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Ectoparasites of indigenous Malawi chickens

Zumani Banda

University of Malawi, Polytechnic, Faculty of Applied Sciences, Department of Environmental Health, Private Bag 303, Chichiri, Blantyre 3.

Abstract: A study was carried out in Mzuzu Agricultural Development Division (MZADD) in the northern region of Malawi in 1996/1997 to determine ectoparasite species infesting local chickens and their levels of infestation, in different localities and seasons. Ectoparasite species were also collected from local chickens in 2009/ 2010 in the southern region. A sample of chickens at different farmsteads were examined for the presence of ectoparasites. Ectoparasite levels and species were determined. The stick tight flea *Echidnophaga gallinacea*, lice species *Lipeurus caponis, Goniocotes gigas, Goniocotes hologaster, Menacanthus stramineus, Menopon gallinae,* the mite *Dermanyssus gallinae*, the scaly leg mite *Cnemidocoptes mutans* and the tick *Amblyomma variagetum* were found to occur on local chickens at varying levels of infestation in the northern region. Season had a significant effect ($p < 0.05$) on the levels of infestations for *E. gallinacea* and combined lice infestations. Location had a significant effect ($p < 0.05$) on the levels of infestation for *E. gallinacea* and *Menopon gallinae* and prevalences of *E. gallinacea* and *Menacanthus stramineus*. There was a two way interaction ($p < 0.05$) between season and location on the levels of infestations for *E. gallinacea* and *Menopon gallinae*. *E. gallinacea, Menacanthus stramineus, Menopon gallinae, G. gigas, G. hologaster* and a tick species were found in the southern region.

Key words: Ectoparasites, species, Malawi, local chickens, season, location

INTRODUCTION

To help alleviate the problem of food shortages and enhance food security among many smallholder farm families in Malawi, poultry keeping can be advocated or encouraged. The government of Malawi pinpointed poultry and eggs as one of the main thrusts of the livestock strategy to expand production to satisfy the demands for animal protein on the domestic market (MOALD, 1995). Almost every household in the rural areas in Malawi owns chickens (Safalaoh, A.C.L., 1995). The country's human population depends mostly on indigenous chickens for their dietary protein needs. Whereas the village chicken will survive and breed on food it can pick for itself, it can be affected by parasites and diseases which lower production (UNESCO, 1986). One of the major constraints in smallholder poultry raising in the rural sector in Malawi has been ectoparasites (Ahlers, C., 1996). Severe flea and lice infestation in village poultry have been observed in villages in various parts of the country. In Thailand, parasitic infections are reported to play a major role in economic loss and are the main cause of mortality in the native chickens (Sukpanyatham, N.T., 1982). At present, no routine government activity is in place to control poultry parasites in Malawi. Information of poultry parasite species and the effect they have in reducing the potential productivity of local chickens is scanty. Information available comprises mainly of laboratory diagnoses reports. Control of ectoparasites in rural areas is not practiced. Research on ectoparasites of livestock has mostly been concentrated on ticks in cattle because of the impact of tick borne diseases. Ectoparasites may be a big constraint to the country's endeavours to have increased production of poultry and poultry products. This study was therefore carried out with the main objective of finding out the different ectoparasite species and their levels of infestation in different seasons and localities.

MATERIALS AND METHODS

Study Areas:

The study was carried out in Mzuzu Agricultural Development Division (MZADD) in the northern region

Corresponding Author: Zumani Banda, University of Malawi, Polytechnic, Faculty of Applied Sciences, Department of Environmental Health, Private Bag 303, Chichiri, Blantyre 3.
Phone: +265 (1) 870411; +265 (0) 888771181; Fax: +265 (1) 870578.
E- mail: zumanibanda@yahoo.com; zbanda@poly.ac.mw.

of Malawi in 1996/ 1997 where the Malawi government in conjuction with the Germany government were carrying out delivery of some basic animal health services to farmers through the Malawi/ Germany Basic Animal Health Service Project (MGBAHSP). The study was carried out in two ecologically different locations. One study area was Ekwaiweni in the central plains, about 1600 metres above sea level, in Rumphi/ Mzimba North Rural Development Programme (RDP) area and the other was carried out in Mpamba near the lakeshore area in Nkhatabay RDP with an altitude of 470 metres above sea level. Temperatures in the plains are warm to hot and range from 18- 24 ^{o}C. In the highlands, they range from 13 – 16 ^{o}C. Rainfall in the plains range from 750- 1250 mm and in the highlands from 1500- 2000 mm per annum. Samples were also collected from Chikwawa in the southern Region of Malawi during a sample collection exercise in 2009 and 2010. Chikwawa lies about 50 kilometres from the commercial capital of Malawi, Blantyre. Chikwawa District lies within Chikwawa Agricultural Rural Development Project (RDP) area in the Shire- Valley Agricultural Development Division (ADD) at an altitude of about 200 metres above sea level. It experiences mean annual maximum temperatures of about 30- 32 ^{o}C, mean annual minimum temperatures between 18- 20 ^{o}C and an annual rainfall of about 800- 1200 mm.

Parasitological Examination:

The study was carried out during the dry (August to October) and rainy (November to March) season. Farmers were randomly selected from a list of volunteers to participate in the study. Ten chickens (1 cock, 3 hens, 3 pullets and 3 chicks) were randomly selected from each flock for sampling purposes. The chickens were examined for parasites and signs of parasite infestation. The entire body of the chicken was examined. All parasites seen on each part of the body were counted and recorded. Samples were collected for identification at Mzuzu Veterinary Laboratory.

Examination of Chickens for Parasites:

A systematic approach was followed to detect and count ectoparasites. The head was examined first. This was followed by the neck, body sides, back, ventral part of the abdomen, wings, vent area and legs. Time and care were taken to carefully examine each bird. On site parasitological counts were done with the aid of forceps and a tally counter. Counts were recorded immediately onto a data recording table. For scaly leg mites, skin scrapings were obtained from legs of heavily infested chickens. For others, a scoring system was used (1 – any sign of scales; 0 – absence of scales).

Parasite Identification:

Representative samples of parasites were collected with a pair of forceps into sample bottles containing 60 % ethyl alcohol for identification at Mzuzu Veterinary Laboratory. Identification of parasites was done using descriptions of Soulsby (Soulsby, E.J.L., 1977). Scaly leg mite identification involved placing skin scrapings from the chicken's legs in a test tube with 10 % NaOH(aq) left to stand for 4- 6 hours. The dissolved material was mixed carefully, and a drop was transferred to a microscope slide, covered with a coverslip, and examined with a X 10 objective lens of a compound microscope to check for the presence of the mites.

Data Analysis:

Data were analyzed using descriptive statistics to obtain frequencies, means and standard deviations. Parasite infestation was determined by parasite counts and mean numbers of parasites calculated. These were compared between locations and between seasons by ANOVA. Incidence of ectoparasite infestation between locations and between seasons was compared using a X^2 test.

Results:

Northern Region Samples*:*

Ectoparasites:

Echidnophaga gallinacea was the only flea species found infesting chickens while *Amblyomma variegatum* was the only tick species. Two species of mites, *Dermanyssus gallinae* and *Cnemidocoptes mutans*, and five lice species *Menacanthus stramineus, Menopon gallinae, Lipeurus caponis, Goniocotes gigas* and *Goniocotes hologaster* were identified. *E. gallinacea, D. gallinae, C. mutans, Menacanthus stramineus, Menopon gallinae* and *L. caponis* were found in the central plains and lakeshore areas. *G. gigas, G. hologaster* and *A. variegatum* were found only in the central plains (Table 1).

Prevalence and Abundance:

The most commonly found ectoparasite was *C. mutans* with an overall prevalence of 99 % followed by *E. gallinacea* (52.2 %), *Menopon gallinae* (34.0 %) and *Menacanthus stramineus* (32.0 %). *D. gallinae* (1.4 %), *L. caponis* (1.4 %), *A. variegatum* (1.0 %), *G. gigas* (0.7 %) and *G. hologaster* (0.3 %) were occasionally found. The combined lice infestation was 64.4 %. The most abundant ectoparasites per bird were combined lice infestations. Based on individual species, the stick tight flea *E. gallinacea* was most abundant followed by *Menopon gallinae, Menacanthus stramineus* and *C. mutans. D. gallinae, L. caponis, A. variegatum, G. gigas* and *G. hologaster* were the least abundant. However, on a per infested bird basis, the most abundant ectoparasite per infested bird was *D. gallinae* followed by *E. gallinacea, Menopon gallinae, Menacanthus stramineus*, combined lice infestations, *C. mutans, L. caponis, G. gigas, G. hologaster* and *A. variegatum* (Table 2).

Geographical Distribution:

The most common ectoparasite species in both locations of the Northern region was *C. mutans* which had a prevalence of 100 % in the central plains and 98.0 % along the lakeshore area. *E. gallinacea* was significantly more prevalent ($p < 0.05$) in the central plains (66.7 %) than the lakeshore area (39.2 %). There were no differences in *Menopon gallinae* prevalences between the central plains (33.3 %) and the lakeshore (34.6 %) area. *Menacanthus stramineus* was less common (23.2 %) in the central plains than along the lakeshore area (39.9 %). The prevalences for the other species were too low to allow prevalence comparisons between locations. *E. gallinacea* mean level of 32.0 ± 63.4 was significantly ($p < 0.05$) more abundant per bird along the lakeshore area (11.1 ± 28.8). There were no differences in levels of infestation with *Menacanthus stramineus* between the central plains (10.2 ± 43.5) and the lakeshore area (12.1 ± 27.9). *Menopon gallinae* was significantly ($p < 0.05$) more abundant along the lakeshore area (16.0 ± 27.7) than in the central plains (7.4 ± 16.7). There were no differences in tne mean number of *C. mutans* per bird between the lakeshore and central plains. The prevalences of the other species were too low to permit realistic comparisons of their mean numbers between locations (Table 3).

Southern Region Samples:

E. gallinacea, Menacanthus stramineus, Menopon gallinae, G. gigas, G. hologaster and a tick species were found infesting chickens in the southern region during a sample collection exercise in 2009 and March, 2010. Mean levels of infestation were not determined.

Table 1: Ectoparasites of chickens found in different locations in Northern Malawi.

		Central plains	Lakeshore area
Common name	Order	Species	Species
Flea	Siphonaptera	*Echidnophaga gallinacea*	*Echidnophaga gallinacea*
Red mite	Acarina	*Dermanyssus gallinae*	*Dermanyssus gallinae*
Scaly leg mite	Acarina	*Cnemidocoptes mutans*	*Cnemidocoptes mutans*
Tick	Acarina	*Amblyomma variegatum*	-
Body louse	Mallophaga	*Menacanthus stramineus*	*Menacanthus stramineus*
Shaft louse	Mallophaga	*Menopon gallinae*	*Menopon gallinae*
Wing louse	Mallophaga	*Lipeurus caponis*	*Lipeurus caponis*
Louse	Mallophaga	*Goniocotes gigas*	-
Fluff louse	Mallophaga	*Goniocotes hologaster*	-

Table 2: Prevalence (%) and abundance (mean number ± standard deviation) of ectoparasites found on local chickens in northern Malawi.

Species	N	n	% infested	Mean ± S.D	Mean/ infested bird
C. mutans	291	288	99.0	3.7 ± 1.8	3.8
E. gallinacean	291	152	52.2	21.0 ± 49.4	40.2
Menopon gallinae	291	99	34.0	11.9 ± 23.2	35.1
Menacanthus stramineus	291	93	32.0	11.2 ± 36.1	35.0
D. gallinae	291	4	1.4	0.98 ± 16.0	71.2
L. caponis	286	4	1.4	0.05 ± 0.7	3.5
A. variegatum	291	3	1.0	0.01 ± 0.1	1.0
G. gigas	286	2	0.7	0.01 ± 0.1	1.5
G. hologaster	291	1	0.3	0.003 ± 0.1	1.0

N = Number of birds examined
n = Number of birds infested

Seasonal Distribution:

There were no seasonal differences in the prevalences of *E. gallinacea* and *C. mutans*. Significant ($p < 0.05$) differences were observed only in the prevalences of *Menacanthus stramineus* which was more prevalent in the dry season (70.0 %) than the wet season (1.2 %) and *Menopon gallinae* which was more prevalent

during the wet season (59.6 %) than the dry season (2.3 %). Significant ($p < 0.05$) seasonal differences were observed in mean numbers of *E. gallinacea* which had high mean numbers per bird during the dry season (30.9 ± 61.7) compared to the wet season (13.0 ± 30.2), *Menacanthus stramineus* whose dry season mean was (24.2 ± 50.6) compared to 0.7 ± 6.8 during the wet season and *Menopon gallinae* which was the opposite with a high mean during the wet season (20.9 ± 28.2) and low mean during the dry season (0.8 ± 5.6). There were no seasonal differences in mean burdens for the other species (Table 4).

Table 3: Prevalence (%), mean ± s.d. and mean per infested bird of ectoparasites on the local chickens in the central plains and lakeshore area of Mzuzu Agricultural Development Division (MZADD) in the northern region of Malawi.

	Prevalence									Mean					
	Central plains			Lakeshore area			Totals			Central plains		Lakeshore area		Totals	
Species	N	n	% infested	N	n	% infested	N	n	% infested	Mean ± S.D.	Mean/ infested bird	Mean ± S.D.	Mean/ infested bird	Mean	Mean/ infested bird
E. gallinacea	138	92	66.7^{a}	153	60	39.2^{b}	291	152	52.2	32.0^{a} ± 63	48	11^{b} ± 29	28	21 ± 49.4	40.2
Menacanthus stramineus	138	32	23.2^{a}	153	61	39.9^{b}	291	93	32	10.2 ± 43.5	43.8	12.12 ± 27.9	30.39	11.2 ± 36.1	35.0
Menopon gallinae	138	46	33.33	153	53	34.6	291	99	34	7.4^{a} ± 16.7	22.1	16.0^{b} ± 27.7	46.3	11.9 ± 23.2	35.1
C. mutans	138	138	100	153	150	98	291	288	99	3.2 ± 1.7	3.2	4.2 ± 1.7	4.26	3.7 ± 1.8	3.8
L. caponis	134	2	1.45	152	2	1.3	286	4	1.4	0.09 ± 0.9	6	0.01 ± 0.1	1	0.05 ± 0.7	3.5
D. gallinae	138	3	2.17	153	1	0.6	291	4	1.4	0.09 ± 0.9	4.1	1.8 ± 22.1	272.3	0.98 ± 16	71.2
A. variegatum	138	3	2.17	153	0	0	291	3	1	0.02 ± 0.2	1	0.0 ± 0.0	0	0.01 ± 0.1	1.0
G. gigas	134	2	1.45	152	0	0	286	2	0.7	0.02 ± 0.2	1.3	0.0 ± 0.0	0	0.01 ± 0.1	1.5
G. hologaster	134	1	0.72	152	0	0	291	1	0.3	0.01 ± 0.1	1	0.0 ± 0.0	0	0.003 ± 0.1	1.0

Prevalences and means within the same row with different superscripts are significantly different ($p < 0.05$).
N is the number of birds examined
n is the number of infested birds with species of ectoparasites

Table 4: Prevalence (%) and infestation levels of different ectoparasite species on local chickens in the dry and rainy seasons in Mzuzu Agricultural Development Division (MZADD) of the northern region of Malawi

	Prevalence						Mean			
	Dry season			Rainy season			Dry season		Rainy season	
Species	N	n	% infested	N	n	% infested	Mean ± S.D.	Mean/ infested bird	Mean ± S.D.	Mean/ infested bird
E. gallinacea	130	67	52.5	161	85	52.8	30.9^{a} ± 61.7	59.9	13.0^{b} ± 30.2	24.6
Menacanthus stramineus	130	91	70^{a}	161	2	1.2^{b}	24.2^{a} ± 50.6	34.6	0.7^{b} ± 6.8	56.4
C. mutans	130	127	97.7	161	161	100	3.2 ± 1.8	3.3	4.2 ± 1.6	4.2
Menopon gallinae	130	3	2.3^{a}	161	96	59.6^{b}	0.8^{a} ± 5.6	34.7	20.9^{b} ± 28.2	35.1
L. caponis	130	4	1.4	156	0	0	0.1 ± 0.9	3.3	0.0 ± 0.0	0
D. gallinae	130	2	1.5	161	2	1.2	0.08 ± 0.9	5.2	1.7 ± 21.5	136.8
G. gigas	130	1	0.8	156	1	0.6	0.02 ± 0.2	2.6	0.006 ± 0.1	1
A. variegatum	130	3	2.3	161	0	0	0.02 ± 0.2	1	0.0 ± 0.0	0
G. hologaster	130	0	0	161	1	0.6	0.0 ± 0.0	0	0.006 ± 0.1	1

Prevalences and means within the same row with different superscripts are significantly different ($p < 0.05$).
N is the number of birds examined
n is the number of infested birds with species of ectoparasites

Table 5: Prevalences(%) and infestation levels of some common ectoparasite species on the local chickens in the central plains and lakeshore area in different seasons in Mzuzu Agricultural Development Division (MZADD) in northern Malawi

		Dry season			Rainy season			Dry season		Rainy season	
Species	Location	N	n	% infested	N	n	% infested	Mean ± S.D	Mean/ infested bird	Mean ± S.D	Mean/ infested bird
E. gallinacea	Plains	50	33	64	88	60	68	4.7^{b} ± 89.2	85.5	19.1^{a} ± 37.2	28.0
	Lakeshore	80	35	44	73	25	34	16^{a} ± 36.6	36.6	5.7^{b} ± 116.1	16.6
Menacanthus stramineus	Plains	50	30	60	88	2	2	25.8^{a} ± 68.9	43.0	1.3^{b} ± 9.2	57.2
	Lakeshore	80	61	76	73	0	0	23.2^{a} ± 35.2	30.4	0.0^{b} ± 0.0	0
Menopon gallinae	Plains	50	0	0	88	46	52	0.0^{c} ± 0.0	0	11.6^{b} ± 19.7	22.2
	Lakeshore	80	3	4	73	50	68	1.3^{c} ± 7.1	34.7	32.2^{a} ± 32.6	47.0
C. mutans	Plains	50	50	100	88	88	100	2.4 ± 1.7	2.4	3.6 ± 1.5	3.6
	Lakeshore	80	77	98	73	73	100	3.6 ± 1.7	3.6	4.8 ± 1.5	4.8

Prevalences and means within the same row and column with different superscripts are significantly different ($p < 0.05$).
N is the number of birds examined
n is the number of infested birds with species of ectoparasites

Discussion:

The present study established 2 new species and confirmed 7 previously described ectoparasite species in the village poultry in Mzuzu Agricultural Development Division in Ekwaiweni (central plains) and Mpamba (lakeshore area) in the northern region of Malawi. No documented list of poultry ectoparasites is yet available

for the northern region of Malawi. Documented ectoparasite species from laboratory diagnoses include *C. mutans, E. gallinacea, G. gigas, Menopon gallinae, Menacanthus stramineus, D. gallinae, Cnemidocoptes gallinae* and *A. variegatum* (Department of Veterinary Services Annual Report, 1966, 1976). Most of the species were found in the southern region of Malawi except for *Menacanthus stramineus* and *A. variegatum* which were reported from the central region of Malawi. During a sample collection exercise in 2009 and 2010 in the southern region of Malawi, *E. gallinacea, Menacanthus stramineus, Menopon gallinae* and a tick species were collected from domestic chickens. The present study established the presence of the lice *Lipeurus caponis* and *Goniocotes hologaster*. These two ectoparasite species have not previously been reported in Malawi. This study was the first systematic survey of ectoparasites among indigenous chickens in the country. Previously reported cases are from those birds which are brought to the laboratory for postmortem.

The most commonly found ectoparasites were *C. mutans* followed by *E. gallinacea, Menopon gallinae* and *Menacanthus stramineus*. The least common ectoparasites were *L. caponis, D. gallinae, A. variegatum, G. gigas* and *G. hologaster*. Studies on the prevalence of ectoparasite species have not been done in Malawi so these cannot be compared. However, in Nigeria the following ectoparasite prevalences in Harco, Lumaco, Rhode Island Red and Barbcock were reported: *G. gigas* (15 %), *Menacanthus stramineus* (20 %), *L. caponis* (25 %), *Ceratophyllus gallinae* (25 %) and *Amblyomma* (15 %)(Ugochukwu, E.I., 1986). Another study in Nigeria reported *L. caponis, M. gallinae, Echidnophaga gallinacea* and *C. mutans* on domestic chickens (Ikpeze Obiora Osegboka, 2008). The study reported prevalences of 31.90 % for *Menopon gallinae*, 69.37 % for *E. gallinacea* and 27.70 % for *C. mutans* which are comparable to results obtained in this study except for *C. mutans*. The present study used estimates to score the presence of scales on the legs of the birds in addition to analyzing some collected samples. There might have been an overscoring of the scales on some young birds which may account for a higher prevalence recorded. In India, 67.6 % birds of the fowls examined in 18 different localities were found infested with *Menopon gallinae* (Saxena, A.K., 1995). *Dermanyssus gallinae, Menopon gallinae, Lipeurus caponis* and *Goniocotes gigas* were reported on poultry in Pakistan (Buriro, S.N., S.S. Akbar, 2009). The occurrence of 5 species namely *Menopon gallinae, Menacanthus stramineus, Cuclogaster heterographa, G. gigas* and *Goniodes dissimilis* which infested 61.72 % of birds examined was reported in an earlier study (Shahjehan, I.A., S. Iqbal, 1995).

The distribution of ectoparasites among the birds showed tendencies towards over dispersion whereby the standard deviation was greater than the mean. Few chickens had heavy infestations. Over dispersion can arise due to a number of factors (Kennedy, C.R., 1975). Within any host population, individual host differences resulting from diet, age, sex, physiological status, generation, genetically based variation in susceptibility, behaviour and immunity or response to the parasite have been reported (Saxena, A.K., 1995; Devaney, J.A., R.L. Ziprin, 1980; Devaney, J.A., 1984; Dineen, J.K., 1963; Matthysse, J.G., 1974; Nelson, W.A., 1984). Such differences are commonly found in all naturally occurring populations making random distributions uncommon or infrequent. A large number of parasites occur in a small number of hosts creating a scenario where most of the parasites are concentrated in very few hosts. Death of a single heavily infested individual would mean demise of the parasite. Chemical control of parasites on few heavily infested individuals would be economical.

E. gallinacea was more common and abundant ($p < 0.05$) in the central plains than the lakeshore area. *Menopon gallinae* was more abundant ($p < 0.05$) in the lakeshore area than the central plains. It seems *Menopon gallinae* develops well under high rainfall and high temperature conditions prevalent in the lakeshore area. In Pakistan, a highest rate of occurrence of lice (37.13 %) in Hyderbad and a lower rate (7.06 %) in Nawabshah were reported (Buriro, S.N., S.S. Akbar, 2009). *A. variegatum* was found only in the central plains. Adult *Amblyomma* species prefer to feed on domestic and wild ruminants, but larvae and nymphae can feed on any terrestrial vertebrate and are common on birds. *Amblyomma* is mainly a parasite of cattle, but has been reported also on other species such as rabbits, goats and chickens (Garris, G.I., 1984). In Zimbabwe, *A. walkerae* has been the most common and widely distributed tick found on chicken (Norval, R.A.I., 1985).

E. gallinacea was more abundant ($p < 0.05$) in the dry season than the wet season. It seems the dry season in the northern region of Malawi favour the flourishment of the sticktight flea. High breeding activity during the cool periods of the year may be followed by high populations during the dry season.

Interaction effect ($p < 0.05$) of location and season was observed on the mean levels of *E. gallinacea, Menacanthus stramineus* and *Menopon gallinae*. *E. gallinacea* was more abundant in the dry season in the lakeshore area and wet season in the plains indicating preference for moist conditions. However, it is interesting that during the wet season in the lakeshore area, the levels of *E. gallinacea* on chickens was comparable to that of the dry season in the plains. This may indicate a possible reaction to both dry and wet stress and needs laboratory studies to comfirm the effects of moisture (Relative Humidity) on this parasite. *E. gallinacea* eggs may hatch in 3- 4 days at 26 ^{o}C and 85 percent Relative Humidity [RH] (Suter, P.R., 1964).

Menopon gallinae was more abundant along the lakeshore area than in the central plains and was more abundant in the wet season than the dry season. It was also more abundant in the wet season in the lakeshore

area than in the central plains. It seems the louse has a preference for hot humid conditions than hot dry weather. *Menacanthus stramineus* was more abundant in the dry season in the central plains and lakeshore area indicating a preference for hot dry conditions.

Based on prevalence, abundance and feeding habits, *E. gallinacea* may be an ectoparasite of economic and public health importance. It was found to be very common and abundant ectoparasite. *E. gallinacea* has been reported to cause anaemia which can lead to emaciation, loss of production and death especially among young birds and chicks (Report of Veterinary Research Laboratory, 1969). Flea attachment on birds may lead to irritation, secondary infection, swelling and shutting of eyes (Koehler, P.G., 1991).

The red mite, *D. gallinae*, may also be an ectoparasite of economic and public health importance. Although it was not commonly found, the few infested birds had heavy burdens of this ectoparasite. Cases have been reported by farmers where birds abandon eggs in their brooding nests because of high infestations of the mite (Hara, personnal communication). The parasite can cause listlessness in birds, scratching and blood loss.

The lice species *Menacanthus stramineus* and *Menopon gallinae* are of economic importance. Infestation of birds with Menacanthus stramineus may lead to anaemia and death. A loss in egg production due to *Menacanthus stramineus* have been reported from various studies (Edgar, S.A., 1950; Glees, E.E., 1959; Devaney, J.A., 1976).

More intensive surveys need to be carried out to determine the significance and economic importance of ectoparasites in village poultry in Malawi and when control is necessary. More studies need to be carried out to develop technically feasible and economically viable control strategies for ectoparasites of poultry. The possible public health significance of some of these ectoparasites need to be studied.

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