Pigeons, this study aimed to decipher the complex effects that these bird pests’ behaviour might impose. This covers, but not restricted to, possible health risks from pigeon droppings, annoyances from their cooing and roosting activities, property damage, and any other issues that locals might experience because of these birds' presence.

1.4 Scope of Study:

This study focused on the Pest Behaviour of Rock Pigeons in Bandar, Kluang, Johor. The observation was conducted for a month and the study area is a residential area. The study focused on what pest behaviour the pigeon exhibits the most which causes nuisance on the study area.

Focal sampling method. The method was conducted for 30 days, from 8.00 AM to 5.00PM. It was used in this study to observe the pigeon pest behaviour. The sets of questionnaires were handed out to assist the outcome of this study. The data obtained from the questionnaires were then analysed using Analysis of Variance (ANOVA) to differentiate and identify the patterns and trends of pigeon pest behaviour among the three hotspots mentioned in the study area. As for the study area selection, it was selected through the availability of human settlements. According to Seabra (2016), pigeons can easily find foods in human habitation as human there feeds them with foods like breadcrumbs grains etc. Due to this scenario, human habitation in Bandar Kluang like settlements, flats and apartments were selected for the main study area of this study.

The study strictly followed the ethical guidelines concerning the most humane treatment of pigeons. This study didn't cause any harm to the studied species as it is an effort to preserve and conserve the animal. The observation methods of this study prioritised minimal disturbance to the birds; The questionnaires distributed, were designed with sensitivity to ethical considerations related to wildlife research in residential areas.

1.5 Significance of Study

The current understanding of pigeon pest behaviour in Taman Sri Lambak is limited and insufficient. Pigeons are a common sight but the nuances of their behaviour, especially in a residential context, remain largely unexplored. This study aims to fill this critical gap in knowledge, providing insights into the specific behaviours that contribute to the perceived nuisance caused by pigeons.

The practical implications of this study are crucial. By discovering the patterns and trends in pigeon pest behaviour, we can inform targeted and effective pest management strategies tailored to the unique characteristics of Taman Sri Lambak residents. This could result in reduced property damage, minimised health risks, and an overall improvement in the quality of life for residents.

The insights gained from this study could influence urban planning and design considerations in the study area. Whether through the creation of pigeon-friendly spaces or the implementation of preventative measures in residential structures, the study has the potential to shape the development of more sustainable and wildlife-friendly urban environments that later aids in the species conservation efforts.

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CHAPTER 2

LITERATURE REVIEW

2.1 The Biology and Ecology of Rock Pigeons

Columba Livia Domestica, known as the rock pigeon, city pigeon, feral pigeon, or common pigeon, belongs to the Columbidae family. Descended from the wild rock dove (*Columba Livia*), native to Europe, North Africa, and Asia, it was domesticated about 5000 years ago and has spread globally except in Antarctica. The Cornell Lab (2023) notes there are 300 pigeon and dove species, totalling 400 million individuals, making it one of the most common urban birds worldwide.

Lowther et al. (2014) describe the rock pigeon's varied plumage, which ranges from pure white to black with spots, bars, and chequers. It has a short neck, small head, sturdy body, narrow bill, green and purple iridescence on its neck and breast, pink legs, and crimson eyes. It weighs 200-350 grams, with a body length of 30-35 cm and a wingspan of 60-70 cm.

According to Audubon (2019), rock pigeons are highly adaptable, thriving in both rural and urban settings. They prefer open areas with accessible food, water, and shelter. Their diet includes seeds, grains, fruits, human food scraps, insects, and worms. They can store food in a specialized pouch in their oesophagus and regurgitate it to feed their young or partner, and they also produce crop milk for their nestlings. She nods, leading to billing and pair-bonding. The pair remains together for life unless separated by external factors.

After pigeon mates, they will start to build their nests. They build their nest in variety of locations. According to Lowther, et al., (2014), Usually, male pigeons who responsible in selecting the nest site and then wait for a partner by sitting still and cooing. The location is artificial or rock faces, frequently underneath overhangs or eaves. Pigeons can make their nests in rain gutters, abandoned building rooms, and stairwells. During nest building, the female uses the materials that the male brings to her one at a time to construct a platform as she sits on the nest. In contrast to many other birds, pigeons do not remove the faecal matter from their nests. This implies that the lightweight nest gradually transforms into a robust, pot-like mound, occasionally containing mummies of deceased nestlings and unhatched eggs.

Ronald K. Murton (2022) notes that pigeons forage for food that is often scattered on the ground. They may also search for food in dumpsters and garbage cans, which contributes to various pest problems in urban areas. This behaviour can lead to sanitation issues and increased interactions with humans, often resulting in the perception of pigeons as pests. Additionally, a study by Masanori Kono (2019) found that pigeons use a reinforcement schedule to regulate the energy cost of their responses, thereby modifying their foraging behaviour based on food availability. This adaptability in foraging strategies allows pigeons to efficiently exploit different food sources, highlighting their success in a wide range of habitats. The combination of ground foraging and the ability to adjust their behaviour based on food availability underscores their resilience and adaptability, making them one of the most successful urban bird species.

2.2 Factors Influencing Pigeon's Pest Behaviour

Old buildings with architectural features like ledges, balconies, and crevices provide ideal roosting and nesting sites for the studied species. It leads to higher densities on these building structures compared to newer buildings made of materials like glass and reinforced concrete that are less accessible (Sacchi et al., 2002).

Pigeons thrive in areas with abundant nesting sites, particularly older buildings with architectural features like ledges, balconies, and crevices that provide shelter and resemble their natural cliff habitats. The density of pigeons is higher in towns surrounded by farmland compared to those with forests and lakes, due to the availability of more suitable nesting sites (Giunchi et al., 2012).

While pigeons have natural predators, such as foxes, snakes, and various birds of prey (e.g., red-tailed hawks and peregrine falcons), these predators typically do not thrive in urban areas. Urban settings often lack the necessary habitat and food sources for these predators, leading to a reduced population density of natural pigeon hunters.

Pigeons have evolved and highly adaptable and resourceful when it comes to finding food. In urban environments where traditional food sources might be limited, pigeons highlight their ability to seek out alternative options such as discarded human food or leftovers from outdoor dining areas. This scavenging behaviour demonstrates their resilience in the face of challenging conditions (D-Termination, 2023).

2.3 The Impacts of Pigeon's Pest Behaviour on Human's Life.

Pigeons tend to nest in flocks and often build their nests in the same spot throughout their lives. They construct simple nests from twigs, straw, and other suitable materials. Nesting on buildings can lead to significant problems: pigeon droppings, which contain high concentrations of uric acid, can be highly corrosive and damage buildings and properties. Additionally, pigeon nests can attract other pests like mites, roaches, and lice, exacerbating the problem (Gosper, et al., 2020).

Pigeons can transmit more than fifty diseases, including salmonellosis, psittacosis, histoplasmosis, and cryptococcosis, some of which can be severe or fatal, particularly for individuals with compromised immune systems such as children, the elderly, or those with immune deficiencies (Pest, et al., 2020). Pigeons also harbour parasites like fleas, lice, ticks, and worms, which can afflict humans and pets. Moreover, pigeon dander, feathers, and droppings can cause allergic reactions, including dermatitis, rhinitis, and asthma (Williams & Corrigan, 1994).

Pigeons cause ongoing annoyance through their daily activities. They often roost within or near buildings, disturbing nearby residents (Weber, J. et al, 1994). Pigeons may act aggressively, particularly if they perceive a threat or face territorial conflicts. Young pigeons and adults alike can attack humans, displaying fight-or-flight responses. This aggression may include biting or pecking, charging or lunging at perceived threats, and is often accompanied by fast movements like flapping wings and vocalizations to intimidate intruders (Nadim K. 2022).

2.4 Strategies to Overcome Pigeon's Pest Behaviour in Urban Areas.

There are various methods to manage pigeon pest behaviour in urban areas, depending on objectives, resources, and stakeholder preferences. According to Pierce, R. A. & McGrath, K. (2020), some effective strategies include:

- **Habitat Modification:** Removing food and water sources, sealing off entry points, and trimming trees and bushes are essential components of habitat modification to discourage pigeons from roosting or nesting. By eliminating access to food, water, and potential nesting sites, property owners can make their premises less attractive to pigeons. Sealing off entry points and modifying the physical environment can limit the areas where pigeons can establish roosts or nests.
- **Frightening:** Traditional bird control methods often fail with pigeons. Noise-producing objects like alarms and firecrackers do not permanently disturb roosting pigeons. Pigeons cannot hear high-frequency (ultrasonic) sounds, and visual deterrents like rubber snakes and balloons are ineffective. Water streams can remove pigeons from roosts, but this requires frequent spraying until the birds relocate.
- **Chemical Deterrents:** Avitrol, containing 4-Aminopyridine, can be used both as a toxicant and a frightening agent for pigeons. When pigeons ingest it, they exhibit signs of distress and irregular behaviour, which frightens the rest of the flock. This behaviour reduces the overall number of pigeons without increasing the risk of secondary poisoning to other animals. Consequently, using Avitrol may be less controversial than other toxicants.

- **Nontoxic Chemical Repellent:** There are also pastes and liquid sprays that are nontoxic chemical repellents. Pigeons find a more enticing spot to roost or loaf when they try to use treated sites as perches because these materials produce a sticky substance that makes them uncomfortable. Therefore, take care of all roosting and loafing areas nearby, or the pigeons will only go a short distance to an untreated region.
- **Trapping:** Although there are many varied sizes for pigeon traps, it is advised to use ones that are 9 feet long, 4 feet broad, and 8 inches high. Three sections make up these suggested traps, with various one-way doors located in the outer two portions. When a pigeon flies through a door to get at the corn, the door rises. The door falls, trapping the pigeon as soon as it is fully within. Pigeons that have been caught enter the main area of the trap through another one-way door, where they can live peacefully until the trapper comes back thanks to a big mound of bait and a water dish.

2.5 Perceptions of Residents Towards Pigeon and Their Pest Behaviour.

According to Cappocia et al., (2018), from her study, it is mentioned Pigeons are seen favourably by some residents who see them as elegant, perceptive, or symbolic birds that can also be used for amusement, company, or even as a source of money. Additionally, they might see pigeons with compassion, deference, or tolerance, acknowledging their ethical, social, or ecological worth as well as their right to cohabit with people. Pigeons, for instance, are useful as disease and environmental health indicators as well as for identifying poor air quality within the settlements.

On the other hand, there are residents who have a negative perception towards pigeon. Pigeons may be perceived by certain residents as unclean, unhealthy, or invading birds, as well as a nuisance, danger, or enemy. They may also view pigeons as a source of danger, damage, or irritation, and may be aggressive, afraid, or repulsed by them. Additionally, because they may be aware of, worried about, or impacted by pigeons, some people may have an elevated or exaggerated perspective of the issues these birds pose.

There are also residents who have ambivalent perceptions towards pigeon within their existence. because people's ideas or sentiments toward them could be contradictory or mixed. Their aversion for the noise, stench, or hostility of pigeons may balance their appreciation of the birds' intelligence, beauty, or symbolic meaning. Depending on the situation's setting, frequency, or intensity, individuals might also see the issues brought on by pigeons in a mild or variable manner.

CHAPTER 3

METHODOLOGY

3.1 Study Area.

Located in the centre of the state of Johor is a town and district known as Kluang. The location's coordinates are 2°2'01 N and 103°19'10 E. There are currently around 350,000 people living in the Kluang neighbourhood, and the city itself is home to 200,000 people. After Johor Bahru, Malaysia's second-biggest city, and Batu Pahat, Johor, the state's second-biggest city, Kluang is the third-biggest city in the state. The location's coordinates are 2°2'01 N and 103°19'10 E (Majlis Perbandaran Kluang, 2016). In this study area, there are 3 main areas which have been reported by the residents were infested by the pigeon. These 3 hotspots were picked as there are human settlements like flats, and apartments. These 3 places are Taman, Sri Lambak, Flat Jalan haji Manan, and Taman Merdeka.

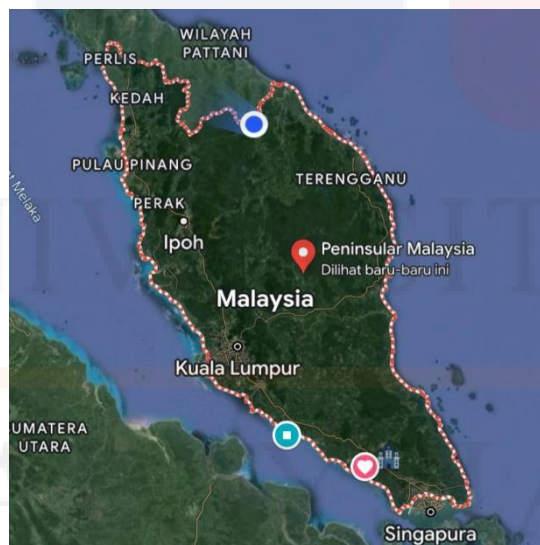


Figure 1.0: Map of Peninsular Malaysia.

Source: Google Maps.

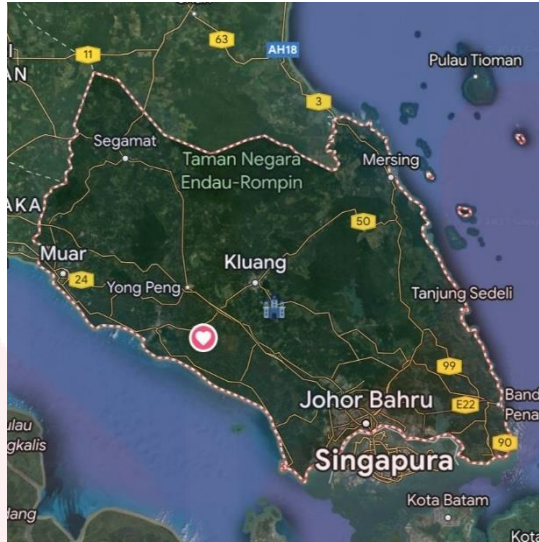


Figure 1.1: Map of Johor State.
Source: Google Maps.

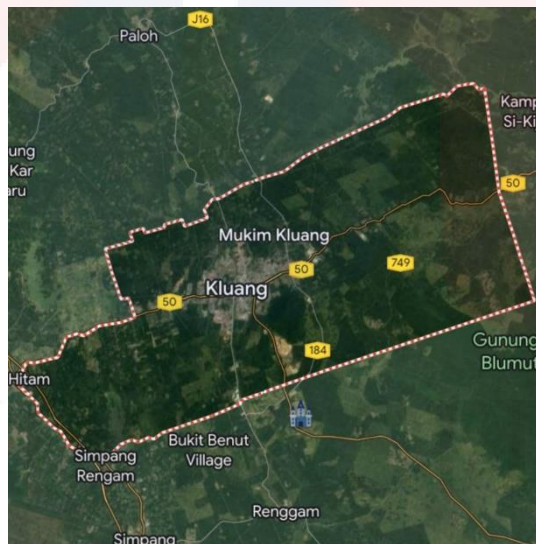


Figure 1.2: Map of Bandar Kluang, Johor.
Source: Google Maps.

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3.2 Materials

In this study, material needed to conduct this pigeon's pest behaviour study are listed just like below:

Table 1.0: List of Material.

No.	Items	Function/use	Amount
1	A Binocular	Being used to observe pigeon's pest behaviour in Bandar Kluang from afar.	1
2	Camera	Recorded and captured all studied species' pest behaviour in their habitat.	1
3	Tablet	Recorded the data and information regarding to pest behaviour obtained from the observations by using Excel apps installed in the tablet	1
4	Laptop	Processed the data retrieved from the survey and observation of pigeon in Bandar Kluang.	1
5	Questionnaires	Distributed to the candidates who affected by pigeon's pest behaviour.	-
6	Pigeon's Pest Behaviour Observation Sheets	Monitored which pest behaviour imposed by the studied species the most.	3

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3.3 Data Collection

3.3.1 Observation

These 3 hotspots in Bandar Kluang Taman Sri Lambak, Flat Jalan Haji Manan, and Taman Merdeka, were the sites of the pigeons' pest behaviour observations. Employing a focal sampling technique, the observation was conducted for 30 days, from 8 a.m. to 5 p.m. Choosing one or a small number of pigeons, either alone or in groups, and keeping a detailed log of all their behaviours and interactions over a predetermined amount of time is known as focus sampling. Using a tablet, the data were recorded, and a binocular and camera were used for the observation. The types, frequencies, durations, and locations of pigeon pest behaviour such as feeding, roosting, nesting, cooing, or defecating as well as the impacts of such behaviour on a regular basis for the residents such as nuisance, property damage, or health risks were all included in the data. The environmental elements that affected the behaviour of pigeon pests, such as the weather, temperature, humidity, or human activity, were noted throughout the observation.

3.3.2 Questionnaire

To gather the thoughts and experiences of people living and working in the three chosen hotspots in Bandar Kluang regarding pigeon pests and their impacts, this study used a convenience sampling method. This means questionnaires were handed out to residents based on their availability and willingness to participate, without randomizing or stratifying the selection. The questionnaire included a mix of multiple-choice, short answer, and Likert scale questions, both closed-ended and open-ended. Residents were asked about their knowledge, attitudes, perceptions, and experiences with pigeon pest behaviour and its effects. Demographic information such as age, gender, occupation, and education level were collected as well. Additionally, residents were asked for their preferences and suggestions for controlling pigeon pest behaviour in their neighbourhoods. The questionnaires were distributed online, making it easier for residents to complete them at their convenience.

3.3.3 Cronbach's Alpha

Before the questionnaire was distributed to the respondents, a pilot test was conducted to determine its reliability using Cronbach's Alpha. Reliability testing is crucial to ensure that the questionnaire consistently measures what it is intended to measure. The alpha value obtained from this pilot test was 0.8291321, which falls within the range considered "Good" and reliable according to Mohd Arof et al. This high level of reliability indicates that the questionnaire is likely to produce consistent and repeatable results, enhancing the credibility of the data collected.:

$$\alpha = \frac{N-1}{N} \left(1 - \frac{\sigma^2}{\sum_{i=1}^N \sigma_i^2} \right)$$

- N is the number of items.
- σ_i^2 is the variance of item i .
- σ^2 is the variance of the total score of all items.

Cronbach's Alpha ranges from 0 to 1, with higher values indicating greater internal consistency of the items in the questionnaire. An alpha value of 0.7 to 0.8 is considered acceptable, while values above 0.8 are considered good, and values above 0.9 are considered excellent.

3.4 Data Analysis

3.4.1 Statistical Analysis

Using proper statistical procedures, this approach has been employed to analyse the data gathered from the observations. The data was entered, coded, and cleaned using software like Excel and SPSS. Descriptive statistics, such as mean, median, mode, and percentage, were used to summarize the data, providing a clear overview of the trends and patterns observed. The data was also meticulously checked for outliers, homogeneity, and normality. Any anomalies were corrected, or the data was transformed as needed to ensure accuracy and reliability.

To further analyse the data, ANOVA (Analysis of Variance) was used to compare and interpret the results, allowing for a deeper understanding of the differences and relationships within the data. The analysed data was then presented in various forms, including tables, graphs, and charts, to facilitate easy comprehension and interpretation of the findings. Software like Word and PowerPoint were employed to report and present the findings effectively, ensuring that the results were communicated clearly and professionally to stakeholders and other interested parties. This comprehensive approach ensured a robust analysis, providing valuable insights into the observations.

CHAPTER 4
RESULT AND DISCUSSION

4.1 Overall Results

Figure 2.0 below shows the overall results of pigeon pest behaviour across three different study areas. The study aimed to investigate and document the pest behaviour of Rock Pigeons and its effects on resident’s daily activities in Bandar Kluang, Johor. The Null Hypothesis stated, "There are no significant differences between pigeon pest behaviour and study areas," while the Alternative Hypothesis posited, "There are significant differences between pigeon pest behaviour and study areas." The study was conducted over 30 days, from 11th February 2024 to 15th March 2024, in three hotspots: Taman Sri Lambak (1.95727°N, 103.38959°E), Taman Merdeka (2.0310622°N, 103.3189672°E), and Flat Haji Manan (2.0379973°N, 103.3212957°E). Observations focused on flocks of 20-50 pigeons. The average temperature during the study was 32.48°C, with predominantly sunny weather and only two rainy days. Observations were not conducted during rainy weather as the pigeons were not visible. The study analysed five types of pest behaviour: droppings, cooing, nesting, foraging, and aggression.

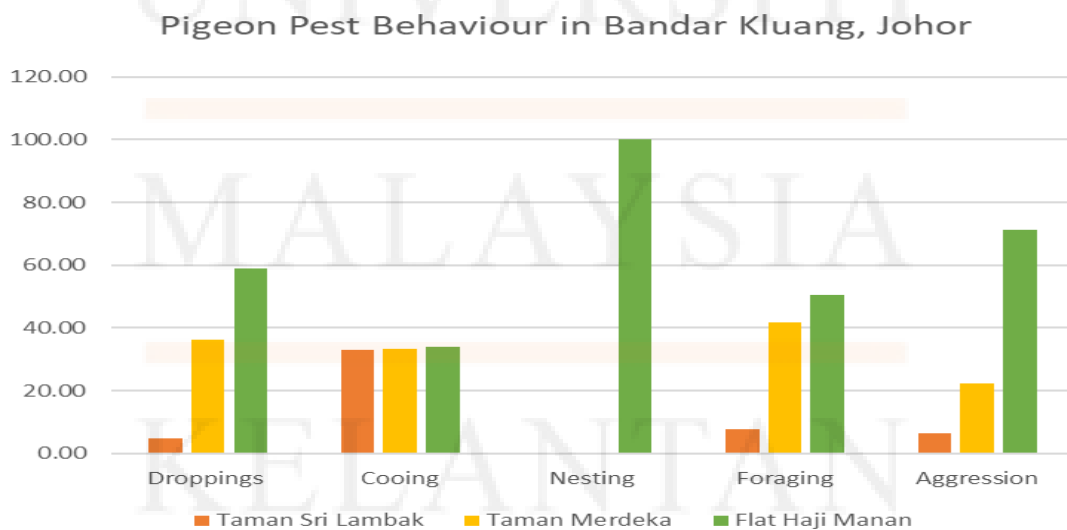


Figure 2.0: Overall Result.

4.2 Droppings Behaviour

Figure 2.1 below shows the percentage of pigeon droppings from the three hotspots of this study. Flat Haji Manan had the highest percentage (59.06%), followed by Taman Merdeka (36.22%), and Taman Sri Lambak (4.72%). This variation is due to differences in food availability. Flat Haji Manan residents regularly feed pigeons, leading to high droppings (Pementer, 2024). Taman Merdeka also has moderate feeding and corresponding droppings. Taman Sri Lambak, where residents do not feed pigeons, had the least droppings. The differences are statistically significant, with an ANOVA test p-value of 0.0, confirming food availability influences pigeon droppings distribution.

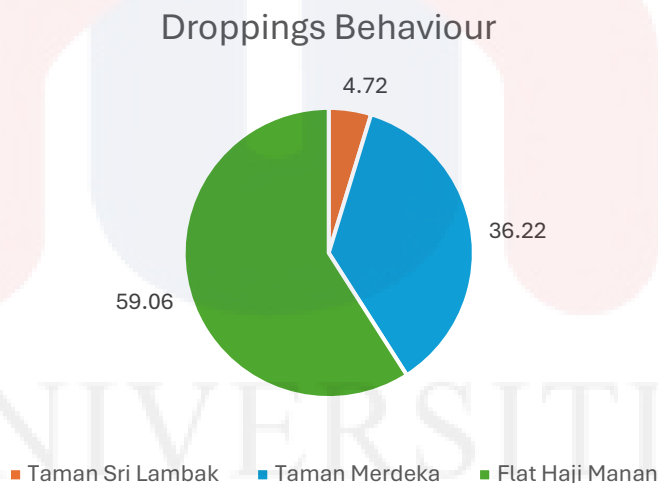


Figure 2.1: Percentage of Droppings Behaviour.



Figure 2.2: Grains Feeding by Taman Merdeka Residents.



Figure 2.3: Seeds Feeding by Taman Merdeka Residents.

4.3 Cooing Behaviour

Figure 2.4 below shows the percentage of pigeons' 'Cooing' behaviour from the three hotspots of this study. Based on the pie chart, all hotspots experienced nearly equal percentages of cooing behaviour: 33.87% for Flat Haji Manan, 32.92% for Taman Sri Lambak, and 33.21% for Taman Merdeka. During the 30-day observation, all pigeons, whether in a flock or alone, cooed constantly. According to Parij and Olga (2022), pigeons use cooing as a means of communication to convey feelings and intentions, signal nesting, attract mates, guard territory, and communicate about egg and young care. When pigeons feel at ease, they coo softly. Hormonal changes, like elevated testosterone in males during breeding season, can make cooing more intense. This similarity in cooing behaviour among pigeons in all three hotspots is statistically supported, as the ANOVA Analysis p-value of 0.931890948 rejected the Alternative Hypothesis, indicating no significant difference in cooing behaviour.

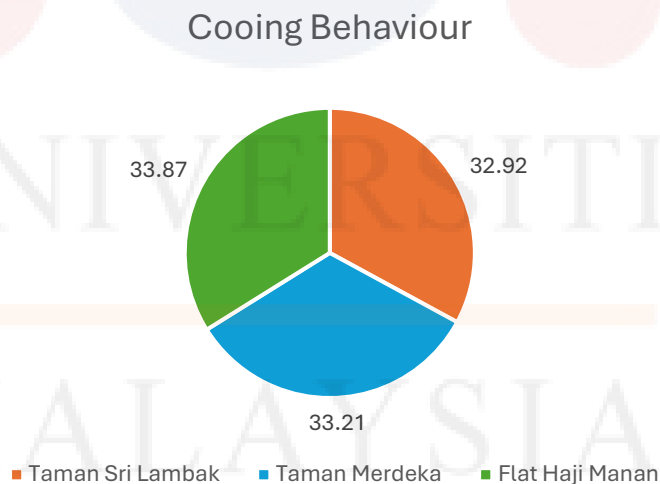


Figure 2.4: Percentage of Cooing Behaviour.

4.4 Nesting Behaviour

Figure 2.5 below shows the percentage of pigeons' 'Nesting' behaviour from the three hotspots of this study. According to the chart, nesting behaviour was observed only at Flat Haji Manan (100%), with no nesting at Taman Merdeka and Taman Sri Lambak (0%). The lack of suitable nesting sites at Taman Sri Lambak and Taman Merdeka, exposed to heavy rain and intense winds, prevented pigeons from building nests. Sandra Kraft and Larry Pinto (2021) state that Rock Pigeons (*Columba livia domestica*) require levelled areas shielded from wind and rain for nesting. Flat Haji Manan's hollowed roof provided an ideal space for nest-building, and its high-rise structure offered protection from predators like foxes and cats. ANOVA Analysis confirmed the comparison, with a p-value of 0.00, rejecting the Null Hypothesis and indicating significant differences in nesting behaviour.

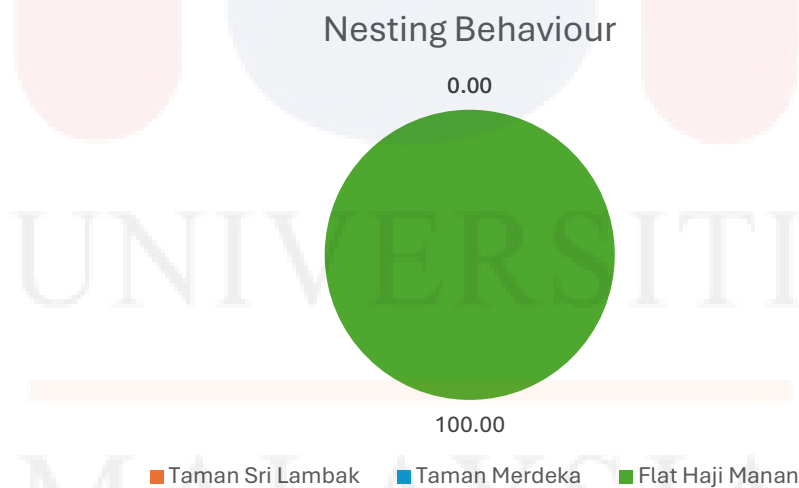


Figure 2.5: Percentage of Nesting Behaviour.

4.5 Aggression

Figure 2.6 below shows the percentage of pigeons' 'Aggression' behaviour from the three hotspots of this study. According to the chart, Flat Haji Manan experienced the highest percentage of pigeon aggression at 71.24%, followed by Taman Merdeka at 22.22%, and Taman Sri Lambak with the least at 6.54%. Pigeons at Flat Haji Manan are more aggressive due to the presence of nests in the area, prompting them to protect their nests and hatchlings from potential threats, whether from humans or other pigeons. In contrast, no pigeon nests were observed at Taman Sri Lambak and Taman Merdeka during the 30-day observation period, resulting in less aggressive behaviour as there were no nests or offspring to defend. This correlation between nest presence and aggression underscores the protective instincts of pigeons. ANOVA Analysis confirmed these observations with the p-value, validating the differences in aggression behaviour among the three hotspots. The p-value of this behaviour is 0.00, less than alpha value of 0.05, which rejected the Null Hypothesis of this study.

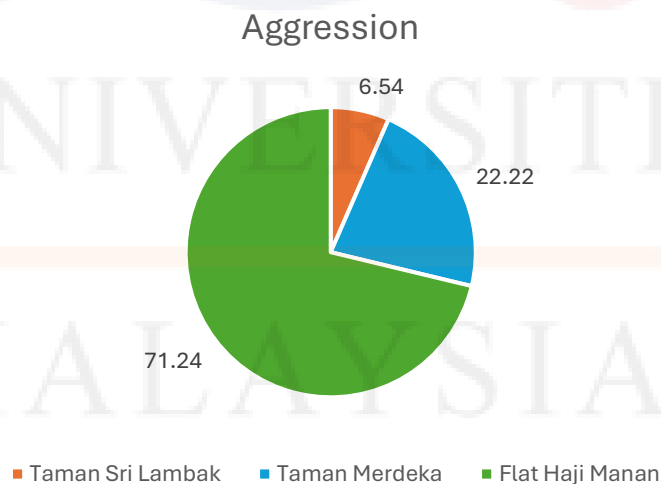


Figure 2.6: Percentage of Aggression.

4.6 Foraging Behaviour

Based on the pie chart below, Flat Haji Manan had the highest pigeon foraging behaviour at 50.60%, followed by Taman Merdeka at 41.73%, and Taman Sri Lambak at 7.67%. This foraging behaviour correlates with their dropping behaviour. Taman Sri Lambak saw the least foraging because residents did not feed pigeons with discarded food waste. In contrast, residents in Taman Merdeka and Flat Haji Manan fed pigeons seeds and grains daily, leading to higher foraging activity. The comparison reveals a significant difference in foraging behaviour among the three hotspots, as indicated by a p-value of 0.00, rejecting the null hypothesis.

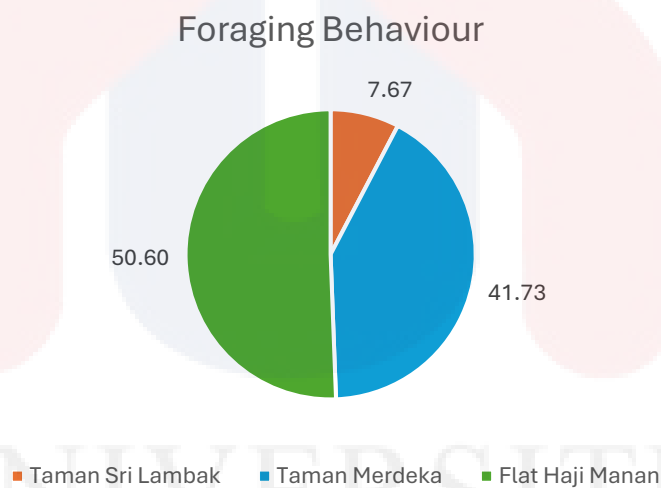


Figure 2.7: Percentage of Foraging Behaviour.



Figure 2.8: Pigeons feed on seed scattered by the residents of Taman Merdeka.



Figure 2.9: Pigeons feed on garbage scattered on the floor of Flat Haji Manan.

KELANTAN

4.7 Questionnaire Findings

In this study, questionnaires were distributed to the residents of Bandar Kluang to gather insights on the impact of pigeons' pest behaviour on their daily lives. The main objective was to understand the resident's experiences and perspectives on the nuisance caused by pigeons. To facilitate easy access and efficient data processing, the questionnaire was distributed entirely online using Google Forms. This method proved convenient for both respondents and researchers, streamlining data collection and analysis.

The questionnaire was available for 30 days, during which residents were encouraged to participate. By the end of this period, a total of 740 responses were collected, providing a substantial dataset for analysis. The questionnaire included a mix of multiple-choice, short answer, and Likert scale questions to capture comprehensive information about pigeon behaviour and its impact. Both closed-ended and open-ended questions were used to allow for quantitative and qualitative analysis.

Written in Malay, the questionnaire ensured that all respondents could easily understand and accurately complete it, maximizing participation and response reliability. The resident's feedback was crucial for assessing the extent of the problems caused by pigeons and identifying potential mitigation strategies. The diverse question types allowed for a thorough examination of the issue, providing valuable insights into the resident's daily challenges and the broader impact on the community.

4.8 Respondent's Length of Stay.

According to Table 2.0, 740 respondents or 36.54% indicated they have resided in Bandar Kluang for 21-30 years. Another 21.5% have lived there for 31-40 years, while 18.25% have stayed for 1-10 years. Additionally, 15.40% reported living in Bandar Kluang for 11-20 years. Long-term residents include 4.60% who have been there for 41-50 years, and 3.71% who have lived in the area for 51-60 years. These figures indicates that respondents who have stayed in Bandar Kluang for 21-30 years have the highest percentage compared to the respondents from different group of length of stay.

Table 2.0: Respondents Length of Stay.

No.	Length of Stay (Years)	Amount	Percentage (%)
1	1-10	135	18.25
2	11-20	114	15.40
3	21-30	270	36.54
4	31-40	159	21.50
5	41-50	34	4.60
6	51-60	28	3.71
Total		740	100

MALAYSIA

KELANTAN

4.9 Respondent's Area of Stay.

According to the table 2.1 below, most of the respondent's response came from the residents of Flat Haji Manan with 42.10% or 311 responses. 25.00% or 184 responses from the residents of Bandar Kluang, 20.22% or 151 responses from Taman Sri Lambak and 12.68% or 94 responses from Taman Sri Impian. Figures above indicate that Taman Sri Impian has the lowest participation, which reflect a smaller community or lower engagement levels among the respondents there.

Table 2.1: Respondents Area of Stay.

No.	Area of Stay	Amount	Percentage (%)
1	Bandar Kluang	184	25.00
2	Flat Haji Manan	311	42.10
3	Taman Sri Lambak	151	20.22
4	Taman Sri Impian	94	12.68
Total		740	100

4.10 Damages and Problems Caused by The Pigeons

From Table 2.2, most respondents experienced issues with pigeon faecal matter, with 57.22% (107 respondents) reporting this problem. This leads to excessive house cleaning. Additionally, 24.06% (45 respondents) reported pigeon nesting in their neighbourhoods, causing respiratory issues due to feathers and poor air quality. Noise pollution was also a problem, with 12.30% (23 respondents) affected by constant pigeon cooing, leading to mental distress. Property damage, such as fading paint and blocked drainage systems, was reported by 6.42% (12 respondents). These responses confirm the prevalence of these issues among the respondents.

Table 2.2: Damages and Problems Caused by The Pigeons.

No.	Damage Caused	Amount	Percentage (%)
1	Faecal Matter Problems (Droppings)	107	57.22
2	Nuisance (Sound Pollution)	23	12.30
3	Nesting	45	24.06
4	Property Damage	12	6.42
Total		187	100

MALAYSIA

KELANTAN

4.11 Diseases and Symptoms Caused by The Pigeons.

According to Table 2.3 below, most respondents experienced only one disease carried by pigeons, with 183 out of 507 respondents (35.68%) indicating this. Additionally, 128 respondents (25.25%) reported experiencing two diseases, while 69 respondents (13.61%) encountered three diseases. The illnesses mentioned include conjunctivitis, fever, coughing, headache, muscle and ligament soreness, dizziness, epilepsy, lethargy, and respiratory diseases such as psittacosis, cryptococcosis, and histoplasmosis. The remaining 130 respondents (25.46%) suffered from more than four pigeon-related diseases, due to frequent encounters with pigeons. This data underscores the need for public health initiatives and educational campaigns to inform residents about the risks of pigeon-related diseases and how to prevent them.

Table 2.3: Number of diseases experienced by the respondents.

Number of Diseases Experienced	Amount	Percentage (%)
1	183	35.68
2	128	25.25
3	69	13.61
4	58	11.44
5	34	6.71
6	19	3.75
7	5	0.99
8	4	0.79
9	9	1.78
Total	507	100

4.12 Respondent's Awareness

As shown in Figure 2.10, most respondents are unaware that pigeons spread illnesses, with 528 out of 691 respondents (76.4%) selecting "Tidak Sedar" (Not Aware). This indicates a significant lack of knowledge about the health risks associated with pigeons. Conversely, 163 respondents (23.6%) were aware of these risks. The large gap between the aware and unaware respondents highlights a deficiency in public health education and awareness about the dangers of pigeon infestations. This lack of awareness may be due to factors like insufficient media coverage, misconceptions about pigeons being harmless urban wildlife, and the general public's limited access to reliable information on the subject. Enhanced educational efforts are needed to bridge this knowledge gap.

Adakah anda sedar bahawa senarai penyakit di atas adalah penyakit bawaan burung merpati?
691 responses

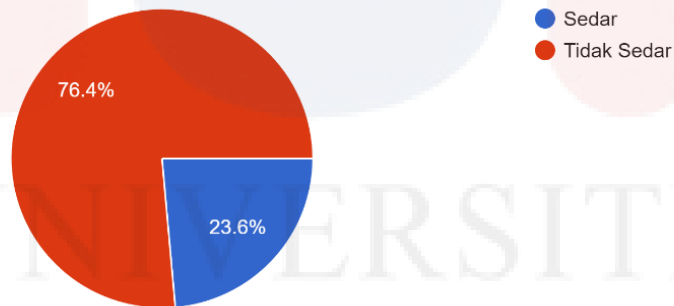


Figure 2.10: Percentage of respondent's awareness towards listed diseases in 4.11

4.13 Respondent's Approaches

According to Figure 2.11 below, a significant majority of respondents, 80.9% or 570 individuals, indicated that they have not taken any measures to prevent pigeons from roosting and dropping their faecal matter in their neighbourhoods or settlements. This suggests a widespread lack of intervention efforts among the residents to address the pigeon problem. On the other hand, 19.1% or 135 individuals have reported taking some actions to deter the birds from roosting and leaving droppings. This minority shows that while some residents are proactive in dealing with the issue, the majority are either unaware of effective methods or are not sufficiently motivated to implement them.

Pernakah anda mengambil sebarang langkah bagi mengelakkan burung merpati bertelur/membuang najis di kediaman anda?

705 responses



Figure 2.11: Percentage of respondents who have taken approaches and not

4.14 Approaches Taken by The Respondents

From Table 2.4, most respondents (80.14% or 107 individuals) have proactively removed pigeon nests to prevent roosting and defecating in their neighbourhoods, highlighting the effectiveness of this method among the 705 respondents. Additionally, 6.38% (8 respondents) chose to chase the birds away themselves for its simplicity. A smaller group, 4.96% (7 respondents), used more aggressive measures like slingshots, guns, or stones to permanently keep pigeons away. Bird traps, used by 0.43% (2 respondents), were considered more humane as they capture birds without harming them. Lastly, 8.09% took measures to eliminate food sources and clean up droppings, finding these methods effective despite the greater effort required.

Table 2.4: Respondents Approaches.

No.	Approaches Taken	Amount	Percentage (%)
1	Nest Eradication	107	80.14
2	Chasing Away	8	6.38
3	Shooting	7	4.96
4	Installing Bird Traps	2	0.43
5	Didn't Feed the Birds	8	6.09
6	Clean the Bird's Droppings	3	2.00
Total		135	100

4.15 Approaches Suggested by The Respondents.

Table 2.5 below shows the percentage of approaches suggested by respondents to mitigate pigeon pest behaviours in Bandar Kluang, Johor. Biological control, involving natural predators, was chosen by 14 respondents (6.31%), indicating it may be seen as less accessible or effective. Compounds, or penalties, were the least favoured with only 2 respondents (0.90%), likely due to perceived ineffectiveness. Awareness programs were suggested by 27 respondents (12.16%), highlighting the importance of public education. Bird traps were popular, selected by 55 respondents (24.77%), reflecting a preference for humane methods. Feeding restrictions and catch and dispose methods were equally favoured, each chosen by 62 respondents (27.93%), indicating these are seen as practical and effective solutions.

Table 2.5: Respondent's Suggestions.

No.	Suggested Approaches	Amount	Percentage (%)
1.	Biological Control	14	6.31
2.	Compounds	2	0.90
3.	Awareness Program	27	12.16
4.	Bird Traps	55	24.77
5.	Feeding Restrictions	62	27.93
6.	Catch and dispose	62	27.93
Total		222	100

4.16 Respondents Agreement on Feeding Restriction

Figure 2.12 below shows whether respondents are agreeing or disagree on feeding restriction able to reduce pigeon's pest behaviour problem in Bandar Kluang, Johor. 74.4% or 524 of 704 respondents opted for "Ya, Saya Bersetuju" (Yes, I'm Agreed) indicating a full agreement on the statement above. The rest or 25.6% or 180 respondents opted for "Tidak, Saya Tidak Bersetuju" (No, I'm Disagreed) stating their disagreement on statement above.

Adakah anda bersetuju bahawa larangan memberi makan kepada burung merpati dapat mengurangkan masalah kelakuan perosak yang disebabkan oleh haiwan ini?

704 responses

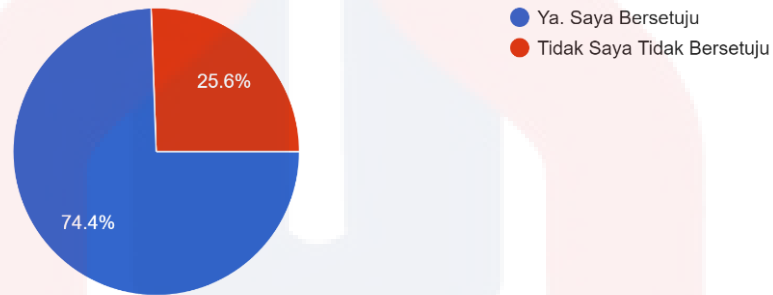


Figure 2.12: Respondents agreements on Food Restrictions.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The purpose of the study was to comprehensively examine and document the pest behaviour of rock pigeons (*Columba livia domestica*) and assess its impact on the daily lives of residents in Bandar Kluang, Johor. This study specifically investigated various aspects of pigeon behaviour, including feeding habits, roosting and nesting patterns, cooing activities, and droppings, as well as how these behaviours influence the surrounding neighbourhood. The research employed a combination of surveys and observational techniques to gather data on these behaviours and their effects on the local community.

The findings revealed significant variations in the patterns and intensity of pigeon pest behaviour across three major hotspot areas in Bandar Kluang: Taman Sri Lambak, Taman Merdeka, and Flat Haji Manan. The study highlighted that the frequency and intensity of the pigeons' disruptive behaviours were influenced by several factors, including the availability of food sources, the suitability of nesting locations, and the presence of natural predators. These factors collectively contributed to the varying levels of nuisance experienced by the residents in these areas.

The study highlighted the significant negative impacts of pigeon pest behaviour on residents. Issues included general irritation, health risks from droppings, and property damage. Aggressive behaviour, persistent nesting, and droppings were major concerns. Additionally, many residents were unaware of the health risks associated with pigeon-borne diseases, underscoring the need for improved public awareness and education.

In response to the pigeon problem, some residents have taken individual measures to mitigate the issue, such as removing nests, chasing pigeons away, and employing shooting as a deterrent. However, the survey results indicated a lack of coordinated efforts and effective strategies from local authorities to manage the pigeon population and address its adverse effects on the community. The absence of a unified approach has likely contributed to the persistence of the problem and the continued disruption experienced by residents.

The study highlights the complex interactions between urban pigeons and human populations, emphasizing the need for a comprehensive and multifaceted strategy to address the rock pigeons' pestilential behaviour in Bandar Kluang. Recommendations for future actions include environmental modifications to reduce pigeon attractants, the implementation of effective deterrent techniques, enhanced public education to raise awareness about pigeon-related health risks, and the development of coordinated pest management plans involving stakeholders and local government. By addressing these areas, it may be possible to mitigate the negative impacts of pigeon pests and improve the quality of life for the residents of Bandar Kluang.

5.2 RECOMMENDATIONS

First, this study has identified several pest behaviours exhibited by rock pigeons in the Bandar Kluang area, such as excessive nesting, aggressive territoriality, and extensive foraging leading to property damage and health risks. A comprehensive and humane pigeon management plan that includes habitat modification, deterrent measures, and public education campaigns need to be implemented by the authorities as these approaches play a crucial and effective role in mitigating and further preventing the pigeon's pest behaviour problems in Bandar Kluang, Johor.

Next, the local authorities like Malaysia Ministry of Health (MOF) should develop and implement public awareness campaigns to educate the community on the dangers of pigeon-borne diseases and the importance of preventive measures. In addition, the current stigma of the community, thinking that pigeons are small and harmless birds, can be changed through increased awareness and education on the significant health risks and property damage they caused throughout this study was conducted. This shift in perception can encourage more proactive and effective measures in managing pigeon populations and mitigating their impact on urban environments.

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APPENDICES

APPENDIX A

Pest Behaviour of Rock Pigeon (*Columba livia domestica*) in Bandar Kluang, Johor

Questionnaire Forms

KELAKUAN PEROSAK BURUNG MERPATI (*Columba livia domestica*) DI BANDAR KLUANG, JOHOR.

Soal selidik ini diedarkan bagi mengumpulkan data berkaitan masalah perosak burung merpati di Bandar Kluang Johor serta bertujuan menyiapkan Projek Tahun Akhir (FYP) Ijazah Sarjana Muda Sains Gunaan (Sains Sumber Asli), Universiti Malaysia Kelantan. Seterusnya, data yang dikumpulkan ini akan digunakan bagi membentuk cara yang sesuai bagi mengatasi masalah kelakuan perosak haiwan ini di samping memelihara spesies ini daripada diancam sebarang risiko kepupusan.

* Indicates required question

Columba livia domestica



Skip to question 1

Bahagian A

DEMOGRAFI RESPONDEN

1. **Umur Responden ***

Mark only one oval.

- 10-19 Tahun
- 20-29 Tahun
- 30-39 Tahun
- 40-49 Tahun
- 50-59 Tahun
- 60-69 Tahun

2. **Jantina ***

Mark only one oval.

- Lelaki
- Perempuan
- Other: _____

3. **Pekerjaan ***

Mark only one oval.

- Pelajar
- Bekerja Sendiri
- Kakitangan Awam
- Kakitangan Swasta
- Professional
- Tidak Bekerja
- Other: _____

4. **Tahap Pendidikan ***

Mark only one oval.

- Tahap Pendidikan Rendah
- Tahap Pendidikan Menengah
- Tahap Pengajian Tinggi
- Other: _____

5. **Berapa tahun anda sudah menetap di Bandar Kluang, Johor? ***

6. **Di kawasan manakah anda menetap di Daerah Kluang, Johor? ***

Skip to question 7

BAHAGIAN B

**PENGALAMAN RESPONDEN TERHADAP KELAKUAN PEROSAK BURUNG MERPATI
(*Columba livia domestica*) DI BANDAR KLUANG, JOHOR.**

7. **Adakah anda kerap melihat burung merpati di kawasan kediaman dan persekitaran sekeliling anda?**

Mark only one oval.

- 1 2 3 4 5
- Sangat Jarang Sangat Kerap

8. Sejauh manakah anda bersetuju bahawa kelakuan perosak burung merpati mendatangkan masalah di kawasan kediaman anda ?

Mark only one oval.

1 2 3 4 5

Sangat Tidak Bersetuju Sangat Bersetuju

9. Sejauh manakah anda berasa selesa dengan kehadiran burung merpati di persekitaran anda

Mark only one oval.

1 2 3 4 5

Sangat Tidak Selesa Sangat Selesa

10. Sejauh manakah anda bersetuju bahawa najis burung merpati boleh membahayakan kesihatan dan keselamatan anda dan orang sekeliling

Mark only one oval.

1 2 3 4 5

Sangat Tidak Bersetuju Sangat Bersetuju

11. Sejauh manakah anda bersetuju bahawa bunyi burung merpati merupakan gangguan terhadap diri anda

Mark only one oval.

1 2 3 4 5

Sangat Tidak Bersetuju Sangat Bersetuju

12. Sejauh manakah anda bersetuju dengan keberkesanan langkah yang telah diambil oleh Pihak Berkuasa Tempatan (PBT) dalam mengatasi masalah kelakuan perosak burung merpati di kawasan kediaman anda?

Mark only one oval.

1 2 3 4 5

San: Sangat Bersetuju

13. Adakah anda sering memberi makan kepada burung merpati di sekitar kawasan kediaman anda

Mark only one oval.

1 2 3 4 5

San: Sangat Bersetuju

Skip to question 14

BAHAGIAN C

KELAKUAN BURUNG MERPATI (*Columba livia domestica*) DI BANDAR KLUANG, JOHOR

14. Adakah burung merpati sering kembali ke tempat yang sama ia diberi makan?

Mark only one oval.

Ya

Tidak

15. Adakah burung merpati sering berkumpul dalam jumlah yang besar di sekitar kawasan kediaman anda?

Mark only one oval.

Ya

Tidak

16. Adakah burung merpati sering membuat sarang di kawasan kediaman dan persekitaran anda?

Mark only one oval.

- Ya
 Tidak

17. Adakah burung merpati di kawasan anda menunjukkan sikap agresif semasa anda berada berdekatan dengannya?

Mark only one oval.

- Ya
 Tidak

18. Adakah burung merpati sering membuang najisnya di sekitar kawasan kediaman anda?

Mark only one oval.

- Ya
 Tidak

19. Adakah burung merpati di sekitar kawasan kediaman anda mengakibatkan sebarang kerosakan terhadap harta benda anda mahupun orang lain

Mark only one oval.

- Ya (Jika "Ya" teruskan dengan soalan seterusnya)
 Tidak (Jika "Tidak" abaikan soalan seterusnya)

20. Sila nyatakan kerosakan yang diakibatkan oleh burung merpati di sekitar kawasan sekitar anda?

BAHAGIAN D

KESAN DAN LANGKAH MENGATASI KELAKUAN PEROSAK BURUNG MERPATI (*Columba livia domestica*) DI BANDAR KLUANG JOHOR.

21. Tandakan simptom/penyakit berikut yang pernah anda hidapi

Check all that apply.

- Mata Merah (Konjunktivitis)
- Demam
- Batuk
- Sakit kepala/gangguan sistem saraf
- Sakit Otot dan sendi
- Mual/Muntah (Salmonellosis)
- Sawan
- Kelesuan (Aspergillosis)
- Gatal-Gatal (Ectoparasites)
- Saki Perut/Ciri-Birit/Najis Berdarah
- Nafas Pendek (Cryptococcosis)
- Susah Bernafas
- Other:

22. Adakah anda sedar bahawa senarai penyakit di atas adalah penyakit bawaan burung merpati?

Mark only one oval.

- Sedar
- Tidak Sedar

23. Pernahkah anda mengambil sebarang langkah bagi mengelakkan burung merpati bertelur/membuang najis di kediaman anda?

Mark only one oval.

- Ya (Jika "Ya" teruskan dengan soalan seterusnya)
- Tidak (Jika "Tidak" abaikan soalan seterusnya)

24. Sila Nyatakan langkah yang anda telah ambi?

25. Cadangkan langkah lain yang sesuai dilakukan bagi membendung masalah kelakuan perosak burung merpati di Bandar Kluang, Johor.

MALAYSIA

KELANTAN

26. Adakah anda bersetuju bahawa larangan memberi makan kepada burung merpati dapat mengurangkan masalah kelakuan perosak yang disebabkan oleh haiwan ini?

Mark only one oval.

- Ya. Saya Bersetuju
- Tidak Saya Tidak Bersetuju

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APPENDIX B

Pigeon Pest Behaviour Observation Sheet (Taman Sri Lambak):

Time/Behaviour	Dropping	Cooing	Nesting	Foraging	Aggression
9:00 AM					
9:10 AM					
9:20 AM					
9:30 AM					
9:40 AM					
9:50 AM					
10:00 AM					
10:10 AM					
10:20 AM					
10:30 AM					
10:40 AM					
10:50 AM					
11:00 AM					

Date:

Temperature:

Weather:

Coordinates:

Comments/Notes:

APPENDIX C

Pigeon Pest Behaviour Observation Sheet (Taman Merdeka):

Time/Behaviour	Dropping	Cooing	Nesting	Foraging	Aggression
12:00 PM					
12:10 PM					
12:20 PM					
12:30 PM					
12:40 PM					
12:50 PM					
1:00 PM					
1:10 PM					
1:20 PM					
1:30 PM					
1:40 PM					
1:50 PM					
2:00 PM					

Date:

Temperature:

Weather:

Coordinates:

Comments/Notes:

APPENDIX D

Behaviour Observation Sheet (Flat Haji Manan):

Time/Behaviour	Dropping	Cooing	Nesting	Foraging	Aggression
3:00 PM					
3:10 PM					
3:20 PM					
3:30 PM					
3:40 PM					
3:50 PM					
4:00 PM					
4:10 PM					
4:20 PM					
4:30 PM					
4:40 PM					
4:50 PM					
5:00 PM					

Date:

Temperature:

Weather:

Coordinates:

Comments/Notes:
