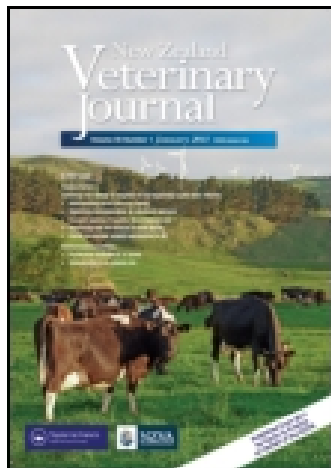




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Short Communication

Thysanoptera infestation on skin and periorbital cellulitis in ostriches (*Struthio camelus*) aged 14 months

RG Cooper*

Abstract

AIM: To report the infestation of Thysanoptera (*Limothrips denticornis*) on ostriches (*Struthio camelus*) and to determine their relative density.

METHODS: A farm in Poland was studied on which ostriches aged 14 months were severely infested with *L. denticornis* (thrips). Thrips were collected and their density on the neck, torso and legs (10 cm²) of 85 ostriches determined at 0600, 1200 and 1800 h, respectively, over 7 days. At the same times, apparent densities of thrips/m² were determined in adjacent grassy areas (120 m²) on a muslin cloth impregnated with permethrin. Thrips were mounted onto slides in Hoyer's medium, for identification.

RESULTS: The apparent density of thrips was greatest at 1200 h, and was greater on the neck than the torso and legs ($p=0.03$). In adjacent surroundings, densities were also highest at 1200 h (mean 199 (SE 9.3) thrips/m²) and were similar to the maximum densities recorded on the necks of ostriches at that time (mean 205 (SE 6.4) thrips/m²). Ostriches engaged in excessive preening and attempted to scratch their head/neck with their feet. Numerous small, pale red papules were observed on the skin. Observations of periorbital cellulitis, conjunctivitis, blepharitis, watery discharge, inflammation, and sclerotic discolouration were noted in 65 ostriches.

CONCLUSION: Observations were commensurate with *L. denticornis* infestation.

CLINICAL RELEVANCE: Infestation may exacerbate stress levels and subsequently lead to a reduction in feed intake and performance. The infestation and subsequent irritation from thrips impacts negatively on the general health of ostriches by damaging skin and irritating eyes.

KEY WORDS: *Limothrips denticornis*, ostrich, thrips, periorbital cellulitis

Introduction

Thrips are a small insect in the order Thysanoptera that have an oblong brown body and two pairs of thin, fringed wings (Bhatti 1969; Leigh et al 2005) (Figure 1). Worldwide, thrips can colonise crops up to 2,000 m above sea level. They occupy vast niches and include phytophagous, fungivorous and predacious species (Lewis 1973). Thrips have increased in prominence as insect pests



Figure 1. Ventral surface of a thrips collected from an ostrich aged 14 months (10x magnification).

of field, plantation and greenhouse crops in many countries, resulting in losses in yield and spoilage (Lewis 1997). Others may be predators on small insects such as aphids and mites. Thrips have also been noted in fields of corn (*Zea mays*) (Bourguet et al 2002) and winter cereal (Lang 2003). They are often overlooked as they are small in size, move rapidly and are light in colour (Childers et al 2005).

Thrips may become a nuisance when they swarm and land on exposed areas of skin (Childers et al 2005); attacks on people usually occur in hot, sultry weather. Itching and pricking sensations result from their activity in seeking moisture from the skin or they may be attracted to volatile compounds in perspiration. If they land on bare skin they rasp the skin, causing a sudden burning sensation at the site of the bite. Rashes and dermatitis have been reported following thrips bites (Bailey 1936; Leigh et al 2005). In some people, a red wheal may develop and an itching sensation persists for several days (Leigh et al 2005). Severe infestations in ratites may result in damaged skin indirectly through preening. Visual impairment may occur when thrips enter the eyes of the birds. As a consequence, thrips infestation is of clinical significance to veterinarians. Reported here is a case of Thysanoptera infestation on the skin and periorbital cellulitis in farmed ostriches.

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Materials and methods

In July 2005, infestation with thrips was studied on 85 ostriches aged 14 months, and their surroundings, on a 21-ha ostrich farm in Poland (51°43'N, 15°33'E). The farm was subdivided into paddocks for chicks (3, 6 and 8 months old), growers (9–12 months old), and breeders (>12 months old). Only 14-month-old ostriches were studied, due to a decision made by the farmer to minimise stress in his flock. The ambient temperature and relative humidity at 0600, 1200 and 1800 h averaged 27°C and 34%, 31°C and 37%, and 29°C and 35%, respectively. All experiments were performed in strict accordance with European Union-approved OIE guidelines for animal welfare (2005), and the animal ethics committee of the Polish Academy of Sciences Animal Research Committee, Warsaw, Poland.

Thrips were collected from ostriches and from areas of grass (10 x 12 m) adjacent to the paddocks containing ostriches, using fine forceps, and immersed in 10% ethanol and mounted onto slides in Hoyer's medium (Krantz 1978). As described by Childers et al (2005), slides were then subsequently oven-cured for 14 days at 43°C, and identified to species; 50 slides were prepared for this purpose. The insects were placed in separate Petri dishes (Porcilexible glass, 10 cm diameter; High Hope International Group, Baixia, China) filled with lactophenol solution (100 g phenol crystals, 106 ml glycerine, 82 ml lactic acid, and 100 ml distilled water; Sigma-Aldrich, Gillingham, UK), examined directly at 10x magnification using a dissection microscope (Zoom Stereo Microscope ZTXE; JNOEC, Nanjing, China), and photographed.

The apparent density of thrips per cm² of ostrich skin on the neck, torso and legs was determined using photographs of these areas taken at 0600, 1200 and 1800 h over 7 days; visible thrips were counted using stereological point-counting with a transparent sheet (10 x 10 cm) adapted from previous studies (Strickland 1961; Cooper 2004; Parajulee et al 2006). Thrips beneath the feathers were not counted. The minimum sample size based on visual sampling (0.20 precision) was 30 thrips per 100 cm². Data were converted into the density of thrips per m² of ostrich skin, in order to make comparisons with counts in the environmental surroundings.

The apparent density of thrips in areas adjacent to the paddocks was determined using 10 x 12 m light muslin cloth impregnated with permethrin spray (2.8 % w/w, pre-pressurised hand-held aerosol; Miswa Chemicals Ltd, Northampton, UK) spread on the ground, nailed in position, and left out for 12 h; a method adopted from that described by Banks and Brown (1962). Counts were made at the same times of the day as for the ostriches.

The preference of thrips for skin area and eyes, the response of the ostriches to the irritation, and any resultant pathology were recorded. The time of day during which maximum irritation occurred was noted. The behavioural responses of the birds to thrips were recorded specifically as movement, scratching, preening and feather-ruffling.

Statistical analysis

Data were analysed using repeated measures analysis of variance (Analyse-It Software Ltd, Leeds, UK). Counts of thrips on the skin and in the eyes of ostriches were compared between sites and times using Tukey's studentised range test for equal sample sizes, to allow for multiple pairwise (non-orthogonal) comparisons of

means. Aggregated mean $\pm$ standard error (SE) were computed for thrips present in the left and right eyes.

Results

Morphological observations of thrips

The thrips were identified as *L. denticornis*, a species common throughout Europe (Leigheb et al 2005). They were approximately 1–2 mm long, the head was large, elongated and highly mobile, and had two well-developed, large, compound eyes and a single pair of antennae (Figure 1). The mouthparts appeared adapted for rasping-sucking movements, consisting of maxillae, a right mandible, the labium with terminal labella, hypopharynx and the labrum. The thorax comprised three segments, the prothorax, meso-thorax and meta-thorax. The thrips had two pairs of wings, which were fringed with long hairs. There were three pairs of legs, each leg consisting of five sections: coxa, trochanter, femur, tibia and tarsus.

Apparent density of thrips on ostriches and in the adjacent surroundings

All 85 ostriches presented with thrips on the torso and areas of bare skin on the neck and legs. In 43 ostriches, infestation was particularly abundant on the head and neck region. The apparent density of thrips was greater at 1200 h than at 0600 h and 1800 h, and on the neck than on the torso and legs ($p < 0.05$; Table 1). The density of thrips landing on the ground in areas adjacent to the paddocks containing the ostriches averaged 88 (SE 2.9) thrips/m² at 0600 h, increased to 199 (SE 9.3) thrips/m² at 1200 h, then declined to 136 (SE 4.9) thrips/m² at 1800 h. The density of thrips on the ground at 1200 h was not significantly different from the counts on the birds' necks at that time ($p > 0.05$). The number of thrips entering the eyes did not differ significantly between the right and left eye throughout the experimental period. However, the average number of thrips in both eyes was higher at 1200 h than at 0600 h or 1800 h ($p < 0.05$), being 47 (SE) 0.08, 29 (SE) 1.0, and 25 (SE) 0.09, respectively.

Response of ostriches to thrips infestation

Ostriches engaged in excessive preening and attempted to scratch their head/neck with their feet. Observations of naked skin demonstrated numerous small, pale red papules. Many thrips entered the conjunctival sacs, causing a watery discharge from the eyes. Observations of periorbital cellulitis, conjunctivitis and blepharitis were noted in 65 ostriches. Inflammation and reddish discoloration in the sclerae were noted in five cases. Watery discharges from both eyes extended down the head onto the upper recesses of the neck. In some instances, the birds attempted to rub their

Table 1. Mean $\pm$ standard error of the apparent density of thrips/m² on the neck, torso and legs of ostriches (n=85) at 0600, 1200 and 1800 h, respectively, over 7 days.

Time (h)	Legs	Torso	Neck
0600	38 $\pm$ 0.8 ^{a,x}	48 $\pm$ 1.1 ^{b,x}	114 $\pm$ 2.8 ^{c,x}
1200	126 $\pm$ 3.2 ^{a,y}	153 $\pm$ 5.4 ^{b,y}	205 $\pm$ 6.4 ^{c,y}
1800	53 $\pm$ 1.4 ^{a,z}	55 $\pm$ 1.7 ^{a,z}	126 $\pm$ 1.7 ^{b,z}

^{a,b,c} Means within rows with different superscripts are significantly different ($p < 0.05$)

^{x,y,z} Means within columns with different superscripts are significantly different ($p < 0.05$)

heads on fences to alleviate the pruritis. The ostriches appeared stressed by the presence of the thrips and neither engaged in activity nor random feeding, particularly at 1200 h. Workers moved the birds into barns and gave them fresh feed mixed with lucerne. The doors of the barns were closed to help reduce the severity of thrips infestation.

Discussion

This is the first known documentation of thrips infestation in ostriches. *Limothrips denticornis* is morphologically adapted to flight and is able to seek out moist areas including grassy verges and actively perspiring areas of skin. It is clear that pathology due to thrips is associated with accidental entry into the eyes, nostrils, mouth and on moist skin surfaces (Vevy 1962; Waisman 1968). Thrips are attracted to natural juices and humidity and take refuge from dryness (Mumcuoglu and Ruffi 1982; Leigh et al 2005). It is suggested that at 1200 h the sun reached its zenith and the temperature of 31°C threatened desiccation of the thrips, causing them to urgently seek sources of moisture; this was the time when the thrips were most numerous. Thrips favoured the skin on the neck in preference to the torso and legs, suggesting that it was an area which actively perspired. Although the skin of the leg is devoid of feathers, the keratin therein would make it more difficult for thrips to bite. After 1200 h, thrips presumably flew to shaded areas to escape the heat and desiccation. Dermatological reactions were observed on the neck and head region, indicative of the marked urticaria, inflammation and irritation from thrips bites. The specialised mouthparts were able to penetrate the ostrich's skin and induce a dermatological reaction, resulting in scant epidermal lesions. Lesions following thrips bites have been noted elsewhere in the literature, particularly in human subjects, and are characterised by small erythematous papules circumscribed by an anaemic halo due to local vasoconstriction, lasting 6–10 days (Goldstein and Skipworth 1968; Mumcuoglu and Volman 1988; Leigh et al 2005). Subsequent excessive preening and scratching could potentially introduce infection. It is possible, therefore, that the quality of leather produced from affected ostriches could be reduced. Further investigations may possibly determine the moisture content of the skin in designated places on the ostriches, and which chemicals in perspiration might be attractive to thrips.

Associated with periorbital cellulitis was conjunctivitis and blepharitis. The voluminous watery discharge was suggestive of marked inflammation and was attractive to thrips. The infestation and subsequent irritation impacted negatively on the general health of the ostriches and exacerbated stress levels. Although attempts were made to isolate the birds from thrips by housing them indoors, relief afforded was at best temporary.

Measures need to be adopted to reduce the density of thrips when infestation occurs. The invasion biology of the species in this study must be determined before sustainable management practices can be developed (Morse and Hoddle 2006). Lack of detailed autecology of the species in this study limits an understanding of their polymorphism and how they live (Mound 2002, 2005). If pesticides are used, trials would have to be undertaken to determine the efficacy and efficiency of such, prevent misuse, and consider possible contamination of the environment. There have also been recent reports of insecticide resistance in thrips (MacIntyre Allen

et al 2005; Shelton et al 2006). It is also suggested that topical antibiotic ointment/drops may be applied to the skin and eyes of the birds to prevent infection and restrict the progress of inflammation. Leigh et al (2005) and Whitfield et al (2005) suggested that thrips are vectors of phytopathogenic viruses and bacteria. This would of course require accurate diagnosis and advice from a competent veterinarian specialising in avian diseases/pathology.

Thysanoptera infestation may be more common in livestock than is reported due to the large abundance and distribution of these insects. In a country like Poland, where there is a steady increase in the number of breeding birds on ostrich farms, infestations from thrips should be considered in an area prior to construction of paddocks.

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References

- Bailey SF. Thrips attacking man. *Canadian Entomologist* 68, 95–8, 1936
- Banks CJ, Brown ES. A comparison of methods of estimating population density of adult sunn pest, *Eurygaster integriceps* Put (Hemiptera, Scutelleridae) in wheat fields. *Entomologia Experimentalis et Applicata* 5, 255–60, 1962
- Bhatti JS. Taxonomic studies in some *Thripini* (Thysanoptera Thripidae). *Oriental Insects* 3, 373–82, 1969
- Bourguet D, Chaufaux J, Micoud A, Delos M, Naibo B, Bombarde F, Marque G, Eycheenne N, Pagliari C. *Ostrinia nubilalis* parasitism and the field abundance of non-target insects in transgenic *Bacillus thuringiensis* corn (*Zea Mays*). *Environmental Biosafety Research* 1, 49–60, 2002
- Childers CC, Beshear RJ, Frantz G, Nelms M. A review of thrips species biting man including records in Florida and Georgia between 1986–1997. *Florida Entomologist* 88, 447–51, 2005
- Cooper RG. A histological and ultra-structural investigation of the liver and its embedded lobes in the African catfish *Clarias gariepinus* (Burchell – 1822). *Discovery and Innovation* 16, 41–5, 2004
- Goldstein N, Skipworth GB. Papular eruption secondary to thrips bites. Halos in Hawaii. *Journal of the American Medical Association* 203, 53–5, 1968
- Krantz GW. Collection, rearing, and preparation for study. *A Manual of Acarology*. 2nd Edn. Pp 77–98. Oregon State University Book Stores Inc, Corvallis OR, USA, 1978
- Lang A. Intraguild interference and biocontrol effects of generalist predators in a winter wheat field. *Oecologia* 134, 144–53, 2003
- Leigheb G, Tiberio R, Filosa G, Bugatti L, Ciattaglia G. Thysanoptera dermatitis. *Journal of the European Academy of Dermatology and Venereology* 19, 722–4, 2005
- Lewis T. Movement, migration and dispersal. *Thrips: Their Biology, Ecology and Economic Importance*. Pp 131–66. Academic Press, London, UK, 1973
- Lewis T. Distribution, abundance and population dynamics. In: Kirk WDJ (ed). *Thrips as Crop Pests*. Pp 217–57. CAB International, Wallingford, UK, 1997
- MacIntyre Allen JK, Scott-Dupree CD, Tolman JH, Harris CR. Resistance of *Thrips tabaci* to pyrethroid and organophosphorous insecticides in Ontario, Canada. *Pest Management Science* 61, 809–15, 2005
- Morse JG, Hoddle MS. Invasion biology of thrips. *Annual Review of Entomology* 51, 67–89, 2006
- Mound LA. Thysanoptera biodiversity in the Neotropics. *Revista de Biología Tropical* 50, 477–84, 2002
- Mound LA. Thysanoptera: diversity and interactions. *Annual Review of Entomology* 50, 247–69, 2005

- Mumcuoglu KY, Ruffi T.** Thysanoptera (Fransenflügler). *Dermatologische Entomologie*. Pp 116–9. Perimed Fachbuch-Verlagsgesellschaft, Erlangen, Germany, 1982
- Mumcuoglu KY, Volman Y.** Thrips stings in Israel – a case report. *Israel Journal of Medical Sciences* 24, 715, 1988
- Parajulee MN, Shrestha RB, Leser JF.** Sampling methods, dispersion patterns, and fixed precision sequential sampling plans for western flower thrips (Thysanoptera: Thripidae) and cotton fleahoppers (Hemiptera: Miridae) in cotton. *Journal of Economic Entomology* 99, 568–77, 2006
- Shelton AM, Zhao JZ, Nault BA, Plate J, Musser FR, Larentzaki E.** Patterns of insecticide resistance in onion thrips (Thysanoptera: thripidae) in onion fields in New York. *Journal of Economic Entomology* 99, 1798–804, 2006
- Strickland AH.** Sampling crop pests and their hosts. *Annual Review of Entomology* 6, 201–20, 1961
- Vevy A.** Pseudoparasitisme of the Thrips. *Biological Society of Zoology* 27, 207–9, 1962
- Waisman M.** Thrips bite dermatitis. *Journal of the American Medical Association* 204, 82, 1968
- Whitfield AE, Ullman DE, German TL.** Tospovirus-thrips interactions. *Annual Review of Phytopathology* 43, 459–89, 2005
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