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Feather Mites: A Slight Negative Correlation with Physiological Condition

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Summary

Feather mites are found on most species of birds and the birds captured at SWAMP in Lake Forest, IL are no exception. However, little is known about their biology, and there is an ongoing debate on whether or not feather mites are parasites. We examined three years of SWAMP data for eleven species to determine whether or not feather mite infestation is correlated with poor physiological condition. We found that in a few cases feather mites are significantly related to birds with poorer physiological condition. In these few cases, birds had a reduced wing average wing length, reduced fat score, or a reduced average weight. Feather mites seem to be parasitic or at the very least they may be correlated with negative physiological conditions. In the future a more precise feather mite scoring will provide a better basis for comparison.

Introduction

Feather mites are abundant on many different species of birds, but their biology is very poorly known. All mites known as feather mites are in the suborder Astigmata; many of them are known to be harmful, such as members of the families Knemidocoptidae, which are skin parasites, and Laminosioptidae, which live inside the quills (Proctor 2003). Feather mites in the superfamilies: Analgoidea, Freyanoidea and Pterolichoidea, are considered to be "true" feather mites (Proctor 2003). Some sources describe these as harmless commensals of birds, while others consider them to be harmful ectoparasites. We set out to determine whether or not feather mites infestations are correlated with poor physiological condition indicators in migrant songbirds passing through northeast Illinois in spring.

Some have suggested that feather mites are not harmful. Among the true feather mites there is evidence that feather mites in the superfamilies Analgoidea and Pterolichoidea do not eat the actual feather of their host (Proctor 2003). 26 species of feather mites had only oil, various skin flakes and feather fragments as well as spores in their stomachs. The fragments are mostly particles that get caught in the uropygial gland oil that the feather mites eat (Proctor 2003). The eating of this oil probably does not affect the bird. In fact, it may actually benefit the bird by helping to clean the feathers. Also they may benefit the birds by competing for space with actual parasites (Blanco 1999).

Some have found evidence that feather mites are harmful. Barn Swallows with lower levels of mites (Ornithonyssus bursa) were found to have greater success when mating (Lehmann 1993). Perez-Tris (2002) also found that Blackcap's tail feathers were duller after molt when a bird was heavily infested with mites. Harper (1999) found that European species such as the robin and wren in Harper's study had shorter wing lengths after molt when then were heavily infested with feather mites.

Thompson et al. (1997) demonstrated that Analgoid feather mites in the family Proctophyllodidae were harmful to House Finches in California. His study found that heavily infested House Finches had duller plumage and shorter wing lengths. Many birds choose their mates based upon the brightness of their plumage. Thompson et al. (1997) suggested dull plumage of infested birds may be a sexual selection mechanism allowing females to select against unfit males.

Female birds are most often the sex that pick their mate based upon appearance. Males, ironically, happen to be the more infested of the sexes (Hartup et al. 2004). Feather mites are relatively difficult for the birds to get rid of; they are capable of avoiding molting feathers (Jovani and Serrano 2001). If feather mites do affect the plumage coloration, females have an advantage when choosing their mate. Since feather mites are most commonly transferred by direct contact (Jovani 2001), females can choose the showiest male and more likely than not the bird will have a low infestation of feather mites.

One possible harmful effect of feather mite infestation on birds is that the feather mite mass can reach up to 10% of the wing mass of their host (Blanco 2001). This may tax a bird, especially if the bird is migrating. However, the wing mass is only a fraction of the total weight of the bird, thus, this effect is probably minimal (Blanco 2001). Other possible negative effects feather mites may have on birds is reducing aerodynamic and/or waterproofing properties of feathers (Bridge 2003). These are not well studied theories but they are possible outcomes of feather mite infestations.

Some have suggested that feather mites might be correlated with poor condition, not cause it. Thompson et al. 1997, Harper 1999, and Clayton 1991 conducted studies that found feather mites on birds in poor physiological condition, but feather mites may be an indicator of a bird in poor condition, not the cause. Bridge (2003) found that mite densities are negatively correlated with host size and body condition but believes that it is not because feather mites are parasitic. Birds that have other parasites, such as lice or blood parasites may not be able to spend as much time preening and therefore they may have more feather mites (Blanco et al. 2001, Perez-Tris et al. 2001). Even if feather mites are an effect rather than a cause of poor physiological condition, it is still suggestive of a negative relationship between bird and mite. Were it a neutral relationship there should be no correlation between infestation and physiological condition.

The bottom line is feather mites have been studied in few species and there are lots of ideas but little knowledge. The correlations between feather mites and poor physiological condition are not well studied, they may not hold true for all species. I looked at SWAMP data to see if there was a relationship

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between feather mites and indicators of physiological condition such as wing length, weight and fat in the birds that were captured at SWAMP.

Results

Number of birds infested

Out of 1788 total birds from the selected species, 216 were infested with feather mites. This is over 10% of the birds captured at SWAMP from 2002-2004. Figure 1 shows the percentage of individuals of each species that were infested with feather mites. The Swainson's thrush had the greatest number of captures and the highest percentages infested with feather mites, 59 of 248 birds.

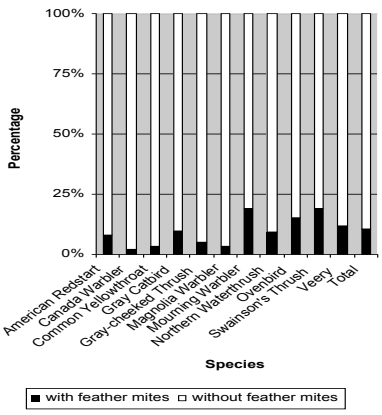

Figure 1.
Percentage of individuals infested with feather mites for eleven species (see text) caught during spring migration at the SWAMP banding station in Lake Forest, IL during 2002-2004.

12% of total birds were infested. The species that was most infested was the Swainson's thrush at 23.8%.

Effects on Physiological Condition

Table 1 shows the mean wing, weight and fat scores for infested and uninfested individuals of each species. Few of the comparisons between infested and uninfested birds were statistically significant but the number of birds recorded with feather mites was relatively small. There were four significant comparisons, one for weight, two for fat and one for wing length. Although there were only a few significant comparisons, each of them were negative relationships.

Identification

We had a May Swainson's thrush window kill from near the study site that was infested with feather mites. These feather mites were sent to Dr. Heather Proctor and they were identified as Pterodectes sp. from the superfamily Proctophyllodidae.

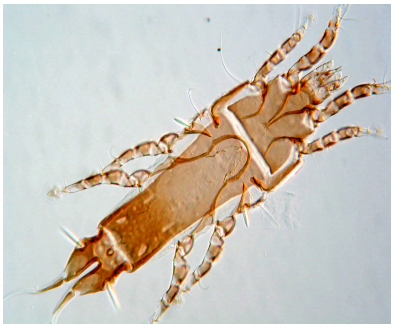

Figure 2.
Pterodectes sp. female from the swainson thrush window kill near study site. Identified by Dr. Heather Proctor.

Table 1.
Mean ± S.E. weight, fat and wing of infested and unifested birds of eleven species captured at the SWAMP banding station in Lake Forest, Il during 2002-2004. The asterisk represents statistically significant differences between infested and uninfested birds (two-way t-tests, $p \leq 0.05$).

Species	Weight mean w/feather mites	Weight mean w/out feather mites	fat mean w/feather mites	fat mean w/out feather mites	wing mean w/feather mites	wing mean w/out feather mites
American Redstart	8.77 ± 0.23	8.53 ± 0.08	0.54 ± 0.14	0.72 ± 0.05	59.46 ± 0.81	60.14 ± 0.22
Canada Warbler	10.50 ± 0.50	10.49 ± 0.15	0 *	0.38 ± 0.05	63.00 ± 2.00	63.68 ± 0.27
Common Yellowthroat	9.60 ± 0.24	10.15 ± 0.09	0 *	0.50 ± 0.05	54.00 ± 1.64	54.05 ± 0.24
Gray Catbird	35.25 ± 0.75	36.28 ± 0.21	O.45 ± 0.11	0.69 ± 0.04	87.50 ± 0.57	88.40 ± 0.24
Gray-cheeked Thrush	37.00 ± 3.06	36.18 ± 0.74	1.33 ± 0.33	1.57 ± 0.08	93.67 ± 8.35	101.22 ± 0.53
Magnolia Warbler	8.88 ± 0.30	8.59 ± 0.07	0.50 ± 0.19	0.66 ± 0.04	57.00 ± 0.80	58.13 ± 0.25
Mourning Warbler	12.56 ± 0.32	12.50 ± 0.16	0.53 ± 0.15	0.52 ± 0.06	59.84 ± 0.48	59.85 ± 0.27
Northern Waterthrush	17.48 ± 0.44	17.36 ± 0.15	0.32 ± 0.10	0.57 ± 0.04	74.08 ± 0.44	73.71 ± 0.20
Ovenbird	20.23 ± 0.24	19.69 ± 0.18	0.86 ± 0.09	0.69 ± 0.04	73.09 ± 0.33	73.04 ± 0.19
Swainson's Thrush	33.75 ± 0.55	34.19 ± 0.33	1.41 ± 0.08	1.40 ± 0.05	95.61 ± 0.37 *	96.41 ± 0.21
Veery	31.32 ± 0.56*	32.88 ±. 0.31	0.95 ± 0.12	1.09 ± 0.05	94.79 ± 0.86	95.38 ± 0.28

Discussion

Physiological Condition Correlations

We found limited evidence that feather mite infestations are correlated with poor physiological condition. We note that few species showed statistically significant differences between infested and unifested. However, we did find some evidence of correlation in all three physiological indices, and always in the direction predicted by parasite hypothesis.

The Swainson's thrush had a significant wing length difference between birds with feather mites and birds without feather mites. The birds with feather mites had a shorter wing length mean. This agrees with the studies Harper (1999) and Thompson (1997) conducted. The result may be even more significant because the birds were not sexed and males tend to have longer wings than females. Males also tend to be more likely infested with feather mites. If the majority of the infested swainson thrushes were male, one would expect the average wing length to be longer not shorter. The fact that the mean of infested swains on thrushes is smaller may mean the result is more significant. The infested population may be mostly male birds but their wings may be shorter because of their feather mite infestations.

There are only a few studies that look at feather mites and the birds they inhabit. None of the birds I looked at have ever been in one of these studies. The feather mites on these birds are from the family Proctophyllodidae. This family is in the true feather mite category developed by Proctor (2003) and they are also the family on feather mites in Thompson's study (1997).

Future of SWAMP

Behnke et al. (1999) developed a scoring system for feather mites and SWAMP is going to adopt a similar system. The limited patterns seen may be due to the crude feather mite quantification up to now at SWAMP. By employing a new scoring system we hope to gather more detailed information for future analysis.

Experimental Procedures

We used data from May captured birds at the SWAMP spring migrant banding station in Lake Forest, IL for the years 2002-2004 (see Gordon et al. 2002). Presence or absence of feather mites was noted on all captured birds. We used fat, wing chord, and weight as indices of physiological condition. Fat was scored on a 0 – 2 scale. Birds scoring a 0 had no fat at all and birds scoring a 2 had bulging fat in their furcular hollow and in their vent and wingpits. The birds scoring a 1 had some fat in at least one of these places. The wing chord was measured by a ruler to the nearest mm. Birds were weighed to the nearest gram using spring scales. Eleven species were selected for this analysis from the SWAMP data set based on at least 50 captures per species and more than one of the captures infested with feather mites.

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