

The presence of quill mites (*Gabucinia bicaudata*) and lice (*Struthiolipeurus struthionis*) in ostrich wing feathers

R G Cooper^{a*} and H A A El Doumani^b

ABSTRACT

Quill mites (*Gabucinia bicaudata*) and lice (*Struthiolipeurus struthionis*) may infest ostrich feathers, resulting in skin damage, pruritis and excessive feather preening and loss. Four different feather types (prime white, femina extra wide, femina class 1, and femina short; $n = 10$) were collected. The quill mites and lice were removed with fine forceps, studied using a photographic optical microscope and counted microscopically at $\times 100$ magnification following collection by sedimentation. They were placed in separate Petri dishes containing lactophenol solution and examined ($\times 40$ magnification). Anatomical features are described. The density of quill mites in all feather types of both wings was higher than that of the lice. There was no significant difference between the counts of both arthropods on the left wing and the right wing, respectively, except for the femina class 1 quill mites ($P = 0.01$). The femina extra wide feathers were a preferred habitat in both wings. Large standard deviations (quill mites left wing: 73 ± 8 ; quill mites right wing: 69 ± 7) suggested variations in the degree of migration between feather shafts or as a response to escape preening. It is recommended that ostriches be treated with an oral preparation of Ivermectin administered per os at a dosage rate of 0.2 mg/kg at 30-day intervals for quill mites, and with a 1–5 % Malathion dust at 14-day intervals for lice.

Key words: feather louse, *Gabucinia bicaudata*, quill mite, ostrich, *Struthiolipeurus struthionis*.

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INTRODUCTION

Quill mites (phylum: Arthropoda; class: Arachnida; order: Acarina; family: Pterolichidae; species *Gabucinia bicaudata*) and lice (phylum Arthropoda; class Insecta; order Phthiraptera; suborder Ischnocera; family Philoptera; species *Struthiolipeurus struthionis*) may inhabit and infest ostrich (*Struthio camelus* var. *domesticus*) feathers. Ostrich wing feathers have been classified according to their length and number⁴. Although they are highly specialised plumage and skin ectoparasites that are variously adapted for inhabiting certain microhabitats on a bird's body, they can potentially damage the quality of skin and ultimately leather as irritation may result in pruritis and excessive feather preening and loss^{1,3,5}. Abundance and location of vane-dwelling mites is affected by season, temperature, light, humidity, and host body condition⁷. Transmission between hosts usually

depends on host body contact and feather mite phylogeny often parallels host phylogeny. There may also be host-jumping and 'missing the boat' in several mite lineages⁷.

Cooper¹ suggested that infestation with these ectoparasites causes stress and indirectly predisposes birds to secondary infections and gastrointestinal disorders like impaction. There are currently no detailed counts of these arthropods in the ostrich. Presented, therefore, is collective and anatomical data on the number of quill mites and lice in 4 types of wing feather of the ostrich. Specific morphological characteristics of the insects were noted in order to confirm infestation with mites and lice.

MATERIALS AND METHODS

Four different feather types (prime white, femina extra wide, femina class 1, and femina short; $n = 10$ for each type) were collected in June 2005 from 3 breeder ostriches aged 4 years [1 male, 2 females; 113.9 ± 4.32 kg (mean \pm SD) body weight; $n = 3$] from both wings in a 1:1 proportion, on a small scale private farm in Egypt (Dakahlia Governorate, 31°00'N, 31°30'E). Five quill mites and 5 lice were removed with fine forceps, killed in 10% ethanol and studied using a photographic optical microscope (Olympus CH30, Olympus Optical Co. Ltd., Tokyo, Japan). Counts of the arthropods inhabiting the ventral shaft groove or feather barbs of an infected wing feather were completed using sedimentation-flotation based on the method prescribed by². Each infected feather was collected and kept in 10 % NaCl (2.5M; El Nasr Pharmaceutical Chemicals, Abu Zaabal, Egypt) for 12 hours in order to dissolve any debris. This was accelerated by applying gentle heat (40 °C for 2 minutes) to the sample using a water bath. The extract was transferred to a centrifuge tube (10 ml) and spun at 3000 rpm (4000 g) for 10 min in a Straight-8 5 K Centrifuge (Lab Essentials, Inc., New York). The supernatant fluid was discarded and the sediment was placed in the centre of a 10 % alcohol cleaned, dry glass microscope slide, in mounting oil, covered with a cover slip and examined microscopically at $\times 100$ magnification to detect the number of quill mites and lice. The arthropods were then placed in separate Petri dishes (Porclicable glass, 10 cm, High Hope International Group, Baixia, China) filled with lactophenol solution (100 g Phenol crystal; 106 ml Glycerin; 82 ml lactic

Table 1: Mean count \pm SD of quill mites and lice per ostrich feather type ($n = 10$).

Feather	Prime white	Femina extra wide	Femina class 1	Femina short
Quill mites left wing	21 \pm 2	73 \pm 8	40 \pm 2	12 \pm 1
Quill mites right wing	17 \pm 4	69 \pm 7	33 \pm 2	10 \pm 2
<i>P</i> value, <i>t</i> -test, 95 % CI	0.28	0.66	0.01	0.31
Lice left wing	10 \pm 2	17 \pm 1	7 \pm 1	4 \pm 1
Lice right wing	8 \pm 2	14 \pm 2	5 \pm 2	3 \pm 1
<i>P</i> value, <i>t</i> -test, 95 % CI	0.39	0.07	0.42	0.37

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acid; 100 ml distilled water; El Nasr Pharmaceutical Chemicals, Abu Zaabal, Egypt) and examined directly for micro-anatomical features at $\times 40$ magnification using a stereo-microscope (Zoom Stereo Microscope ZTXE, JNOEC, Nanjing, China). Digital photographs were taken. All counts were analysed using Student's *t*-test.

RESULTS

The count of quill mites in all feather types of both wings was higher than that of the lice (Table 1). There was no significant difference between the counts of both arthropods on the left wing and the right wing, respectively, except for quill mites on the femina class 1 feathers, where the left wing was significantly ($P < 0.05$) more infested than the right wing (Table 1).

The feathers showed evidence of extensive damage, including torn borders, and loss of proximal and distal barbules (Fig. 1a,b,c). The mite has a mouth adapted for chewing and biting consisting of a pair of palps and a pair of chelicerae located between the palps. There are paired claws at the end of the pretarsus on each leg (Fig. 2). The louse has distinct mandibulate mouthparts allowing biting and chewing (Fig. 3). They are composed of a labrum, a pair of mandibles and a pair of maxillae attached laterally to the labium. Each leg has 2 tarsal claws.

DISCUSSION

From the data it appears that the femina extra wide feathers were a preferred habitat, as both wing types had the highest density of arthropods. The large standard deviations for the quill mites in the femina extra wide feathers (quill mites left wing: 73 ± 8 ; quill mites right wing: 69 ± 7) (Table 1), however, indicated possible variations in the degree of migration of the quill mites between feather shafts or as a response to escape preening. This may explain the significant difference ($P < 0.05$) for the density of quill mites between wings in the femina class 1 feathers (Table 1). It is also suggested that the quill mites may perform mass or blind movements across wing feathers, as has been demonstrated in other species⁶. In fact, it is probable that clusters of quill mites in the femina extra wide feathers are a consequence of the unique conditions operating within the ostrich feather-quill mite system. The mites are highly adapted to live and reproduce within the ostrich feathers (Figs 2, 3). The pair of palps on the mite acts as simple sensory organs that help it to locate food with a palpal claw or apotele on the distal segment. The

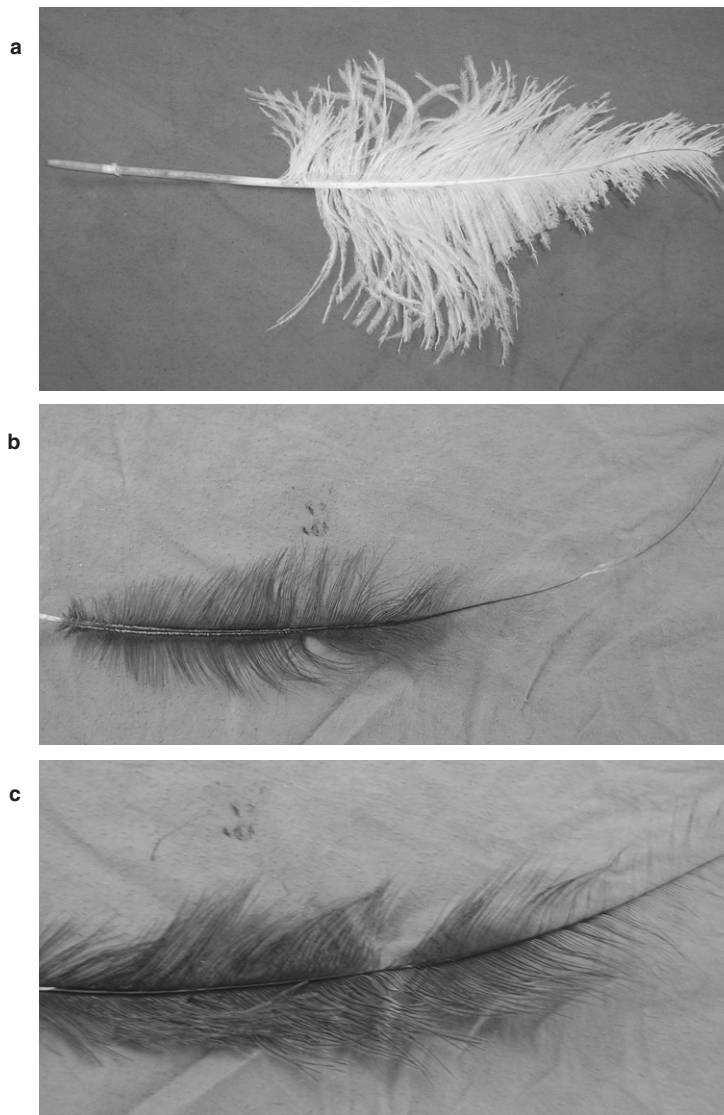


Fig. 1: Selected samples of ostrich feathers examined. a: Prime white feather with rough and torn borders; b, c: Femina extra wide feathers with loss of proximal and distal barbules.



Fig. 2: Ventral view of adult female ostrich quill mite (*Gabucinia bicaudata*) ($\times 40$ magnification). Characteristically possesses legs each with 2 claws and the posterior end of the abdomen bi-lobed with 2 suckers.



Fig. 3: Dorsal view of adult male ostrich louse (*Struthiolipeurus struthionis*) ($\times 40$ magnification) showing a dorsoventrally flattened body with few dorsal hairs on the abdomen. The head is rounded anteriorly and broader than the thorax. The legs are characteristically curled and end in claws.

pair of chelicerae is used for tearing and grasping. The paired claws aid in grasping and tearing the feather (Fig. 2). The mandibulate mouth parts on the louse allow it to ingest skin scales and scabs, effectively digesting keratin.

This louse is not adapted to sucking blood. The ventral location of the mandibles on the head (Fig. 3) allow it to ingest feathers by removing barbules, causing the feather coat to become thin and tattered (Fig. 1b,c). The tarsal claws aid in holding on to feather barbs and tearing them. As the sample of 3 ostriches exam-

ined in this study showed moderate damage to feathers and mild feather loss, it is suggested that the counts made in this study represent a mild to moderate infestation. Indeed, during heavy infestations of lice, ostriches will characteristically exhibit bare patches due to destruction of feathers¹. Although the ectoparasites do not directly kill the bird, their constant irritation may cause general unthriftiness and loss of body weight, ultimately resulting in progressive weakness and death. In order to prevent cross-infestation, it is recommended that the

entire flock be treated for quill mites using Ivermectin (Panomec; Merck & Co.) administered orally at a dosage rate of 0.2 mg/kg at 30-day intervals, and with a 1–5 % Malathion dusting powder (Malathion; Griffin Ltd) at 14-day intervals for lice.

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