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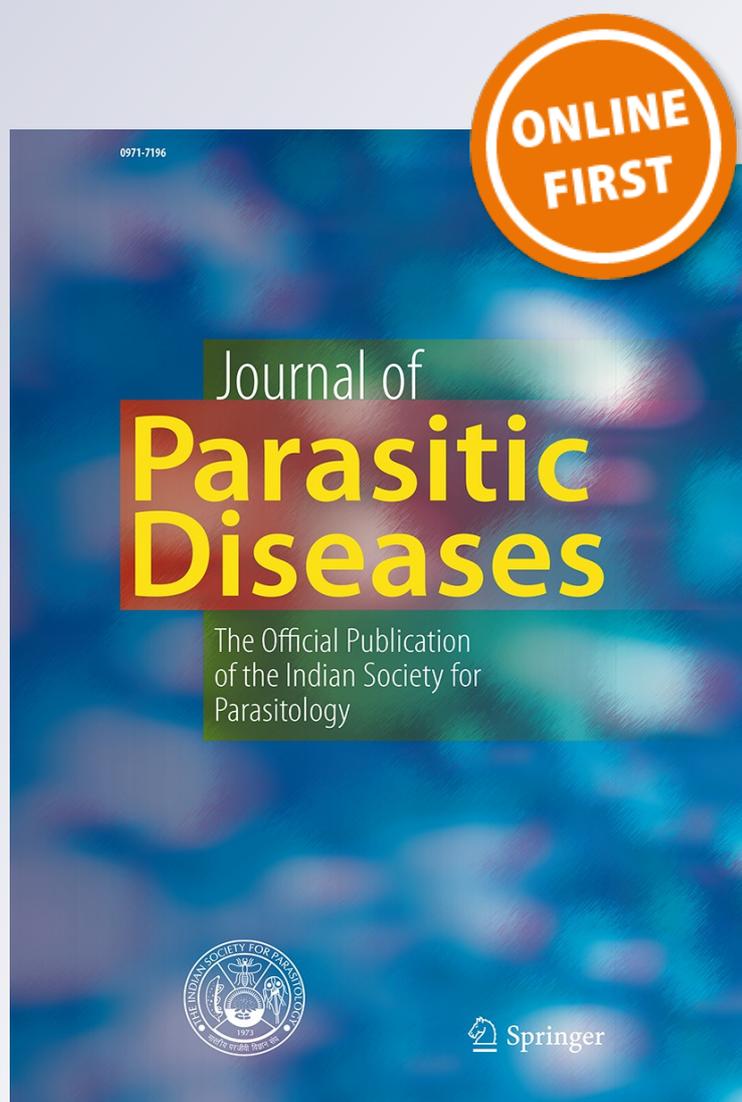
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Ectoparasite (louse, mite and tick) infestations on female turkeys (Galliformes, Phasianidae. *Meleagris gallopavo*) in Iran

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Abstract Wild turkeys (*Meleagris gallopavo*) were evaluated as potential hosts of ectoparasites. Different lice, ticks and mites can infest turkeys and cause direct and/or indirect harms and in some cases can also be fatal. Samples (feathers) were collected from lateral parts of 15 and 7 female turkeys' body of two different turkey flocks, in Rasht, Gilan province and Piranshahr, Western Azerbaijan province, Iran, respectively. Feathers were inspected for ectoparasites, the collected ectoparasites were decolorized and mounted then identified by identification keys in parasitology laboratory. In this research, four new lice, one mite and one tick on 13 infested turkeys were identified and discussed.

Keywords Turkey · *Meleagris gallopavo* · Ectoparasite · Lice · Iran

Introduction

The wild turkey (*Meleagris gallopavo*) which is widespread in Northern America was originally introduced to California, US, from Mexico in 1876 (Dickson 1992; Gardner et al. 2004). Following numerous translocations, this bird now is

widespread throughout much of the continental United States (Stangel et al. 1992). In Iran *M. gallopavo* was introduced from Europe and increasingly spread to all parts. In some provinces such as Khorasan, Gilan, Mazandaran, Western and Eastern Azerbaijan, Markazi, Fars, Esfahan and Kerman, this bird is traditionally grown by farmers. During these recent decades in Iran, the industrial growing of turkey has increased; however this bird may carry many unknown diseases which are prevalent and important.

Ectoparasites (external parasites) such as louse, mite and tick are important in poultry growing industries because of the harms caused by themselves and also by transmitting other diseases, all which cause irritation and stress to some degree. Blood sucking ectoparasites can cause anemia, weight loss, decrease in egg production and in some cases can also be fatal (Ralph 2010). Avian lice are members of the insect order Phthiraptera. Two suborders of Phthiraptera are chewing lice: Amblycera, which occur on feathers and skin, Ischnocera, which are more restricted to feathers (Atkinson et al. 2008). Avian lice spend its entire life cycle on the host bird, feeding on dead skin and feathers, causing irritation which can become severe. The female lays her eggs which stick to the feather base, they hatch as nymph (three instars) and third nymph become adult (Ralph 2010).

Feather mites are arthropods, which belong to class Arachnida, subclass Acari, order Sarcoptiformes, suborder Astigmata. Different families have been identified. They are also reported from different kinds of birds (Gaud and Atyeo 1996; Proctor and Owens 2000; Proctor 2003; O'Connor 2009). Most of these mites may be considered as commensal organisms but several families are true parasites living on the feather, inside the quill, and in and on the skin (Gurler et al. 2013). Mironov and his coworkers have done several researches on feather mites' classification (Mironov and Proctor 2008; Mironov et al. 2012), yet there

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is little information about turkey's feather mites and their importance.

Soft ticks are arthropods, which belong to class Arachnida, subclass Acari, order Ixodida, family Argasidae. They are a kind of ectoparasites that some can live and feed on birds, such as *Argas* spp. The female feeds on the bird's blood before laying her eggs on its host: their eggs are usually several hundred in the early stages. The larvae hatches and feeds on the bird for 2–10 days before dropping off and molting in 4–16 days. The nymph seeks the host, attaches and completes feeding in 30 min. Unfortunately, they can transmit some other diseases such as *Borrelia anserina* which cause fowl spirochaetosis and *Aegyptianella pullorum* during the blood sucking (Ralph 2010).

The following is a research to record the incidence of ectoparasites on turkeys in Iran and possibly to introduce some new ones.

Materials and methods

Undergraduate students had to collect samples from the city they lived in for parasitology course. Two of them decided to collect samples for detecting ectoparasites of two different turkey flocks. Flock A from Rasht city, Gilan province, North of Iran and flock B from Piranshahr city, Western Azerbaijan province, Northwest of Iran. Flock A and B consisted of 32 and 12 female turkeys, respectively. There were some degrees of itching among turkeys of both flocks. The samples were taken from 15 and 7 female turkeys of Flock A and B, respectively. Feathers were randomly cut from lateral parts of turkeys' body. The samples were kept in 70 % ethanol and transferred to the laboratory. Feathers were inspected under stereoscope. The ectoparasites were removed, the adult lice were decolorized by 10 % KOH for 10 min and lice nymphs and feather mites were kept in lactophenol. The collected ectoparasites were mounted on permanent slides by Balsam. Lice were identified by the keys developed by Bei-Bienko (1967). Dubinin (1951, 1953) keys were used for feather mites' identification and soft tick was identified by Salman and Tarrés- Call (Salman and Tarres-Call 2013).

Eleven lice and many mites were obtained from nine female turkeys (60 %) of flock A and twenty-two ectoparasites were obtained from four female turkeys (57 %) of flock B which are listed below. The identified lice were *Goniodes gigas* (Ischnocera, Philopteridae) (Taschenberg) or large chicken louse, *Goniocotes gallinae* (Ischnocera, Philopteridae) (De Geer) or fluff louse, *Chelopistes meleagridis* (Ischnocera, Philopteridae) (Linnaeus) or large turkey louse, *Menocanthus stramineus* (Amblycera Menoponidae) (Nitzsch). *Megninia ginglymura* (Analgidae)

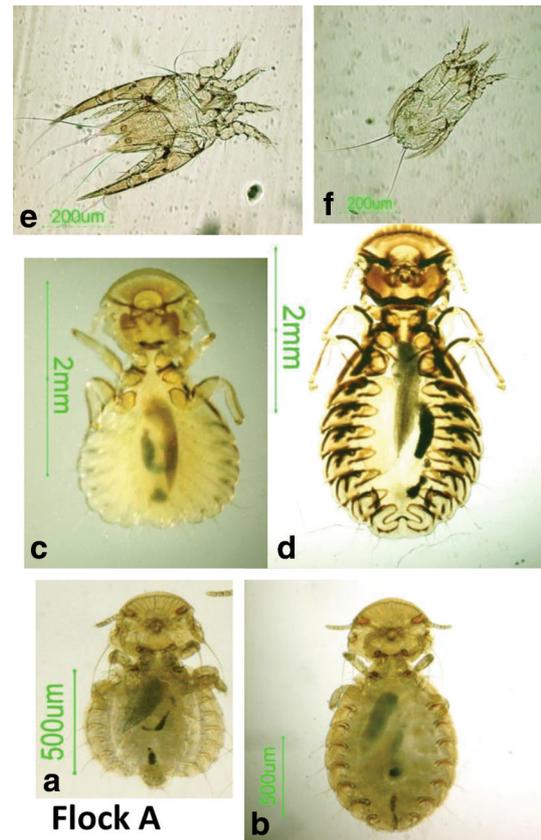


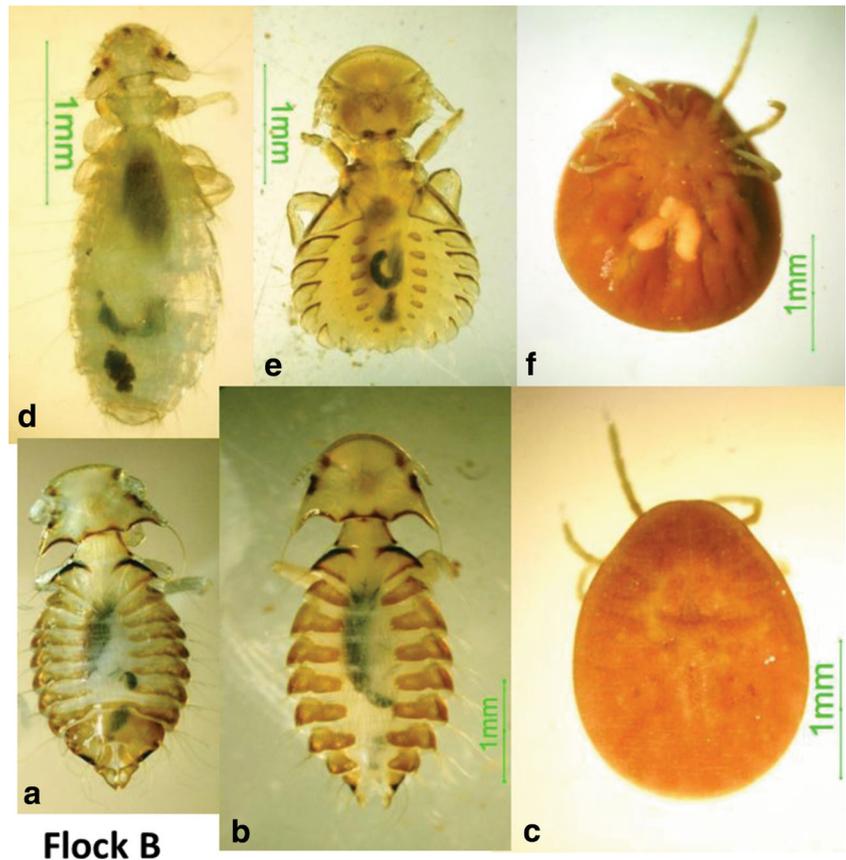
Fig. 1 Ectoparasites of turkey flock A, **a** *Goniocotes gallinae* male, **b** *Goniocotes gallinae* female, **c** *Goniodes gigas* male, **d** *Goniodes gigas* female, **e** *Megninia ginglymura* male, **f** *Megninia ginglymura* female

(Megnin) was identified as feather mite and *Argas persicus* (Oken) as soft tick. Flock A: *G. gigas* (1 male, 1 female) on 1 female turkey, *M. stramineus* only 1 male on 1 female turkey, *G. gallinae* (4 female, 2 male nymphs, 2 female nymphs) on 2 female turkeys, *M. ginglymura* (a lot of) on 5 female turkeys, (Fig. 1). Flock B: *M. stramineus* (3 male, 1 female) on 1 female turkey, *C. meleagridis* (8 male, 7 nymphs, 1 female) on 2 female turkeys, *G. gigas* (1 male) and *A. persicus* (1 nymph) on 1 female turkey, (Fig. 2).

Discussion

Although, this is the first study and recording concerning these ectoparasites in Iran, but such recording also have been conducted in other countries. The following is a list of these researches: In 1951 *C. meleagridis* and *Menocanthus stramineus* were recorded from *M. gallopavo silvestris* (Eastern turkey), *C. meleagridis* from *M. gallopavo Merriami* (Nelson-Merriam's turkey) in the US (Emerson 1951), In 1960 *C. meleagridis* and *M. stramineus* were recorded from *M. gallopavo* in the US (Malcomson 1960),

Fig. 2 Ectoparasites of turkey flock B, **a** *Chelopistes meleagridis* male, **b** *Chelopistes meleagridis* female, **c** *Argas persicus* nymph dorsal view, **d** *Menacanthus stramineus*, **e** *Goniodes gigas* male, **f** *Argas persicus* nymph ventral view



in 1969 *Megninia* sp., *C. meleagridis* and *M. stramineus* were recorded from *M. gallopavo silvestris* in southern part of the US (Kellogg et al. 1969), In 2002 *C. meleagridis* and *M. stramineus* were recorded from *M. gallopavo osceola* in the US (Holt 2002), In 2006 *C. meleagridis* and *M. stramineus* were recorded as 37.5 and 12.5 % out of 113 examined *M. gallopavo intermedia* (Rio Grand wild turkey) in California state parks, US (Lane et al. 2006). Lice are the most host specific of all ectoparasites. Many species of chewing lice being found on only one genus or species of host, such as *C. meleagridis* in this study. Some species of chewing lice are less specific, however, occurring on multiple host genera, families or even orders; *G. gigas*, *G. gallinae*, *M. stramineus* are the examples of these lice in this study (Atkinson et al. 2008).

In 2008 *M. ginglymura* was reported on *M. gallopavo* from Cuba (Szczepel et al. 2008) and in 2009 *M. stramineus* was first recorded on *M. gallopavo* in Chile (Gonzalez-Acuna et al. 2009), in 2010 *M. ginglymura* was reported from *M. gallopavo* in Mexico (Camacho-Escobar et al. 2010). There are still a lot of ambiguities about feather mites and the diseases which are caused by them. *G. gigas*, *G. gallinae* and *A. persicus* were first reported on turkeys in the world from Iran. This first observation of ectoparasites

on turkeys in 2014 doesn't mean that there have been no ectoparasites on Iranian turkeys till now but it shows how little has been done and how many factors remain unidentified regarding turkey diseases.

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