ECTOPARASITES (PHTHIRAPTERA: PHILOPTERIDAE; ACARI: IXODIDAE) OF COMMON NIGHTHAWK, *CHORDEILES MINOR,* AND WHIP–POOR–WILL, *CAPRIMULGUS VOCIFERUS* (CAPRIMULGIFORMES: CAPRIMULGIDAE), IN MANITOBA

T. D. GALLOWAY
Department of Entomology, University of Manitoba,
Winnipeg, Manitoba, Canada R3T 2N2
email: Terry_Galloway@umanitoba.ca

Abstract *J. ent. Soc. Ont.* 137: 5-11

Samples of 103 salvaged Common Nighthawks (*Chordeiles minor* (Forster)) and seven Whip–poor–wills (*Caprimulgus vociferous* Wilson) were examined for ectoparasites in Manitoba during 1992-2004. Two nighthawks were infested with the rabbit tick, *Haemaphysalis leporispalustris* (Packard), and 64 (62.1%) with the chewing louse, *Mulcticola macrocephalus* (Kellogg), at a mean intensity of 13.5. Louse infestation fits a negative binomial distribution (k=0.299; mean/variance ratio=18.5); females outnumbered males in the total sample, males:females=0.66. Prevalence of infestation was lower in adult birds examined during May and June (37.5%; n=16) than in mixed–age birds examined from 31 July to December (64.7%; n=85), though mean intensity was similar (17.7 versus 13.6, respectively). Two of seven Whip–poor–wills were infested with an undescribed *Mulcticola* sp.

Published July 2007

Introduction

Many people are familiar with the two species of goatsuckers (Caprimulgiformes: Caprimulgidae) found in Manitoba. Common Nighthawks, *Chordeiles minor* (Forster), are usually seen flying erratically high overhead in their search for aerial prey, particularly at dusk on warm summer evenings. Their distinctive call and white patches on the undersides of their wings make them readily identifiable, and they are unlikely to be confused with any other species. The Whip–poor–will, *Caprimulgus vociferus* Wilson, makes the familiar, "Whip–poor–will! Whip–poor–will! Whip–poor–will!" call that has kept many a camper awake into the wee hours of the morning. As familiar as these birds may be, few people have seen them up close. Both are secretive during the day and well camouflaged so that detection is difficult. The greatest chance of seeing a nighthawk on the ground might be when an injured bird is found, although occasionally they rest in the open (Taylor and Holland 2003). Despite their abundance in North America, details of the biology of the Common Nighthawk and the Whip–poor–will are poorly known (Poulin et al. 1996; Cink 2002).

Apart from the original description of the chewing louse, *Mulcticola macrocephalus* (Kellogg) (Phthiraptera: Philopteridae), there is very little known about ectoparasites of the Common Nighthawk and Whip–poor–will in North America. During a survey of the ectoparasites associated with birds in Manitoba, I had the opportunity to examine a relatively large sample of nighthawks and a small number of Whip–poor–wills. Given our poor knowledge of parasites associated with these species, and that there is evidence that bird populations may be in decline in many areas (Wedgewood 1992; Poulin et al. 1996; Taylor 1996; Cinc 2002), a close examination of data collected from the survey was warranted.

Undergraduate entomology majors at the University of Guelph back in the early 1970's had a great deal of contact with Dave Pengelly. His Natural History of Insects course was often the one to ignite the passion for insects so characteristic of the time, and his courses in Insect Taxonomy and Aquatic Entomology required collections of insects that became the obsessions of so many of us. He was always around and always encouraging to the students struggling with their collections or with their thoughts on insects. Dave always seemed interested in what insects were where and what it was they did. Many times, he mentioned to me that there were few people working on lice, and that someone should do something about them in Canada. For that reason, I like to think he would have enjoyed reading this paper, and I dedicate it to his memory, with many thanks for his continued support and friendship over the years.

Methods

Birds were salvaged from a number of sources, primarily from the Manitoba Wildlife Rehabilitation Organization's hospital (MWRO) at the Glenlea Research Station (Faculty of Agricultural and Food Sciences), and from Manitoba Conservation's office in Winnipeg under a scientific collecting permit issued by the Canadian Wildlife Service. A few birds were found dead by members of the public. No attempt was made to sex or age the birds. Each bird was individually bagged immediately after death and frozen to kill all ectoparasites. Ectoparasites were collected from two nighthawks examined early in the survey (1992-1993) by ruffling the feathers of each over a white enamel pan. Subsequently examined birds were washed in warm, soapy water and ectoparasites were collected using methods described in Mironov and Galloway (2002). Ectoparasites were preserved in 70% ethanol, and slides of representative specimens of chewing lice were made throughout the study using the method described by Richards (1964). Terminology of Margolis et al. (1982) is adopted here for infestation parameters; prevalence (percentage of hosts infested) and mean intensity (mean number of lice per infested host) are reported for parasitism by *M. macrocephalus*.

Calculations and comparisons of infestation parameters were conducted using Quantitative Parasitology 2.0, according to Rózsa et al. (2000). Voucher specimens are deposited in the J. B. Wallis Museum of Entomology (Department of Entomology, University of Manitoba, Winnipeg, Manitoba R3T 2N2) and in the Canadian National Collection (Agriculture and Agri–Food Canada, Ottawa, Ontario K1A 0C6).

Results

Common Nighthawk

During the period of this survey, 1992-2004, 103 nighthawks were examined from 25 known localities in Manitoba. Numbers of birds examined each year of the survey were as follows: 1992–1, 1993–1, 1994–4, 1995–17, 1996–3, 1997–12, 1998–4, 1999–17, 2000–7, 2001–12, 2002–4, 2003–6, 2004–14, plus one bird with no known collection year. Most birds (n=65) were found in Winnipeg, additionally with four from Glenlea, two each from Headingley, Niverville, and Selkirk, and one bird each from the following localities: Tooth Lake, Lockport, Stony Mountain, Camp Shilo, Portage la Prairie, St. Laurent, Dauphin, Clandeboye, Great Falls, Cartier, Grosse Isle, Sanford, Morris, Richot, Beausejour, Roblin, Morden, West St. Paul, Moosehorn, and Îles des Chênes. There were no associated locality data for eight birds, though these birds were found in Manitoba. Relatively few birds were collected during spring migration or during the breeding season (n=16) when only adult birds would be expected: May–2; June–14. Most birds were submitted during the latter part of the season, during the period of return migration (n=85), when a mixture of adults and young of the year would be included in the samples: July–1 (this bird died on 31 July); August–53, September–29, November–1, December–1. Two birds had no reliable dates of collection.

Diversity of ectoparasites was relatively low. Two nighthawks were each infested with one rabbit tick nymph, *Haemaphysalis leporispalustris* (Packard), one from Winnipeg, 26 July 1999, and the other from Moosehorn, 5 September 2004. The only insect ectoparasites collected were the chewing lice, *M. macrocephalus*, a specific parasite of Common Nighthawk (Price et al. 2003), and *Columbicola columbae* (Linnaeus). Only one bird was infested with *C. columbae* (1♂; 1♀), which is a parasite of Rock Pigeon, *Columba livia* Gmelin; this infestation is likely a contamination and is not considered further.

In the total sample of birds, 62.1% (n=64) were infested with *M. macrocephalus* (95% exact confidence limits: 51.1%-70.6%) and the mean intensity of infestation was 13.5 (95% bootstrap confidence limits: 10.72-16.89). The most heavily infested bird carried 60 lice, and 19 birds (18.5%) carried more than 20 lice. The infestation of lice among all hosts fits a negative binomial distribution (k=0.299, $P \leq 0.05$; variance/mean ratio=18.5), and the Index of Discrepancy (D) was 0.693. Median intensity of infestation was 8.0.

The male:female sex ratio was 0.66. Of 874 *M. macrocephalus* collected over the entire study, 191 (21.9%) were males, 272 (31.1%) were females, and 411 (47.0%) were nymphs. The sex ratio for lice collected during May and June was 0.28, largely the result of disproportionate numbers of females on two birds (one with 19 females and no males, the other with 21 females and 3 males). For lice collected from mixed–age birds during July to August, the sex ratio was 0.80. The proportion of nymphs collected during these corresponding time periods were not substantially different, 43.9% versus 47.8%. Among the 14 birds that were infested with at least one female louse but no males, 6 were accompanied by at least one nymph, and there were no nymphs found on 8 birds. Only 4 birds were infested with males but no females, 2 of which had no nymphs. Three infested birds had 1, 2, and 5 nymphs, but no adult lice.

Among the 16 adult birds examined during May and June, only 6 (37.5%; exact confidence limits=15.2%-64.6%) were infested, with a mean intensity of 17.8 (95% bootstrap

confidence limits: 6.33-30.83). Prevalence was significantly higher (χ^2=4.167; *P*=0.041) among the mixed age birds examined during July to December, when prevalence was 64.7% (exact confidence limits=53.6%-74.8%). There was no significant difference (bootstrap *P*=0.56) in mean intensity of mixed–age (13.6; bootstrap confidence limits=10.51-17.44) compared to adult birds collected during May and June.

Whip–poor–will

Only seven Whip–poor–wills were examined over the survey period: four from Winnipeg, one each from Portage la Prairie and Grunthal, and one from Manitoba, but with no specific locality data. Three birds were examined in 1995 and one each in 1996, 1997, 2001, and 2003. None of the birds were sexed or aged, but four were submitted in May to early July, and would likely have been adults. Two birds (Portage la Prairie, 1 July 1995–2 nymphs; Winnipeg, 30 August 2001–1♂; 1♀) were infested with an undescribed *Mulcticola* sp. Too few specimens are available for a formal description of this new species.

Discussion

As Dave Pengelly so often told me, "It's surprising what you find if you take the time to look." This study has been a perfect example. There are no published records of ectoparasites of the Common Nighthawk (other than a record of *Pseudolychnia brunnea* (Latreille) (Hippoboscidae) in Ontario (Bequaert 1955; Wheeler and Threlfall 1989)) or the Whip–poor–will in Canada, and there is only one report of an unidentified louse on approximately 2% of Whip–poor–wills examined in Kansas (Cinc 2002). Although the rabbit tick, *H. leporispalustris*, commonly infests a variety of ground dwelling birds in Manitoba (Kgoroba 1980), I know of no records for this tick infesting *Chordeiles minor*.

Whip–poor–wills are very seldom submitted to the MWRO and are not particularly common in cities or towns. As a result, there are few data available on their ectoparasites; I can only offer encouragement to others who may be in a position to examine this species, in the chance that additional specimens of the *Mulcticola* sp. might be collected. That two of seven birds examined in Manitoba were infested with lice is clear indication that further searches will be productive.

Chordeiles minor on the other hand, is a commonly seen bird even in cities where they frequently nest on roofs of suitable buildings. They are abundant where people live and where people are likely to find disabled birds to submit to a wildlife hospital facility. This is clearly indicated by the overwhelming proportion of the birds examined in this study which came from Winnipeg (68% of the birds from known localities). Galloway (2005) discussed some of the advantages and disadvantages of relying on salvaged birds for the study of their parasites, and the efficacy of the method of collecting lice from salvaged birds is certainly acceptable (Clayton and Drown 2001). However, in the present study, there are a number of factors to keep in mind while interpreting infestation parameters. The data reported here were pooled from birds salvaged over a thirteen year span, with one to 17 birds examined in any given year, and mostly from the five month period of spring to fall migration. Although most of the birds were found in Winnipeg, the remainder (n=30) were from other locations, or from no known location (n=8). Clearly, any conclusions drawn

from this dataset may only be indicative, and additional information from more intensive and controlled sampling is desirable. Having said this, given the nature of the host, this may be difficult to accomplish, and therefore it is useful to make some cautious observations from the data at hand.

Common Nighthawks are relatively long–lived birds, the life span generally being four to five years, but birds have been recorded to live up to nine years (Dexter 1961). They are largely solitary, though they do migrate in fall in large flocks through Manitoba (Taylor and Holland 2003). Opportunities for exchange of lice during this period or on the wintering grounds are unknown, but lice can certainly be transferred during mating and from parents to offspring; males are known to roost together (Poulin et al. 1996) and lice may disperse from one host to another at this time as well. Nothing is known about the longevity of *M. macrocephalus*. All of these factors could lead to the relatively high prevalence of infestation (61.2%) observed, in addition to the possibility that birds which are submitted to a wildlife rehabilitation facility may inherently be more heavily infested as a result of their injuries or disabled condition.

Mulcticola macrocephalus infestations on Common Nighthawk conformed to a negative binomial distribution. This is not particularly unusual, and this level of aggregation has been demonstrated in infestations of many species of lice on birds (e.g., Eveleigh and Threlfall 1976; Rósza et al. 1996). The more interesting manifestation was in its prevalence. The sample of infested adult birds during May and June was admittedly small (6 of 14), but among these birds, there was a substantial proportion of the *M. macrocephalus* population made up of juveniles, about 44%, not substantially different from that found on the mixed–age birds sampled later in the season (about 48%). From this, it is reasonable to conclude that the lice are actively reproducing at the time the birds return to the breeding ground. However, the proportion of males relative to females on those adult birds (0.28) was lower than on mixed–age birds (0.80), though females usually outnumbered males (in 37 of 63 infested birds), sometimes considerably. Without knowing something about factors affecting mortality in males versus females, or relative longevity in each sex, it is difficult to speculate on the reasons for this skewed sex ratio, though it has been suggested that by the very nature of louse populations on solitary birds, a bias for females should be favoured (Clayton et al. 1992; Rózsa et al. 1996). Among these same adult birds in which numbers of males were low, prevalence of infestation was also significantly lower than among mixed age birds sampled later in the year (37.5% versus 64.7%). Perhaps the opportunities to acquire additional lice during the non–breeding season are not particularly great, and some birds infested with few lice may lose their infestation. Nearly one third of the infested birds (31.8%) had five or fewer lice, and many of these had either just one louse (n=7), or adult lice of only one sex (n=3). Among these latter birds, in the presumed absence of parthenogenesis in *M. macrocephalus*, and unless single adult females were already mated, it would seem that these populations of lice have a high probability of extirpation, in the absence of recruitment from some other infested host. During the non–breeding season, it is likely that opportunities for reinfestation or supplementation of a small population of lice are not great, and as a consequence, prevalence of infestation in birds returning to the breeding ground may be at its lowest of the year.

Populations of Common Nighthawk are reported to be in decline (Poulin et al. 1996; Murphy 2003). A number of researchers have drawn attention to conservation issues related

to ectoparasites (Rósza 1992; Stork and Lyal 1993; Windsor 1995; Whiteman and Parker 2005). However, despite being monoxenous, it is unlikely that the continued occurrence of *M. macrocephalus* is threatened, given its high prevalence on Common Nighthawk, unless there is a precipitous decline in host populations. There are insufficient data from surveys of Whip–poor–will to provide a clear indication of trends in their populations (Cink 2002); it is not possible to speculate on the status of *Mulcticola* sp.

The most obvious benefit of the opportunity to examine salvaged birds is to gain access to samples, sometimes quite large, of host species that are otherwise difficult or impossible to sample intensively. From this, we gain an appreciation of the diversity of the fauna of ectoparasites to be found. This also allows some insight into the nature of the interaction and biogeographic relationship between these ectoparasites and their hosts.

Acknowledgements

Special thanks go to the hospital staff at the Manitoba Wildlife Rehabilitation Organization at Glenlea, and especially to Lisa Tretiak, who have provided so much care and assistance over the years in initial processing of the birds. I also thank staff at Manitoba Conservation for allowing me to examine specimens from their freezers and the Canadian Wildlife Service for the scientific permit. Dave Holder has been involved with the ectoparasite survey since its inception and provided unflagging technical support throughout. Additional assistance in the lab was provided by Lisa Babey and Debra Wytrykush. Ricardo Palma (Museum of New Zealand Te Papa Tongarewa) provided valuable comments on the manuscript. Funding for part of this study was provided by a Discovery Grant from the Natural Sciences and Engineering Research Council of Canada.

References

Bequaert, J. C. 1955. The Hippoboscidae or louse–flies (Diptera) of mammals and birds. Part II. Taxonomy, evolution and revision of American genera and species. Entomologica Americana 35: 233-416.

Clayton, D. H. and D. M. Drown. 2001. Critical evaluation of five methods for quantifying chewing lice (Insecta: Phthiraptera). Journal of Parasitology 87: 1291-1300.

Clayton, D. H., R. D. Gregory, and R. D. Price. 1992. Comparative ecology of Neotropical bird lice (Insecta: Phthiraptera). Journal of Animal Ecology 61: 781-795.

Cinc, C. L. 2002. Whip–poor–will (*Caprimulgus vociferus*). *In* The Birds of North America, No. 620. A. Poole and F. Gill (eds.), The Birds of North America, Inc., Philadelphia, PA.

Dexter, R. W. 1961. Further banding and nesting studies of the Common Nighthawk. Bird–Banding 32: 79-85.

Eveleigh, E. S. and W. Threlfall. 1976. Populations dynamics of lice (Mallophaga) on auks (Alcidae) from Newfoundland. Canadian Journal of Zoology 54: 1694-1711.

Galloway, T. D. 2005. Ectoparasites from native and introduced birds from Christchurch and surrounding areas, New Zealand. Tuhinga – Records of the Museum of New

Zealand Te Papa Tongarewa 16: 13-20.
Kgoroba, K. G. 1980. A study of the seasonal population dynamics of the ticks *Dermacentor variabilis* (Say) and *Haemaphysalis leporispalustris* (Packard). M.Sc. thesis, University of Manitoba, Winnipeg, Manitoba, Canada. 203 pp.
Margolis, L., G. W. Esch, J. C. Holmes, A. M. Kuris, and G. A. Schad. 1982. The use of ecological terms in parasitology. Journal of Parasitology 68: 131-133.
Mironov, S. V. and T. D. Galloway. 2002. Four new species of feather mites (Acari: Analgoidea). The Canadian Entomologist 134: 605-618.
Murphy, M. T. 2003. Avian population trends within the evolving agricultural landscape of eastern and central United States. The Auk 120: 20-34.
Poulin, R. G., S. D. Grindal, and R. M. Brigham. 1996. Common Nighthawk (*Chordeiles minor*). *In* The Birds of North America, No. 213. A. Poole and F. Gill (eds.), The Academy of Natural Sciences, Philadelphia and the American Ornithologists' Union, Washington, D.C.
Price, R. D., R. A. Hellenthall, R. L. Palma, K. P. Johnson, and D. H. Clayton. 2003. The chewing lice: world checklist and biological overview. Illinois Natural History Survey Special Publication 24. x + 501 pp.
Richards, W. R. 1964. A short method for making balsam mounts of aphids and scale insects. The Canadian Entomologist 96: 963-966.
Rózsa, L. 1992. Points in question: endangered parasite species. International Journal of Parasitology 22: 265-266.
Rózsa, L., J. Reiczigel, and G. Majoros. 2000. Quantifying parasites in samples of hosts. Journal of Parasitology 86: 228-232.
Rózsa, L., J. Rékasi, and J. Reiczigel. 1996. Relationship of host coloniality to the population ecology of avian lice (Insecta: Phthiraptera). Journal of Animal Ecology 65: 242-248.
Stork, N. E. and C. H. C. Lyal. 1993. Extinction or 'co–extinction' rates? Nature 366: 307.
Taylor, P. 1996. Apparent decline of migrant Common Nighthawks near Pinawa, Manitoba. Blue Jay 54: 35-38.
Taylor, P. and G. E. Holland. 2003. Whip–poor–will. *In* The Birds of Manitoba, Manitoba Naturalists' Society, Friesens Printers. p. 239.
Wedgewood, J. 1992. Common Nighthawks in Saskatoon. Blue Jay 50: 211-217.
Wheeler, T. A. and W. Threlfall. 1989. Synopsis of parasites of vertebrates of Canada. Ectoparasites of birds. Alberta Agriculture. v + 85 pp.
Whiteman, N. K. and P. G. Parker. 2005. Using parasites to infer host population history: a new rationale for parasite conservation. Animal Conservation 8: 1-7.
Windsor, D. A. 1995. Equal rights for parasites. Conservation Biology 9: 1-2.