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Ectoparasites encountered on Guinea fowl (*Numida meleagris*) in Ahoué (Alépé, Côte d'Ivoire)

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ABSTRACT

Guinea fowls are short-cycle birds raised for their meat and their eggs. Very few studies have been conducted on parasites infesting these birds. This study aims to improve their health in farming to enhance their productivity. To do this, 180 guinea fowls, including 87 with gray plumage and 93 with white plumage, were inspected from March to April 2025, at Ahoué poultry farm (Alépé, Côte d'Ivoire), in order to collect ectoparasites infesting them. These ectoparasites underwent morphological identification at the Laboratory of Animal Biology and Cytology of Nangui Abrogoua University according to appropriate keys. A total of 345 ectoparasites were collected, and they were exclusively lice. These lice were grouped into three species: *Goniocotes gallinae*, *Goniodes gigas*, and *Menacanthus stramineus*. The most predominant species was *Goniocotes gallinae*. It was found in all the guineafowls examined with an average abundance of 1.7 and represented 88.7% of the collected lice. In contrast, only 10% of the guineafowls hosted *Goniodes gigas* and 7.22% carried *Menacanthus stramineus*. These two species were less abundant (abundance of 0.12 and 0.10 respectively for *Goniodes gigas* and *Menacanthus stramineus*) and represented respectively 6.08% and 5.22% of identified lice. Regarding the average parasitic intensity, values were not significantly different (1.7 for *Goniocotes gallinae*, 1.16 for *Goniodes gigas*, 1.38 for *Menacanthus stramineus*). This study identified the main lice of the guinea fowl in southern Ivory Coast. Further studies will verify presence of pathogens in these lice that could be transmitted to guinea fowls or to the breeders.

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INTRODUCTION

Food security is currently the greatest challenge of the Food and Agriculture Organization of the United Nations. It involves sustainably obtaining and ensuring a growing and quality food production for the ever-increasing global population year after year. To meet demand for animal proteins, numerous efforts are being made. In West Africa, livestock farming plays a central role in the economy, contributing up to 44% of agricultural GDP (Kamuanga *et al.*, 2008 ; Amole *et al.*, 2022). It also represents one of the main economic activities upon which the most vulnerable populations depend, serving as both an essential source of income and food (Idrissou *et al.*, 2019).

According to the Ministry of Animal and Fisheries Resources (MIRAH, 2010), livestock farming in Côte d'Ivoire remains an economic activity in development. This country imports frozen meat or live animals for more than 120 billion FCFA per year to meet its protein needs. To curb this dependence and exploit local resources, the state has developed a strategic plan for livestock development primarily focused on short-cycle animals (small ruminants, pigs, rabbits...) and, particularly poultry (MIRAH, 2014). Poultry products enhance nutritional security and also provide significant income to various segments of the population through commercial exchanges. The guinea fowl (*Numida meleagris*), which ranks second in the poultry sector in sub-Saharan Africa, is more appreciated for its meat and particularly for its eggs (Baruwa *et al.*, 2016). It is a bird that can be raised successfully with limited means under semi-intensive conditions (Yildidrim, 2012). It is resistant to the most common poultry diseases such as salmonellosis, Newcastle disease, and Gumboro, and its raising requires little labor (Moreki and Seabo, 2012). Moreover, it has great socio-economic importance in rural society where its meat and eggs provide a source of income for poor farmers (Bonkoungou, 2005). Its eggs are often used to enhance virility and sexual potency in men (Moreki and Seabo, 2012). To improve this farming in Côte d'Ivoire, several scientific studies have been conducted, particularly on the typology of breeders (Koné *et al.*, 2017 ; Kouassi *et al.*, 2019a), feeding of guinea fowls (Kouassi *et al.*, 2019b), growth and reproduction (Coulibaly *et al.*, 2025), and gastrointestinal parasites infesting them (Yapi *et al.*, 2025). However, the farming of guinea fowls, although promising, is still facing various health challenges, notably ectoparasitism. Indeed, ectoparasites that are vectors of numerous pathogens capable of causing zoonoses are still very little studied in guinea fowls. Their presence could have significant impacts on the health and productivity of guinea fowls and even on the health of farmers. Therefore, with the aim of improving the sanitary environment of guinea fowls and their productivity, this study was conducted to identify the ectoparasites present in guinea fowls raised in the locality of Alépé, specifically at the meleagricole farm of Ahoué.

MATERIALS AND METHODS

Study area

The study was conducted from March to April 2025 in AHOUE in Alépé sub-prefecture (Fig. 1), located in Mé region in the south of Côte d'Ivoire. This region is situated in an ombrophile forest zone with a humid climate (AIP, 2015). The temperature is relatively constant and fluctuates around 27.5°C. Seasons are divided into a major season (April - July) and a minor rainy season (mid-September to November), followed by a major dry season (December-March) and a minor dry season (mid-July to mid-September) (Amba *et al.*, 2022). The annual rainfall is 1789mm. The sub-prefecture of Alépé is watered by many waterways. Soils there are generally fertile and conducive to coffee and cocoa cultivation and also favorable for food crops (Amba *et al.*, 2022).

Animals

The study focused on 180 guinea fowls (*Numida meleagris*) raised in captivity. These guinea fowls, aged 7 months, were divided into two non-sexed groups consisting of 87 gray guineafowls and 93 white guineafowls (Fig. 2). They were raised in the same way, on the same farm, but in two distinct compartments.

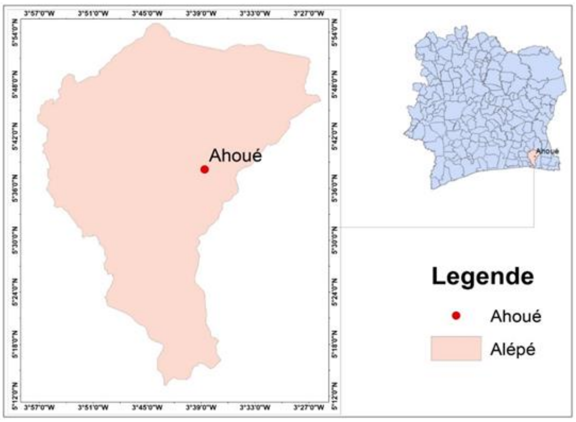

Fig. 1. Study area

Fig. 2. Guinea fowls (*Numida meleagris*)

Ectoparasites collection

Ectoparasites were collected from live guinea fowls on the farm. All parts of the birds' bodies were thoroughly examined visually. Each encountered ectoparasite was removed using a hooked forceps and placed in a tube containing 70% alcohol (Ethanol) (Tuo *et al.*, 2020; Tiba *et al.*, 2025). Thus, the ectoparasites collected from each guinea fowl were preserved in a tube labeled with the number and color of the guinea fowl's plumage. These tubes, placed in a cooler, were transported to the Animal Biology and Cytology Laboratory of Nangui ABROGOUA University for observation and identification of the ectoparasites.

Observation and identification of ectoparasites

Once in the laboratory, ectoparasites contained in each tube were placed in a petri dish. This was placed under a binocular microscope for the observation of ectoparasites. This method allowed for a precise examination of their external morphology. Identification of different genera and species relied on external morphological characteristics, namely the shape and body size, number of legs, number of antenna segments, shape of the head, shape of the abdomen, antennas position, distribution of hairs on the body, and shape of legs and claws. The keys used for louse identification were those of Pajot (2000). For ticks, the key of Walker *et al.* (2003) was used. Lastly, the identification of different flea species was made possible through keys of Beaucournu and Lanay (1990), Beaucournu (2013) and then Duchemain *et al.* (2003).

Calculated parameters

The calculated parasitic indices during this study were prevalence, abundance, mean intensity, and frequency of encountered ectoparasites.

Prevalence (P), which is the percentage ratio of the number of infested guinea fowls (N) by a given parasitic species to the number of examined guinea fowls (H), was determined using the following formula: $P\ (\%) = \frac{N}{H} X100$

Abundance (A) is the ratio of the total number of a parasite (n) to the total number of examined guinea fowls (H). Its formula is as follows :

$A = \frac{n}{H}$

The Average Parasitic Intensity (I), which is the ratio of the total number of individuals of a parasite species (n) in a sample of hosts to the number of infested hosts (N) by this species in the sample, has been calculated according to the formula below :

$I = \frac{n}{N}$

The Frequency (F) is the ratio of the number of individuals of a parasite species (Ne) to the total number of collected parasites (Nt) multiplied by 100 :

$F\ (\%) = \frac{Ne}{Nt} \times 100$

Statistical analysis of data

Data were entered and compiled in an Excel file to calculate prevalence, abundance, average intensity, and frequency of ectoparasites. The Chi-squared test at a 5% threshold was used via GRAPH PAD software to compare prevalences obtained for the different ectoparasite species as well as frequencies to determine if the observed differences are significant or not. Additionally, abundances and average intensities were compared using Student's t-test with the same GRAPH PAD software, also at a 5% threshold.

RESULTS

Ectoparasites collected

During this study, 345 ectoparasites were collected, of which 232 (67.24%) were from white guineafowls and 113 (32.76%) from gray guineafowls. All these ectoparasites were identified as lice. No ticks or fleas were encountered. Morphological identification allowed these lice to be classified into three species: *Goniocotes gallinae* (Fig. 3), *Goniodes gigas* (Fig. 4), and *Menacanthus stramineus* (Fig. 5).

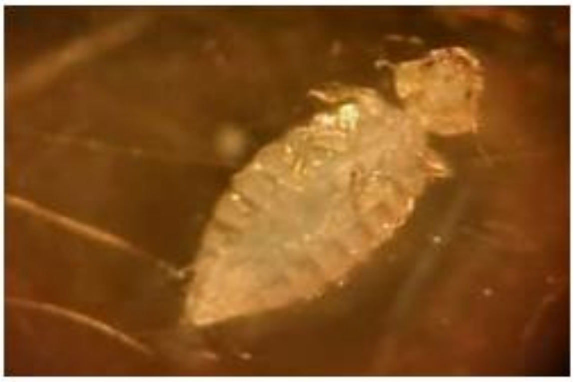

Fig. 3. *Goniocotes gallinae*

Fig. 4. *Goniodes gigas*

Prevalence

Overall, the louse *Goniocotes gallinae* was found on all guinea fowl examined during this study. In contrast, only 10% of the guinea fowl (18/180) harbored *Goniodes gigas*. This prevalence was also higher than that of *Menacanthus stramineus*, which was 7.22% (13/180).

Fig. 5. *Menacanthus stramineus*

Depending on the feather color, Fig. 6 below presents the obtained values. Indeed, the prevalence of *Goniocotes gallinae* was 100% for both white and gray guinea fowl. Regarding *Goniodes gigas*, white guinea fowl were more infested (12/93 or 13.98%) compared to gray guinea fowl (6/87 or 5.75%) ($p<0.05$). Finally, the species *Menacanthus stramineus* was also more present on white guinea fowl with a prevalence of 9.69% (9/93) compared to 4.60% (4/87) for gray guinea fowl ($p<0.05$).

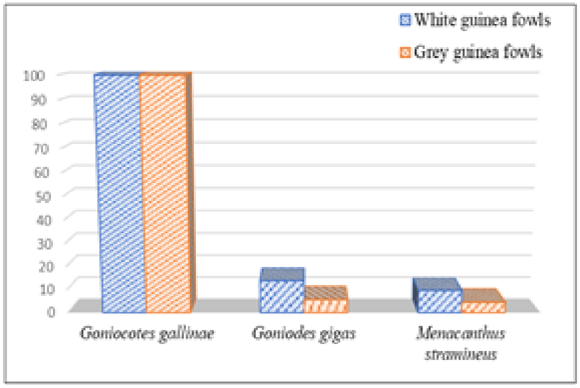

Fig. 6. Prevalences of lice according to the feather color of guineafowls

Abundance (A)

The average abundance of each louse species was calculated. The value obtained for *Goniocotes gallinae* was 1.7. This value was higher than those of the two other species (respectively 0.12 and 0.10 for *Goniodes gigas* and *Menacanthus stramineus*).

The average abundance of each louse species was also calculated based on guinea fowl plumage color. The results show that the three lice species were more abundant on white guinea fowl compared to grey guinea fowl. Indeed, the species *Goniodes gigas* had an abundance of 0.15 in white guineafowls compared to 0.08 in gray guineafowls. These two values were significantly different (*p*-value = 0.0001). As for *Goniocotes gallinae*, the abundance in white guineafowls (2.20) was higher than that obtained in gray guineafowls (1.16) (p=0.0033). Finally, for *Menacanthus stramineus*, the abundance value obtained in white guineafowls was 0.14 compared to 0.06 in gray guineafowls, and the difference was also significant (p=0.0001) (Table 1).

Table 1. Average abundance of lice encountered according to guinea fowls plumage color

Lice species	White guinea fowls	Grey guinea fowls	*p*-value
Goniodes gigas	0.15^{a}	0.08^{b}	0.0001
Goniocotes gallinae	2.20^{a}	1.16^{b}	0.0033
Menacanthus stramineus	0.14^{a}	0.06^{b}	0.0001

Values in the same row with different letters as superscripts differ significantly at the 0.05% level.

Table 2. Average parasitic intensity of lice

Lice species	White guinea fowls	Grey guinea fowls	*p*-value
Goniodes gigas	1.16^{a}	1.16^{a}	0.098
Goniocotes gallinae	2.20^{a}	1.16^{b}	0.0001
Menacanthus stramineus	1.44^{a}	1.25^{a}	0.056

Values in the same row with different letters as superscripts differ significantly at the 0.05% level.

Table 3. Frequency of lice based on the feather color of guinea fowls

	Color of the plumage of guinea fowls				
Lice species	White guinea fowls		Grey guinea fowls		*p*-value
	Number of lice	Frequency (%)	Number of lice	Frequency (%)	
Goniodes gigas	14	6.03^{a}	7	6.20^{a}	
Goniocotes gallinae	205	88.36^{b}	101	89.38^{b}	0.9433
Menacanthus stramineus	13	5.60^{a}	5	4.42^{a}	

Values in the same row with the same letter as an exponent do not differ significantly at the 0.05% threshold for each species. The same applies to the values in the same column.

Average parasitic intensity (I)

Overall, the average parasitic intensity of *Goniocotes gallinae* was 1.7. That of *Goniodes gigas* was 1.16 and finally, that of *Menacanthus stramineus* was 1.38. These values were not significantly different (p> 0.05). Depending on the guineafowl feather color, the species *Goniocotes gallinae* had a higher average intensity in white guineafowl (2.20) compared to gray guineafowl (1.16). For the two other species, there was no significant difference between values obtained based on the feather color of guinea fowls. Thus, for *Goniodes gigas*, values were 1.16 for both groups of guinea fowls. Regarding the species *Menacanthus stramineus*, the obtained values were 1.44 on white guinea fowls and 1.25 on gray guinea fowls (Table 2) (p > 0.05).

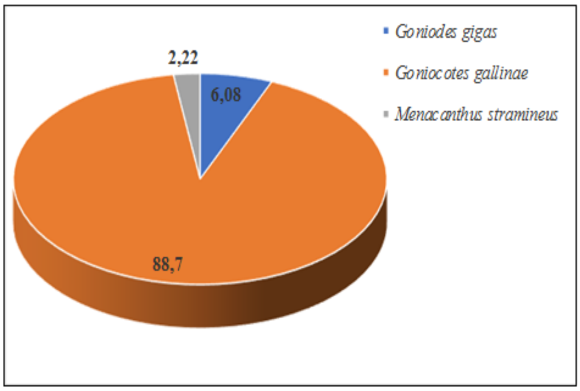

Fig. 7. Global frequencies (%) of lice collected from guinea fowls

Frequency (F)

The frequencies of lice were calculated during this study. Overall, *Goniocotes gallinae* was the most frequent. It represented 88.7% of lice collected. This value was very high compared to those of *Goniodes gigas* and *Menacanthus stramineus* which were 6.08% and 5.22% respectively (Fig. 7).

Depending on the plumage, *Goniocotes gallinae* was the most frequent species in both groups of guinea fowl with 88.36% in white guinea fowl and 89.38% in grey guinea fowl. The frequency of *Goniodes gigas* was 6.03% in white guinea fowl compared to 6.20% in grey guinea fowl. These values were not significantly different from those of *Menacanthus stramineus* which were 5.60% in white guinea fowl and 4.42% in grey guinea fowl (Table 3).

DISCUSSION

During this study, 345 ectoparasites were collected from the inspected guinea fowls. Sixty-seven point twenty-four percent (67.24%) were collected from white guinea fowls compared to 32.76% from gray guinea fowls. Animals living under the same climatic and environmental conditions, this distribution of ectoparasites could be explained by the fact that white plumage is more visible than gray plumage. These results are in line with those of Nnadi and George (2010) who stated that factors related to pigmentation or grooming behavior can influence the parasitic load between types of poultry. Clayton and Moore (1997) also showed that the color and density of plumage influence the visibility and colonization of ectoparasites. Thus, the lighter plumage of white guinea fowls may facilitate their detection or colonization by ectoparasites.

Observation under the binocular loupe showed that all collected ectoparasites were lice. Indeed, the study site (Ahoué) is located in the south of Côte d'Ivoire, in a forested area where rainfall is high. This is suitable for the survival of lice. This would explain the numerous cases of infested guinea fowls. These results confirm the observations of Memeteau *et al.* (1998) who reported that the risk of lice infestation is higher in the presence of a thick vegetation cover and especially of natural, uncultivated vegetation.

Three species of lice have been identified during these investigations. They are *Goniocotes gallinae*, *Goniodes gigas*, and *Menacanthus stramineus*. These same species have been found in studies conducted in Algeria (Meguini *et al.*, 2018 ; Nahal *et al.*, 2021 and Ouarab *et al.*, 2021). Among the three species of lice, *Goniocotes gallinae* was encountered in all the examined guinea fowls. This species is one of the most common lice in gallinaceous birds due to its high adaptability to feathers and its direct transmission facilitated by contact between birds. According to Murillo and Mullens (2016), it is widely spread in laying hen farms, with significant prevalence in non-industrial production systems.

Additionally, Martínez *et al.* (2001) also identified this species in 51% of the hens examined in Venezuela, highlighting its predominance in tropical areas. Rezaei *et al.* (2014) noted their presence in 5.16% of hens in extensive farms in Iran, indicating their persistence even in less confined environments. The species *Goniodes gigas* and *Menacanthus stramineus* had prevalences of 10% and 7.22% respectively, indicating a more moderate but significant infestation. According to Rezaei *et al.* (2014), *Menacanthus stramineus* and *Goniodes gigas* are among the most common ectoparasites in local hens with rates of 26.7% and 2.33% respectively, confirming their variable presence depending on farming contexts. Murillo and Mullens (2016) also reported the frequent coexistence of these species, although their prevalence varies according to the type of poultry, the environment, and sanitary practices.

All identified lice species showed a higher abundance in white guinea fowls. This seems to indicate a greater sensitivity of these guinean fowls to ectoparasites. The high abundance of lice could be explained by the relatively short life cycle (five to seven days) of these permanent parasites. According to Dik and Uslu (2006), this short life cycle leads to a rapid proliferation of the population until growth is slowed down by resource limitation.

The comparative analysis of infestation intensity by lice reveals that *Goniocotes gallinae* exhibits a significantly higher average intensity in white guinea fowls (2.20) compared to grey guinea fowls (1.16). This confirms observations of Permin and Hansen (1998). According to them, some species of poultry are more susceptible to infestations due to their plumage, behavior, or habitat. The other two species of lice showed nearly equal average intensity values. This closeness in values could be explained by the fact that both groups of guineafowl likely operate under the same farming conditions (habitat, hygiene, diet, climate). According to Wall and Shearer (2001), unlike some lice that prefer a specific feather color, the species *Menacanthus stramineus* is less selective and easily adapts to different species or colors of hosts.

The frequency of the species *Goniocotes gallinae* was very high in both groups of guineafowls (89.38% in gray guineafowls and 88.36% in white guineafowls) compared to the two other lice species. This could be related to behavioral or physiological factors in gray guineafowls that would favor better survival or reproduction of the parasite (Mungube *et al*., 2008).

Depending on the plumage, the infestation frequency was almost similar in white and grey guineafowls for each louse species.

This would mean that these parasites affect both groups of guineafowls in a nearly equivalent way ; which could be due to their direct transmission mode through contact, little influenced by factors such as plumage color according to Permin and Hansen (1998).

CONCLUSION

The study conducted on guinea fowls in Ahoué identified three ectoparasites: *Goniodes gigas*, *Menacanthus stramineus*, and *Goniocotes gallinae*, which were exclusively lice. The species *Goniocotes gallinae* was the most abundant and frequent. It was present in all the examined guinea fowls. This necessitates the establishment of effective control and management strategies for ectoparasites in this area. Looking ahead, studies concerning the search for pathogens in these lice and the use of medicinal plants as a preventive means should be conducted.

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