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New records of ectoparasites from passerine birds in the High Tatras of Slovakia

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Abstract. During the summer of 2015, 52 passerine birds, representing 16 genera and 19 species were captured at a field site in the High Tatra Mountains, Tatranská Javorina, Slovakia. These birds were examined for ectoparasites, including chewing lice (Phthiraptera: Ischnocera), fleas (Siphonaptera), flies (Diptera: Hippoboscidae), and feather mites (Acari). A list of host-parasite associations is provided, along with data on parasite prevalence and intensity. Many of the records are known host associations, but two species of lice (one named, one unnamed) represent new host records.

Key words: Passeriformes, Phthiraptera, Ischnocera, Philopteridae, Ricinidae, Siphonaptera, Acari

Introduction

The High Tatras are a mountain range along the Slovakia-Poland border. We surveyed the ectoparasites of birds mist-netted in the High Tatras June-July 2015 at the Institute of High Mountain Biology (University of Žilina), which is situated in the small village of Tatranská Javorina, Slovakia. The site contains mature mixed deciduous and coniferous trees and small open fields with wildflowers, adjacent to a mountain stream. We concentrated primarily on chewing lice, which are permanent parasites that pass all stages of their life cycle on the body of the host (Clayton *et al.* 2015). The collecting method we used is particularly effective for quantifying populations of lice, as we describe below.

Material and Methods

Birds were captured with mist-nets placed on the grounds of the Institute of High Mountain Biology, Tatranská Javorina, Slovakia (49.266° N 20.143° E elevation 1000 m), during June and July of 2015. Each bird was processed on location. Ectoparasites were removed by placing each bird in a "fumigation chamber" or "anethesia jar" for at least 15 min., which is a standard method for removing ectoparasites from live birds (Clayton and Drown 2001). Briefly, a cloth collar was fitted around the neck of each bird and the body of the bird lowered into a wide-mouthed glass jar containing a cotton-ball soaked with chloroform. The chloroform vapors penetrated the bird's plumage and killed ectoparasitic arthropods, which were then collected by removing the bird from the fumigation chamber and ruffling its feathers over a clean white sheet of paper. This method is described in detail by Clayton and Drown (2001). Since the bird's head remained out of the jar during this process, each bird's head was visually examined and any parasites on the head were removed with forceps. This sampling method recovers most lice, as well as other ectoparasites like fleas and flies (Clayton and Walther 1997; Clayton and Drown 2001). However, it is less reliable for the removal of feather mites. We examined the flight feathers of each bird for mites, and preserved a sample of mites from infested birds.

To avoid cross-contamination, birds were held in clean paper-bags prior to fumigation, and the chambers and all working surfaces were carefully cleaned and inspected between birds. All recovered parasites were preserved in 95% ethanol, and are deposited in the Price Institute of Parasite Research (PIPeR) at the University of Utah, Salt Lake City, Utah, USA.

Results

A total of 52 passerine birds representing 16 genera and 19 species were examined (Table 1). Overall, 44.2% (23/52) birds were infested with at least one type of ectoparasite.

Lice

Lice were the most common ectoparasite. In all, 26.9% (14/52) of birds were infested with lice. Ten species of feather lice were recovered (Table 2): four species in the *Brueelia*-complex (*Brueelia* spp., and *Guimaraesiella* spp.) (Gustafsson and Bush 2017), five species of *Philopterus*, and one species of *Ricinus*. All of these genera are already known to be associated with passerines; however, two of the species collected represent new host records: *Philopterus fringillae* ex. *Pyrrhula pyrrhula* (Eurasian bullfinch), and *Philopterus* sp. ex. *Carduelis spinus* (Eurasian siskin).

Bird species	# Birds examined	Lice	Fleas	Flies	Mites •
		# Birds infested (Louse intensity*)	# Birds infested (Flea intensity*)	# Birds infested (Fly intensity*)	# Birds infested
Carduelis carduelis	3	0	0	0	-
Carduelis spinus	4	2 (8-11)	0	0	-
Carpodacus erythrinus	1	0	0	0	-
Erithacus rubecula	2	0	1 (1)	0	1
Fringilla coelebs	4	3 (19-92)	0	0	-
Motacilla cinerea	1	0	1 (3)	0	1
Muscicapa striata	2	0	0	0	1
Parus major	7	0	0	1 (1)	-
Periparus ater	2	0	0	0	-
Phoenicurus ochruros	4	0	1 (1)	0	2
Phylloscopus collybita	2	0	0	0	-
Poecile montanus	4	0	0	0	-
Prunella modularis	4	3 (1-15)	1 (1)	0	-
Pyrrhula pyrrhula	1	1	1 (6)	0	-
Serinus serinus	1	0	0	0	1
Sylvia atricapilla	1	0	0	0	2
Turdus merula	2	1 (160)	1 (6)	0	-
Turdus philomelos	1	0	0	0	-
Turdus pilaris	4	4 (3-89)	0	0	-
Total	**52**	**14**	**6**	**1**	**8**

* Intensity reported as the range in number of parasites infesting individual birds.
• Intensity not reported for mites because many mites remained on the flight feathers after fumigation. The number of birds infested with mites is based on visual examination of the flight feathers of each bird.

Table 1. List of ectoparasites recovered from birds in the study.

Host	Lice *	# Birds infested	Mean intensity (range)
Carduelis spinus	*Brueelia chrysomystris*	1	10.0
	Philopterus sp. *	2	4.5 (1-8)
Fringilla coelebs	*Brueelia kluzi*	1	87.0
	Philopterus fortunatus	3	18.7 (5-32)
Prunella modularis	*Philopterus modularis*	3	6.0 (1-15)
Pyrrhula pyrrhula	*Philopterus fringillae* *	1	7.0
Turdus merula	*Guimaraesiella amsel*	1	160.0
Turdus pilaris	*Guimaraesiella marginata*	4	25.8 (3-87)
	Philopterus bischoffi	1	2.0
	Ricinus elongatus	1	1.0

* New host record

Table 2. Summary of host-louse associations.

The unnamed *Philopterus* was a unique morphospecies found on two different host individuals. No lice in the genus *Philopterus* are known from this host (Price *et al.* 2003), so this may be a new species.

Other ectoparasites

Fleas (Siponaptera) were found on 11.5% (6/52) of the birds, and a single hippoboscid fly (Diptera) was found on one of the 52 birds. Feather mites (Acari) were found on 15.4% (8/52) of the birds.

Discussion

A study of avian ectoparasites by Sychra *et al.* (2011) examined the ectoparasites of passerine birds captured near the Sub-Beskidian Hills of the Czech Republic (49° 34'N, 17° 59E, elev. 400m). Sychra *et al.* (2011) examined 16 avian species, nine of which were species we also examined in this study: *Fringilla coelebs*, *Parus majer*, *Periparus ater*, *Phylloscopus collybitta*, *Prunella modularis*, *Pyrrhula pyrrhula*, *Sylvia atricapilla*, *Turdus merula*, and *Turdus philomelos*. Sychra *et al.* (2011) ob-

served the following prevalence of parasites: lice = 15.3% (autumn, 2005) and 13.5% (spring, 2007); fleas = 0.8% (autumn, 2005) and 2.9% (spring, 2007); hippoboscid flies = 0% (spring, 2007). In comparison, we observed a higher prevalence of all three of these ectoparasitic insects in our study: lice = 26.9%, fleas = 11.5%, and flies = 1.9%. Many factors could be responsible for these differences, such as differences in locality, season, host species composition, etc. In both studies, however, lice were the most commonly observed ectoparasitic insects.

We found species of lice that are new host records (Table 1), and one may be a new species (*Philopterus* sp. ex. *Carduelis spinus*). Additional taxonomic work is required to make that determination.

In addition to ectoparasitic insects, we found feather mites on 15.4% of the birds in our study, which is probably an under estimate of true mite prevalence. Our estimate is based on examination of feather mites on the flight feathers of the wings, yet mites are known to inhabit other microhabitats on the body of the bird. For example, a single parrot species (*Aratinga holochlora*) was infested with at least 25 species of feather mites, and probably hosted several species of skin mites, nest mites, quill mites, and nasal mites (Perez 1995; 1997). Future surveys that screen more carefully for mites will likely reveal a higher prevalence of mites than we documented.

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