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**DETECTION OF *HAEMAPHYSALIS* SPP. AND LICE INFESTATION AND ASSOCIATED RISK FACTORS IN BACKYARD CHICKEN IN KOTA BHARU, KELANTAN**

**By**

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KELANTAN**

**ABSTRACT**

Ectoparasites, involving lice and ticks, are common in poultry and can adversely affect bird health, productivity, and welfare by causing irritation, feather damage, anemia, and serving as vectors of disease. Backyard chickens are particularly vulnerable due to various risk factors which in this study focusing on age and rearing system. The objective of this study was to identify *Haemaphysalis* spp. and lice infestations and determine the related risk factors in backyard chickens in Kota Bharu, Kelantan. A total of 40 chickens were examined, and ectoparasite samples were collected and analyzed under a stereomicroscope for morphological identification. The results showed that 30 chickens (75.0%) were infested with lice, while none were positive for *Haemaphysalis* spp. Age and rearing systems were significantly associated with lice infestation. In conclusion, lice are highly prevalent in backyard chickens in Kota Bharu, highlighting the need for regular monitoring and effective ectoparasite management to improve bird health and productivity in small-scale poultry systems.

Keywords : Backyard chicken, ectoparasite, lice, *Haemaphysalis* spp., Kota Bharu, Kelantan.

**PENGESANAN *HAEMAPHYSALIS* SPP. DAN INFESTASI KUTU SERTA FAKTOR RISIKO BERKAITAN DALAM AYAM KAMPUNG DI KOTA BHARU, KELANTAN**

**ABSTRAK**

Ektoparasit, seperti kutu dan kutu daun, lazim ditemui pada unggas dan boleh memberi kesan negatif terhadap kesihatan, produktiviti, dan kesejahteraan burung dengan menyebabkan kegatalan, kerosakan bulu, anemia, serta bertindak sebagai pembawa penyakit. Ayam kampung amat terdedah kerana sistem pemeliharaan secara bebas, biosekuriti yang rendah, dan kawalan ektoparasit yang terhad. Kajian ini bertujuan untuk mengesan *Haemaphysalis* spp. dan infestasi kutu serta mengenal pasti faktor risiko yang berkaitan pada ayam kampung di Kota Bharu, Kelantan. Sebanyak 40 ekor ayam diperiksa, dan sampel ektoparasit dikumpulkan serta dianalisis di bawah mikroskop stereoskop untuk pengenalan morfologi. Keputusan menunjukkan bahawa 30 ekor ayam (75.0%) dijangkiti kutu, manakala tiada sampel yang positif bagi *Haemaphysalis* spp. Umur dan sistem pemeliharaan didapati berkait rapat dengan infestasi kutu. Kesimpulannya, infestasi kutu adalah tinggi pada ayam kampung di Kota Bharu, menunjukkan bahawa strategi kawalan ektoparasit yang bersasar, amalan pemeliharaan yang lebih baik, dan pemantauan berkala adalah penting untuk mengurangkan infestasi, meningkatkan kesejahteraan burung, serta menyokong pengeluaran ayam kampung yang lestari.

## CERTIFICATION

This is to confirm that we have reviewed the research paper titled “Detection of *Haemaphysalis* spp. “Lice infestation and related risk factors in backyard chickens in Kota Bharu, Kelantan,” by Nadia Natasha Binti Suhaimi, meets our expectations for scope, quality, and presentation as a partial requirement for the DVT55204- Research Project course.



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## DEDICATIONS

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**LIST OF ABBREVIATIONS**

spp.	: Species
ID	Identification
SPSS	Statistical Package for the Social Sciences



## CHAPTER 1 : INTRODUCTION

### 1.1 Background

*Haemaphysalis* spp., a varied genus of hard ticks, are prevalent in both tropical and temperate areas, feeding on a wide variety of vertebrate hosts such as mammals, birds, and reptiles. These ticks are significant not just in veterinary medicine, but also in public health, as they are recognized carriers of zoonotic pathogens. *Haemaphysalis* ticks are linked to the spread of several emerging infectious agents such as *Rickettsia* spp. *Borrelia* spp. *Babesia* spp. And *Anaplasma* spp which pose significant threats to human health. In Southeast Asia, particularly Malaysia, animals frequently host species such as *Haemaphysalis hystricis*, *H. bispinosa*, and *H. wellingtoni*, which might act as bridge vectors linking animal reservoirs to humans (Khoo et al., 2016). The growing intersection of human communities and tick environments, fueled by elements like agricultural growth and deforestation, heightens the threat of tick-borne zoonotic diseases. Thus, comprehending the ecology, host variety, and vector capability of *Haemaphysalis* spp is essential for creating effective control methods to reduce the risk of zoonotic disease spread.

Lice in one of the most common ectoparasites that is found in chicken. They are small, flat, wingless six-legged parasites and commonly they spend their entire life cycle on the chicken. The lice will survive on the host by eating feather parts, dead skin and blood. During heavy infestation of lice, the chicken may show signs of scratching on themselves, alopecia, restlessness and may have broken feathers (Murillo and Gerry, 2016). Lice are important ectoparasites of poultry which cause health problems in poultry such as irritation, reduction of hemoglobin, a decrease in erythrocytes value and hyperchromic anemia (Mohamed Kalefa Mansur *et al.*, 2019). Infestations can lead to economic losses due to reduced weight gain,

decreased egg production, and potential secondary infections. Backyard chickens, which are often reared under free-range conditions with limited parasite control, may be particularly susceptible to *Menopon gallinae* and other species of poultry lice infestations (Samson Mukaratirwa *et al.*, 2012). Understanding the infestation of both *Haemaphysalis* spp. and *Menopon gallinae* in backyard chickens is crucial for developing effective parasite control strategies and improving the health and productivity of backyard poultry. This study aims to determine the presence and associated risk factors of *Haemaphysalis* spp. and *Menopon gallinae* infestation in backyard chickens.

## 1.2 RESEARCH PROBLEM STATEMENT

Despite the economic and cultural importance of backyard chicken in Kelantan, there is a lack of epidemiological data on the prevalence of ectoparasites such as *Haemaphysalis* spp. and *Menopon gallinae* specifically in Kota Bharu, Kelantan. Without such data, it is difficult to assess the extent of infestation, implement effective control measures, or educate farmers on proper poultry health management. This gap in knowledge poses a potential risk to health and productivity of backyard chickens and by extension to the livelihood of rural communities. Therefore, this study aims to fill the existing knowledge gap in Kota Bharu, Kelantan regarding the presence of *Haemaphysalis* spp. and *Menopon gallinae* infestation in backyard chickens to better understand the extent of the problem and provide evidence-based recommendations for its management.

## 1.3 RESEARCH QUESTIONS

- 3.1 What is the status of *Haemaphysalis* spp. infestation in backyard chickens in Kota Bharu, Kelantan?

3.2 What is the status of lice infestation in backyard chickens in Kota Bharu, Kelantan?

3.3 What are the risk factors associated with the occurrence of *Haemaphysalis* spp. And lice infestation in backyard chickens in Kota Bharu, Kelantan?

#### **1.4 RESEARCH HYPOTHESIS**

4.1 *Haemaphysalis* spp. is detected in backyard chickens in Kota Bharu Kelantan.

4.2 There is presence of lice infestation detected in backyard chickens in Kota Bharu Kelantan.

4.3 There is an association between *Haemaphysalis* spp. and lice infestation with various risk factors such as rearing system, age and presence of other animals in the backyard house area.

#### **1.5 RESEARCH OBJECTIVES**

5.1 To detect the presence of *Haemaphysalis* spp. infestation in backyard chickens in Kota Bharu, Kelantan.

5.2 To detect the presence of lice infestation in backyard chickens in Kota Bharu, Kelantan.

5.3 To identify the risk factors associated with *Haemaphysalis* spp. And lice infestation in backyard chickens in Kota Bharu, Kelantan.

## CHAPTER 2: LITERATURE REVIEW

### 2.1 Overview of *Haemaphysalis* spp. and poultry lice

Ticks are mandatory blood-feeding ectoparasites that impact a diverse array of vertebrate hosts, including birds. Ticks serve as effective carriers for the spread of zoonotic infectious agents, such as bacteria, viruses, and protozoan parasites, between animals and humans (Khoo *et al.*, 2016). Ticks are recognized for containing various medically significant bacterial species, including those from the *Rickettsia*, *Anaplasma*, *Bartonella*, *Coxiella*, and *Ehrlichia* genera (Khoo *et al.*, 2016). The genus *Haemaphysalis* includes more than 160 species identified globally (Guang Xu *et al.*, 2022). In Malaysia specifically, species like *Haemaphysalis wellington*, *Haemaphysalis hystricis*, and *Haemaphysalis bispinosa* have been documented infesting domestic animals in two Orang Asli villages (Khoo *et al.*, 2016). The life cycle of *Haemaphysalis* spp. ticks consists of 3 stages: larvae, nymphs, and adults. Every stage needs a blood meal from a host prior to shedding its skin for the next stage. *Haemaphysalis* spp. deposit their eggs in the surroundings, and within days, larvae hatch and look for hosts. Severe infestations can cause considerable blood loss, resulting in anemia, reduced weight gain, depression, toxemia, and paralysis. (Amy C. Murillo *et al.*, 2021)

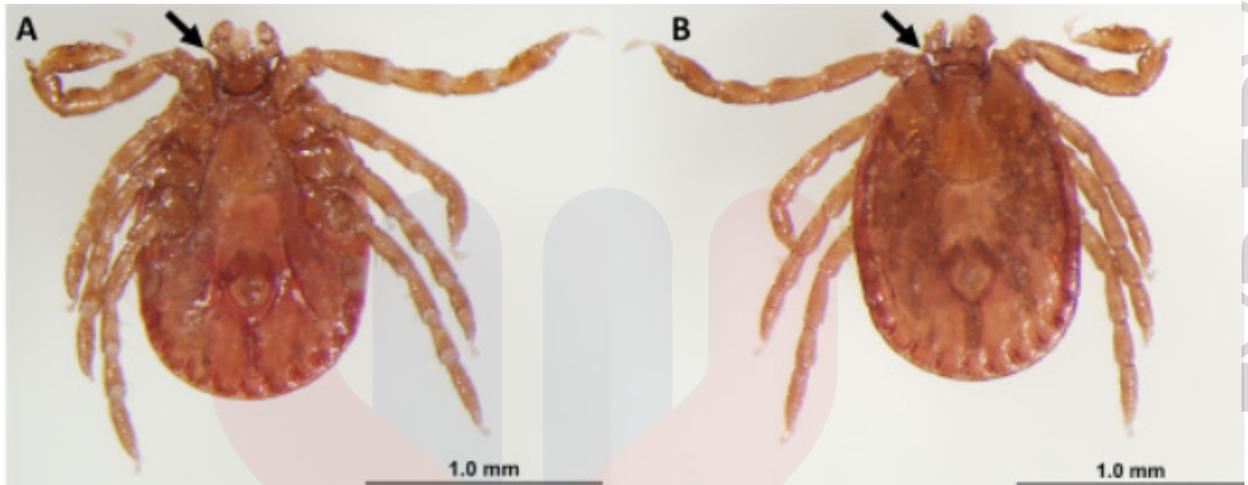


Figure 1: Ventral (A) and dorsal (B) view of *Haemaphysalis longicornis* (Kathryn T. Duncan, *et al.*, 2020)

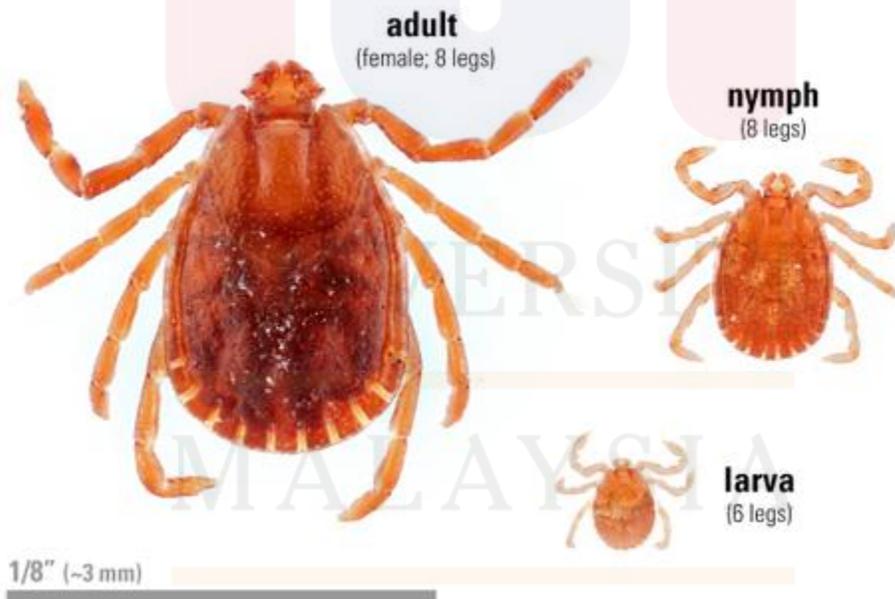


Figure 2: Larvae, nymph and adult stage of *Haemaphysalis longicornis*. (Matt Bertone, *et al.*, 2018)

In poultry, there are several types of lice which differ in body shape, color, and size. Example of common lice are *Menopon gallinae* (Shaft louse), *Menacanthus stramineus* (Chicken body louse), *Lipeurus caponis* (Wing louse), *Goniodes dissimilis* (brown chicken louse), *Goniocotes gallinae* (Fluff louse), and *Cuclotogaster heterographus* (chicken head louse), (Murilo *et al.*, 2024).



**Figure 3 : (1) Chicken body louse, *Menacanthus stramineus*; (2) Shaft louse, *Menopon gallinae*; (3) Fluff louse, *Goniocotes gallinae*; (4) Wing louse, *Lipeurus caponis*; (5) *Menacanthus cornutus* and (6) Chicken head louse, *Cyclotogaster heterographus* (Murillo, 2016)**

Generally, *Menopon gallinae* was reported as most common lice species that would infested in chicken (76.7%), followed by *Lipeurus caponis* (63.3%), *Menacanthus stramineus* (41.7%), and *Goniocotes gallinae* with 9.5% (A. Rahman & Farah Haziqah, 2014). In this literature review will be more focusing on common lice which are *Menopon gallinae*, *Lipeurus caponis* and *Menacanthus stramineus*. All lice poultry is under the class of Insecta with 3 parts of bodies, which are head, thorax and abdomen. It is under order of Phthiraptera, which generally involves all lice species both biting and sucking lice, characterized by their wingless and dorsoventrally flattened bodies. First for *Menopon gallinae*, the taxonomy lies under family *Menoponidae*, and species of *Menopon gallinae*. It is an ectoparasite with a strong mandible, small in size and the color is pale and yellow which is generally different from other populations of chewing lice (Farheen Shaikh *et al.*, 2024). Typically, the body shape of this louse is small, oval, and yellowish in color, with males usually being slightly larger than females. The front part of the body is significantly wider than the back part. The back end of the male is thick and blunt, whereas the female's is pointed. The head typically has a triangular shape, is smooth and rounded at the front, blunt in the middle, and features a smooth lateral edge. The thoracic area is usually small and oval, wider in the middle and narrowing at the edges. The thoracic area is split into three sections: Pronotum, Mesonotum, and Metanotum. The abdominal sections have an elongated, oval to oblong form (Mohamed Kalefa Mansur *et al.*, 2019). In the meantime, *Menacanthus stramineus* mostly resides on the skin surrounding the vent, breast, and thigh regions of birds. This species consumes feathers, skin remnants, and blood from pin feathers, leading to lesions that result in skin irritation, feather harm, and hair loss (Murillo *et al.*, 2024). Typically, similar to other lice

species, it possesses three primary body sections: head, thorax, and abdomen. *Menacanthus stramineus* is elongated with a broadly rounded rear and has robust legs adapted for securely grasping the host's feathers and skin. The head was wider and broader than the thorax, featuring mandibulate mouthparts designed for chewing. The antennae have a club-like shape and are primarily hidden under the head. For this species, the eggs are primarily laid in white clusters at the base of feathers, particularly near the vents (Pereira *et al.*, 2012.). Next, *Lipeurus caponis* is a shaft louse with an abdomen that looks long, slender, and more elongated, while the head is narrow and elongated, in contrast to *Menopon gallinae* and *Menacanthus stramineus*, which have a broad, triangular shape. This species typically favors infesting the feather shafts, where it is often seen running along the quills and feather shafts. These lice thrive on feather keratin and debris, and they do not consume blood (Farheen Shaikh *et al.*, 2024).



**Figure 4: Chewing louse *Menopon gallinae*, A male and B female ( Farheen Shaikh *et al.*, 2024)**

Ectoparasite infestation in villages generally can be linked with various risk factors involving age, gender, management system, location and weather season (Lawal et al., 2017). From the study by Lawal et al., (2017) where they assess the prevalence of ectoparasite in village chicken and associated risks factors, it showed that there were statistical significant differences ( $P < 0.05$ ) in rate of ectoparasite infestation between adult and young chicken where adult show 61.75% rate of infestation compared to young with 22.75%. The prevalence of ectoparasite showed higher in females (46.25%) than in male (38.25%) also the chicken under extensive management have higher infestation

(64.75%) compared to chicken reared semi-intensively (19.75%). The study also concluded that ectoparasite infestation rate was higher during the rainy (49.0%) season compared during dry (35.50%) of the sampling period.

## 2.2 Host range of *Haemaphysalis* spp. and poultry lice and detection in Malaysia

*Haemaphysalis* species, a genus of hard ticks, are known for their broad host range, which includes a diverse array of mammals, birds and reptiles (Abdul Rahman Kazim *et al.*, 2024). These ticks exhibit varying degrees of host specificity depending on the species, geographic distribution, and life stages (Walker *et al.*, 2013). For instance, *Haemaphysalis bispinosa* is frequently found on cattle, goats and dogs (M. Rafiqul Amin *et al.*, 2025). *Haemaphysalis longicornis* have a wide distribution and feed on livestock including cattle, sheep, and horses as well as wildlife like deer and small mammals (Walker *et al.*, 2013). In Malaysia, several *Haemaphysalis* species have been documented parasitizing poultry and other avian hosts. Notably, *Haemaphysalis wellingtoni* has been identified infesting ground-dwelling birds, including domestic chicken (*Gallus gallus domesticus*) and helmeted guineafowl (*Numida meleagris*), marking the first such record in Asia (Kazim *et al.*, 2024). Additionally, *Haemaphysalis hystricis* has been collected from chickens in rural communities, indicating its presence in domestic poultry environments (Khoo *et al.*, 2016). Further studies have been demonstrated the detection of tick-borne pathogens, such as *Candidatus Midichlorida* spp. from *H wellingtoni* collected from peri-domestic animals including poultry in rural communities, highlighting the potential zoonotic and veterinary importance of these ticks in Malaysia (Husin *et al.*, 2021). These findings underscore the significance of *Haemaphysalis* ticks

in Malaysian poultry, highlighting their potential role in transmission of tick-borne pathogens affecting animal and human health.

*Menopon gallinae* typically infest various breeds of *Gallus gallus domesticus*, domestic chickens, and *Numida meleagris*, including Guinea fowl (Farheen Shaikh et al., 2024). Research on the occurrence of ectoparasites in village chicken farms (*Gallus gallus domesticus*) in Malaysia is quite limited. A study carried out on commercial free-range chickens in Alor Setar, Kedah, identified four distinct ectoparasite species, with *Menopon gallinae* exhibiting the highest prevalence at 93.8% (Suhaila et al., 2015). A different study aimed at determining the prevalence of ectoparasites in 240 scavenging chickens randomly gathered from several districts in Penang, Peninsular Malaysia, discovered ten ectoparasite species, including five lice species, two mite species, two tick species, and one chigger species. The research indicated that *Menopon gallinae* was the predominant ectoparasite with a 76.7% prevalence (Wahab et al., 2015). Lice species that infect domestic chickens (*Gallus gallus domesticus*) typically show a strong preference for their specific host. Like *Menopon gallinae*, other chewing lice, including *Lipeurus caponis* and *Menacanthus stramineus*, mainly affect chickens and infrequently target other bird species. This host specificity is typical of many lice in the Amblycera and Ischnocera orders, having evolved to closely adapt to the feather structure and environment of their chosen host. Though sporadic invasions of similar galliform birds, like turkeys or guinea fowl, can happen, they are typically unintended and feature reduced parasite levels (Farheen et al., 2024).

### 2.3 Pathogenesis and clinical manifestation of *Haemaphysalis* spp. and poultry lice infestation.

*Haemaphysalis* spp. as three-host hard ticks inflict damage through direct effects of blood-feeding and indirect effects via pathogen transmission and immunosuppression. Ticks penetrate the skin using barbed mouthparts (hypostome), causing mechanical damage and local inflammation. Tick saliva contains anticoagulants, immunosuppressants and vasodilators which facilitate prolonged feeding but can also induce local allergic reactions and immunomodulation (Šimo *et al.*, 2017). Heavy infestations lead to excessive blood loss as well as skin lesions and feather damage such as dermatitis, scab formation and feather damage. Not only that, *Haemaphysalis* spp. also responsible for feeding on blood and other parts of the body causing birds to become restless and irritated, and later will affect feed intake, digestion, growth and egg production to transmit various pathogens to the poultry such as *Rickettsia*, *Anaplasma*, *Bartonella*, *Coxiella* and *Ehrlichia* genera. Birds that were infested with these ticks may exhibit signs of restlessness, excessive preening, scratching and shaking of the head and neck. During physical examination, we can observe pale combs and wattles indicating anemia in severe cases, visible ticks attached to featherless areas such the head, neck, under wings and vent. Infected birds may show reduced body weight gain, drop in egg production and poorer overall condition (Nuguse Rafisa & Tesfaye Rebuma, 2024).

Avian lice commonly have a life cycle around 3 weeks and they feed on feathers or bits of dead skin (Amy C. Murillo *et al.*, 2021). Generally, lice have a simple metamorphosis (incomplete) and the life cycle entirely on the host. The life cycle starts with female lice

lay eggs (nits) at the base of feathers and the eggs firmly attached to feathers. The egg later hatches into a nymph and three nymphal instars (molts) occur as the nymphs grow larger. Each nymphal stage lasts about 3 to 5 days totaling around 10 - 15 days. As the nymph grows to adult, adults feed on feather debris, skin scales and exudates. Mating occurs on the host and females begin laying eggs (Amy Murillo *et al.*, 2016). These lice feed by chewing on feathers and the skin around the feather bases (Fig. 13), as well as on dry skin flakes and scab tissue. Unlike mites, they do not suck blood but may consume blood that leaks when the bird's skin or developing feathers are punctured. Lice can be found across the entire bird, on both skin and feathers. Most lice spend their entire life cycle on a single host, though some may transfer to another bird during close contact. The constant irritation from lice movement often causes stress in the birds. Infested birds may appear restless, have damaged, "lousy" feathers, and generally look unhealthy. Other symptoms of infestation include decreased feed intake, slower growth, and reduced egg production (Nair *et al.*, 2021).

#### 2.4 Diagnosis of *Haemaphysalis* spp and poultry lice.

The diagnosis of *Haemaphysalis* spp. And lice infestation in chickens involves manually collecting ectoparasites from preferred attachment sites, such as the feather shafts around the vent, wings, neck, and back of the body. Ectoparasites are collected using fine forceps and placed into labeled collection tubes containing 70% ethanol for preservation. In the laboratory, the specimens are further preserved in 70% ethanol to maintain their structural integrity. They are then transferred to Petri dishes containing lactophenol or 10%

potassium hydroxide (KOH) solution for clearing. After 24 hours, the lice and ticks are rinsed with distilled water and mounted using Canada balsam on microscope slides for microscopic identification (Suhaila *et al.*, 2015). The ectoparasite will be identified based on morphology under stereomicroscope with references by (Farheen Shaikh *et al.*, 2024) and (Murillo *et al.*, 2024).



## CHAPTER 3: RESEARCH METHODOLOGY

### 3.1 Ethical consideration

The ethical approval for the use and handling of animals in this study was retrieved from the Animal Ethics Committee of Universiti Malaysia Kelantan under the code (UMK/FPV/ACUE/FYP/015/2025).

### 3.2 Methodology

#### 3.2.1 Study area

The study was conducted in a selected backyard chicken in Kota Bharu, Kelantan

#### 3.2.2 Study design

This study employed a cross-sectional observational design to determine the presence of *Haemaphysalis* spp. and lice infestation in backyard chicken in Kota Bharu, Kelantan. A sample of chickens was examined for the presence of any ectoparasite, and data on host-related variables was collected to assess potential associations with rate of infestations.

#### 3.2.3 Study population

A total of forty backyard chickens ( $n = 40$ ) were selected using convenience sampling. This sample size was appropriate for a cross-sectional study designed to assess the presence and distribution of ectoparasites at a single point in time. As the study targeted free-range backyard

chickens, catching and handling birds were labour-intensive and time-consuming, which limited the number of animals that could be sampled within the study period. Consequently, considering field conditions, animal availability, and time constraints, the selected sample size was sufficient to identify the dominant ectoparasite species present. The study population was restricted to backyard chickens in Kota Bharu, Kelantan.

### 3.3 Selection criteria

#### 3.3.1 Inclusion criteria

For this study, only backyard chickens were included. In this context, backyard chickens were defined as those reared in free-range or semi-confined settings within village or backyard environments, with small flock size, estimated less than 30 chicken or in other words the chickens reared not for commercial purpose. These chickens are primarily used for personal consumption, egg production, or small scale sale. Other than that, these backyard chickens should be reared with minimal biosecurity or veterinary intervention such as absence of disinfectant footbaths, vaccination programs and proper controlled housing.

#### 3.3.2 Exclusion criteria

The exclusion criteria for this study include chickens that are housed in large intensive farming systems with large-scale production, specifically those rearing more than 30 chickens. In addition, chickens that are reared under good and structured biosecurity measures will also be excluded. For the purpose of this

study, structured biosecurity refers to poultry management systems that implement consistent and formalized disease prevention practices. These include restricted farm access, the use of protective clothing, routine cleaning and disinfection, separation of poultry from other animals, controlled introduction of new birds, and regular monitoring by veterinary personnel.

### 3.4 Sampling method and procedure

#### 3.4.1 Animal profile

The physical examination of the chicken was performed and the patient signalment was recorded in animal profile as shown in Table 3.4.1.

Table 3.4.1: Animal Record

Chicken ID	Date	Location	Chicken type	Management	Age	Sex

For age, the classifications are made as shown in table 3.4.2.

Table 3.4.2 : Classification of age into chick, grower and adult

Stage	Weeks
Chick	0-8
Grower	9-20
Adult	> 20

### 3.4.2 Sample collection

A total of 40 village chickens were examined for ectoparasite infestation. Each chicken was carefully restrained by one person (see Appendix 4) to minimize stress and movement, while another person conducted a thorough examination of the preferred sites for ectoparasites, including the breast, vent, wings, neck and back regions. The inspection was carried out visually and by parting the feathers to detect the presence of lice or ticks. Ectoparasites observed on the host were collected using fine forceps (see Appendix 3) and transferred into clean, labelled urine containers. Each container was labelled with the respective sample identification number and relevant details (see Appendix 6). After the examination and sample collection, the chickens were released.

### 3.4.3 Sample processing

In the laboratory, 90% alcohol was added into each urine container containing the collected lice specimens (see Appendix 5). The contents of each container were then poured into a clean Petri dish for examination (see Appendix 10). The

samples, together with the alcohol solution, were observed under a stereomicroscope to study the morphological characteristic of the lice (see Appendix 8). Identification and classification were performed based on the observed morphological features to determine the species of the lice present.

### 3.5 Data collection

The data resulting from the morphological analysis of the ectoparasite that were collected from the backyard chickens was manually recorded and tabulated using Microsoft Excel.

### 3.6 Data Analysis

All gathered data were systematically categorized and input into a spreadsheet for statistical evaluation. Descriptive statistics were utilized to condense the information gathered in the research. The count and proportion of backyard chickens affected by *Haemaphysalis* spp. and lice infestations were determined. In inferential analysis, the relationships between potential risk factors like age, rearing system, and the presence of other animals in backyard housing (including rodents, dogs, cats, cattle, and goats) with the occurrence of *Haemaphysalis* spp. and lice infestations were assessed using Fisher's exact tests for categorical variables. Statistical analyses were conducted utilizing the Statistical Package for the Social Sciences (SPSS) version 27, with statistical significance established at  $p < 0.05$ .

## CHAPTER 4: RESULTS AND DISCUSSION

### 4.1 Result

A total of 40 backyard chicken samples were examined for *Haemaphysalis* spp. and lice infestations, where the distribution of number of samples based on various houses was shown in Table 4.1. The sample was assessed based on various risk factors involving age and management system. Generally, for gender the sample consisted of 16 (40%) male and 24 (60%) female. Meanwhile for management system, sample consist of 20 (50%) chicken reared intensively, 8 (20%) chicken reared semi-intensively and 12 (30%) chicken reared extensively, and for age factor, the sample consist of 7 (17.5%) chicks, 6 (15%) grower and 27 (67.5%) adult. The results showed that none of the samples were positive for ticks (*Haemaphysalis* spp.) infestation. Meanwhile, for lice infestation, 30 out of 40 samples (75%) were found to be positive. Two species of lice were identified among the positive samples, with *Menopon gallinae* showing the highest prevalence, detected in 27 out of 40 samples (67.5%) and *Lipeurus caponis* was identified in 3 out of 40 samples (7.5%).

Table 4.1: Frequency table for number of samples in various backyard houses.

Backyard chicken	No of samples
Backyard house 1: Latitude: 6.1679322, Longitude: 102.3147579	17
Backyard house 2: Latitude: 6.1684184, Longitude: 102.3133508	4

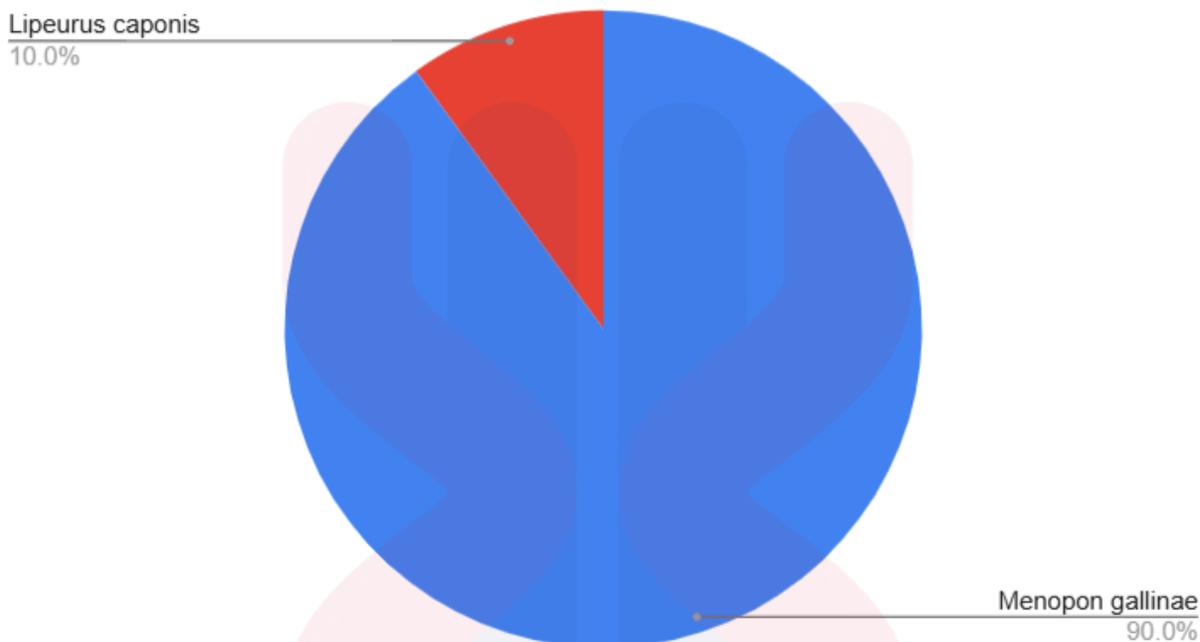
Backyard house 3: Latitude:6.1360585, Longitude: 102.3051539	2
Backyard house 4: Latitude: 6.1367301, Longitude: 102.304051	2
Backyard house 5: Latitude: 6.1376868, Longitude: 102.3043053	1
Backyard house 6: Latitude:6.1370165, Longitude: 102.3039288	4
Backyard house 7: Latitude: 6.1684935, Longitude: 102.3129951	10

4.1.1 Lice infestation based on species

Table 4.1.1: Species of ectoparasite among the backyard chickens

Species	No of host	Infestation rate
<i>Menopon gallinae</i>	27	90.0%
<i>Lipeurus caponis</i>	3	10.0%

### LICE INFESTATION BASED ON SPECIES



**Figure 4.1.1 : The percentage of lice infestation based on species**

#### 4.1.2 Correlation of Lice infestation by age

Table 4.1.2 : Frequency table for positive and negative lice infestation in chick, grower and adult chickens.

	Chick	Grower	Adult	Total
Positive	4 (10.0%)	3 (7.5%)	23(57.5%)	30 (75.0%)
Negative	3 (7.5%)	5 (12.5%)	2 (5.0%)	10 (25.0%)
Total	7 (17.5%)	8 (20.0%)	25 (62.5%)	40

According to the information presented in table 4.1.2, there were 7 (17.5%) samples gathered from the chicks group, which includes 4 (10%) positive samples and 3 (7.5%) negative samples. In total, 8 (20%) samples were gathered from the grower chicken group, with 3 (7.5%) displaying positive results and 5 (12.5%) indicating negative outcomes. Next, a total of 25 (62.5%) samples were obtained from the adult group, of which 23 (57.5%) displayed positive results and 2 (5%) showed negative results. The findings from the Fisher exact test indicated a statistically significant association between age and lice infestation ( $p = 0.003$ ).

#### 4.1.3 Correlation of Lice infestation by rearing system

Table 4.1.3: Frequency table for positive and negative lice infestation extensive and intensive rearing system.

	Extensive	Semi-intensive	Intensive	Total
Positive	6 (15.0%)	6 (15.0%)	18(45.0%)	30 (75.0%)
Negative	6 (15.0%)	2 (5.0%)	2 (5.0%)	10 (25.0%)
Total	12 (30.0%)	8 (20.0%)	20 (50.0%)	40

System	Characteristic
Extensive	<ul style="list-style-type: none"> <li>• Chickens are free-ranging most of the time in open spaces.</li> <li>• No housing area.</li> <li>• Scavenging is the main source of feed.</li> </ul>
Semi-intensive	<ul style="list-style-type: none"> <li>• Chickens are kept in enclosures or housing during part of the day and allowed to roam freely at certain times.</li> <li>• There is a house or enclosure for chickens.</li> <li>• For feed sources it is a mix of scavenged and provided feed.</li> </ul>
Intensive	<ul style="list-style-type: none"> <li>• Chickens are fully confined in structured houses without access to open range.</li> <li>• For feed, fully depend on provided feed.</li> </ul>

According to the information presented in table 4.1.3, 12 samples (30%) in total were gathered from extensively reared chickens, which include 6 positive samples (15%) and 6 negative samples (15%). In total, 8 (20%) samples were obtained from the semi-intensive chicken group, with 6 (15%) yielding positive results and 2 (5%) yielding negative results. Subsequently, a total of 20 (50%) samples were gathered from intensively reared chickens, revealing that 18 (45%) tested positive while 2 (5%) tested negative. The outcome of the Fisher exact test demonstrated a statistically significant relationship between the rearing system and lice infestation ( $p = 0.048$ ).

4.1.4 Statistical analysis

Table 4.1.4 : Statistical analysis of the associated risk factors among lice infected chickens

Variables	Number of animal (n)	Positive (n(%))	Frequency	Odd ratio	95 % CI	P-value
Age						
Chicks	7	4	57.10%	0.307	0.100 - 0.947	0.040
Grower	8	3	37.50%			
Adult	25	23	92.00%			
Rearing system						
Intensive	20	18	90.00%	3.502	1.234 - 9.935	0.018
Semi-intensive	8	6	75.00%			
Extensive	12	6	50.00%			

P-value < 0.05 is considered significant

The risk factors associated with lice infestation in village chickens were further analyzed using odd ratio, 95% confidence intervals and p-value shown by Table 4.1.4. For age factor, the odds

ratio was 0.307. Since  $OR < 1$ , there was a negative association. Adult chickens were 0.307 times more likely to be infested with lice infestation compared to chicks. This result was statistically significant as the p-value was 0.040 and 95% confidence interval did not include 1 (95%CI : 0.100 - 0.947). For the rearing system, the odds ratio is 3.502. Since  $OR > 1$ , there was a positive association. Chicken reared under an intensive system were 3.502 times more likely to be infested with lice compared to chicken in an extensive system. This result was statistically significant as p-value was 0.018 and the 95% confidence interval did not include 1 (95% CI : 1.234 - 9.935).

#### 4.1.4 Lice identification

Both figure 5 (ventral view) and 6 (dorsal view) show *Menopon gallinae* species under microscopic examination, where generally it appears as yellowish to pale in color, oval and elongated in shape. It has 3 main body parts, head, thorax and abdomen. For the head, it has a broad and triangular shape with smooth and rounded anteriorly. Meanwhile for thorax, it appears as broad in center and tapers towards the side. For the abdomen, it appeared as elongated and gradually narrowing towards the posterior end. Specifically, from the dorsal view, one can appreciate the presence of numerous fine, hair-like dorsal bristles (setae) along the body surface, and also presence of dorsal segmented plates which is part of exoskeleton structure.



**Figure 5: *Menopon gallinae* under stereomicroscopic examination (100x magnification) : Ventral view**



**Figure 6: *Menopon gallinae* under stereomicroscopic examination (100x magnification) : Dorsal view**

Figure 7 and 8 show how we can differentiate male and female based on morphology, specifically structure of the posterior end of the abdomen. Generally, the male has a broader, more rounded and blunter posterior terminal end. In contrast, females have narrower and more tapered posterior end and pointed terminal end (Shaikh *et al.*, 2024).

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**Figure 7: *Menopon gallinae* under stereomicroscopic examination (100x magnification) : Female**



**Figure 8: *Menopon gallinae* under stereomicroscopic examination (100x magnification) : Male**

Figure 9 and 10 *Liupeurus caponis* appears as a slender, elongated, narrow and cigar shaped body. For the head, generally it appeared long and narrower compared to *Menopon gallinae*, and the thorax appeared narrow and rectangular in shape. For the abdomen, it has long, narrow and uniform width from anterior to posterior end with visible segmentation.

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**Figure 9: *Liupeurus caponis* under stereomicroscopic examination (100x magnification) : Ventral view**



**Figure 10: *Liupeurus caponis* under stereomicroscopic examination (100x magnification) : Dorsal view**

#### **4.2 Discussion**

This study demonstrated that lice infestation specifically *Menopon gallinae* and *Lipeurus caponis* were present among backyard chickens at Kota Bharu Kelantan and there is no any tick infestation (*Haemaphysalis spp*) was found. In Malaysia, there are several study to determine the prevalence of ectoparasite infestation which for lice infestation, *Menopon gallinae* have the highest prevalence with 93.8%, followed by *Menacanthus pallidulus* (81.3%) and *Lipeurus caponis* with 18.8 % (Suhaila *et al.*, 2015). This study also found only one species of tick infestation which is *Haemaphysalis spp* with 37.5% rate of infestation. There is also another study to assess ectoparasite infestation in Penang Malaysia, which the finding for lice infestation show *Menopon gallinae* was the most common lice infested in chicken (76.7), followed by *Lipeurus caponis* (63.3%), and *Menacanthus pallidus* with 41.7%. This study also reveal 2 species of ticks was found which are *Haemaphysalis spp* (6.7%) and *Ornithonyssus spp* with

3.8% (Wahab and Farah, 2015). Now focusing on prevalence of poultry ectoparasite in outside Malaysia, specifically in South East Asian country, there is study about the ectoparasite infestation in breeder chicken conducted in Surabaya, Indonesia that showed *Anaticola crassicornis* with 59% have highest prevalence, followed by *Menacanthus stramineus* (25%) and *Menopon gallinae* with 9% (Aurandini *et al.*, 2024) Other than that, there is also study conducted on free-range chickens to identify ectoparasite infestation in Bali, Indonesia where the data show only one species of ticks was identified which is *Haemaphysalis* spp. with prevalence of 32% among 60 chickens (Tandisalla *et al.*, 2024).

From this study, the results of lice infestation in backyard chickens can be linked to several risk factors related to age and the management system. In terms of the rearing system, chickens raised intensively experienced a greater rate of lice infestation than those raised extensively. The results showed that chickens raised extensively had a prevalence of 50%, while those raised intensively displayed a significantly higher infestation rate of 90%. This variation might be linked to dust-bathing behavior, a natural maintenance activity where chickens roll in and fluff dry soil or dust through their feathers to eliminate excess oil, dislodge ectoparasites, and preserve feather condition (Lehr, 2025). Chickens raised in free-range conditions have more opportunities for dust-bathing and sun exposure, which will aid in lowering ectoparasite levels. Conversely, chickens raised intensively have restricted access to suitable dust-bathing materials, limiting their grooming capabilities and thereby increasing their vulnerability to ectoparasite infestations (Vezzoli, 2015). Stocking density also explains why intensive chickens exhibit a greater infestation rate, as chickens raised in closer proximity limit their ability to perform natural behaviors like wing flapping, preening, and grooming, which are essential for naturally

managing ectoparasite infestations (Regmi, 2025). In intensive rearing systems, the buildup of deep litter along with high stocking density creates a warm, humid, and organic-rich environment that acts as a favorable habitat for ectoparasites, increasing the vulnerability of intensively reared chickens to ectoparasite infestations compared to those raised extensively (Baker-Cook *et al.*, 2024).

Age variables also influence the infestation rate in chickens. In this research, the age categories were defined as chicks (0-8 weeks), grower (9-20 weeks), and adults (over 20 weeks). Results indicate that adult chickens exhibit a higher infestation rate of 92% compared to chicks at 57.14% and the grower group at 37.50%. These results align with the observations made by Kebede *et al.* (2017) and Lawal *et al.* (2017) who have similar findings, indicating that adult village chickens experienced higher ectoparasite infestations than younger ones. Adult chickens tend to be more social and have larger scavenging areas, leading to greater interactions with other chickens or different animal species, thereby raising their likelihood of coming across ectoparasites. Conversely, growers and chicks usually stay smaller and have restricted mobility, which decreases their contact with sources of parasites (Nnadi & George, 2010). Aside from that, the explanation for detecting adult chickens with a higher infestations rate is due to their fully developed feathers and greater body surface area, which offer more hiding spots and attachment points for ectoparasites

In this research, no ticks specifically identified as *Haemaphysalis spp.* were found in the backyard chickens. This unfavorable result could be affected by various elements, one of which is environmental and climatic factors. Typically, ticks need moderate to high moisture levels to

survive, particularly during times when they are not on a host (Nielebeck *et al.*, 2023). In this study, backyard chickens frequently remained in open areas exposed to sunlight, which offer fewer shaded or moist microhabitats essential for the survival of ticks. Warm and arid circumstances heighten the risk of drying out, complicating survival for ticks in such environment. Extended exposure to high temperatures and low humidity increases water loss and decreases the chances of ticks successfully attaching and establishing on hosts (Nielebeck *et al.*, 2023). These climatic and environmental elements probably played a role in the lack of *Haemaphysalis spp.* in the sampled backyard chickens. Aside from that, ticks belonging to the genus *Haemaphysalis* generally need three distinct hosts to complete their life cycle, which includes various hosts like small mammals, pets, farm animals, or wild animals. In this research, the backyard chickens were primarily kept in settings with minimal or no interaction with other domestic and wild animals. The restricted presence of alternative hosts probably hindered the ticks from finishing their life cycle, which could clarify the lack of *Haemaphysalis spp.* in the chickens sampled. Additionally, the lack of *Haemaphysalis spp.* In this study may influence by sample size. Testing a limited number of chicken locations might overlook ticks that exist at low densities, implying that the species may still be present in the region but went undetected in this survey because of the small sample size.

In this study, lice infestation was observed on various parts of the chicken's body, depending on species. *Menopon gallinae* was commonly found on the dorsal region of the chicken body, particularly along the feather shaft, and also most frequently observed on the breast area. Meanwhile, *Lipeurus caponis* was mainly detected on the wings, where it was seen attaching to and moving along the body feathers of the wing region. This finding was similar to a study

conducted by Medjouel Ilyes *et al.* (2013), where they found *Menopon gallinae* commonly found spread all over the body specifically at the shaft feather of breast area and *Lipeurus caponis* was mainly found on the wing's feathers. These findings are likely due to species-specific preferences, with lice distribution on chickens varying across different body regions depending on the species (Murillo, 2016). *Menopon gallinae*, known as the shaft louse, prefers to inhabit feather shafts at various parts of the body region, mostly the breast and back of the chicken. Also, same reason for *Lipeurus caponis*, it is also known as wing louse as that is predominantly the site where it was found. However, the specific reasons for these species-specific site preferences remain unclear as there is no study that has directly investigated the reason why these species prefer to inhabit certain parts of the chicken.

## Chapter 5: Conclusion and recommendations

### 5.1 Conclusion

This research effectively detected lice infestation in backyard chickens in Kota Bharu, Kelantan, particularly involving *Menopon gallinae* and *Lipeurus caponis*. These results validate that ectoparasite infestation continues to be a health issue in small-scale and traditional poultry farming systems in the area. In contrast, there was no tick infestation, especially *Haemaphysalis spp.*, found in any of the chickens sampled. This lack might indicate a genuinely low presence of ticks in the study region, but it could also be affected by elements like sample size, environmental factors, and host availability, which can restrict tick establishment and observation.

This research additionally showed that various risk elements, especially the housing system and the age of the chicken, greatly affected the probability of lice infestation. Chickens raised in more intensive or confined environments exhibited a greater infestation rate, probably because of increased contact, limited hygiene chances like dust-bathing, and enhanced potential for ectoparasite transmission. Younger chickens or specific age groups demonstrated heightened vulnerability, likely due to less effective grooming habits, developing immune responses, or higher exposure in group environments.

Overall, the findings for this research highlight the importance of appropriate husbandry practices, regular ectoparasite monitoring, and targeted control measures to reduce infestation and improve poultry welfare and productivity. Future studies with larger sample sizes, inclusion of multiple districts, and seasonal sampling are recommended to better understand the dynamics

of ectoparasites, including potential tick presence, in backyard chicken populations across Kelantan.

## **5.2 Recommendations**

According to the results, especially concerning tick identification, it is advised that subsequent research incorporates a larger sample size to enhance the chances of identifying tick infestations, particularly when prevalence rates are low. While sampling, chickens must be examined in greater detail, focusing on concealed or hard-to-reach spots where ticks often attach but may be easily missed. Furthermore, molecular diagnostic techniques, like PCR, are recommended to validate species identification and improve the precision of ectoparasite detection.



## APPENDICES



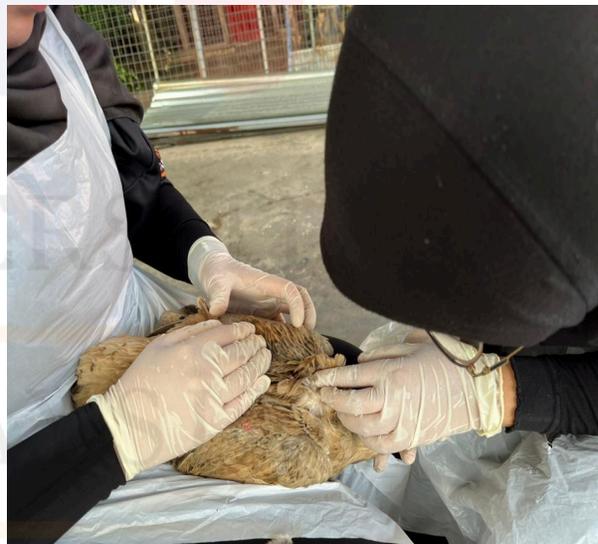
Appendix 1: Process capturing free range chicken.



Appendix 2: Free range chicken



Appendix 3: Examination of ectoparasite infestation, and capture it using forceps.



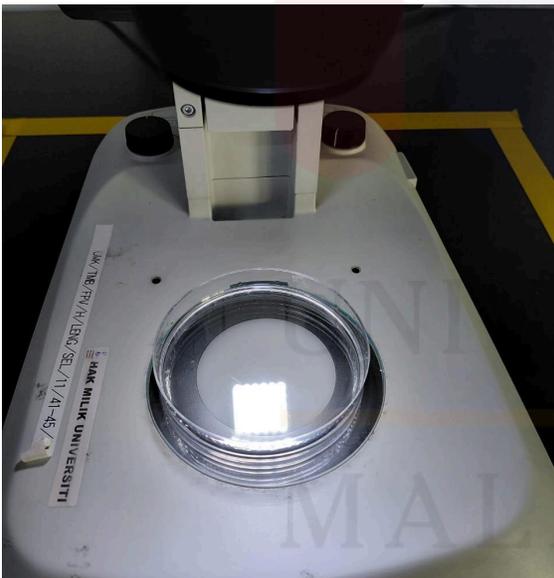
Appendix 4: Examination of ectoparasite infestation at dorsal part of chicken



Appendix 5: Alcohol was poured into a urine container containing lice.



Appendix 6: Lice stored in small collection tube with 90% alcohol



Appendix 7: Lice was submerged in 90% alcohol in a petri dish and examined under stereomicroscope.



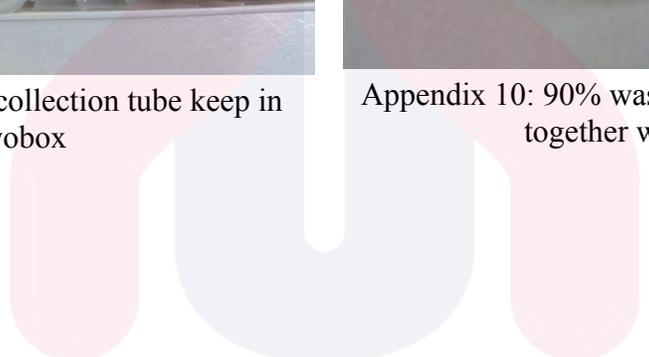
Appendix 8: Examination of ectoparasite using stereomicroscope



Appendix 9: Small collection tube keep in cryobox



Appendix 10: 90% was placed in petri dish together with lice



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