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ECTOPARASITES OF THE SPOTTED OWL

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ABSTRACT.—We conducted a survey of spotted owl (*Strix occidentalis*) ectoparasite richness by examining live and museum specimens of the three subspecies of spotted owl. Seven ectoparasite species from five arthropod orders were collected. A tick (*Dermacentor occidentalis*), a mite (*Euschoengastia* sp.), and a flea (*Opisodasys vesperalis*) were collected, but were presumed to be accidental strays from prey. *Strigiphilus* lice were found on all the subspecies of spotted owl, while the louse *Kurodaia magna* was only collected from the northern spotted owl (*S. o. caurina*). The hippoboscid fly *Icosta americana* was found on the California spotted owl (*S. o. occidentalis*); this species had previously been well documented in the northern subspecies. The only hippoboscid fly found infesting the Mexican spotted owl (*S. o. lucida*) was *Ornithoica vicina*.

KEY WORDS: *ectoparasites;* Icosta americana; Kurodaia magna; Ornithoica vicina; *spotted owl;* Strigiphilus syrnii; Strix occidentalis.

Ectoparásitos de *Strix occidentalis*

RESUMEN.—Realizamos un estudio sobre la riqueza de ectoparásitos de tres subespecies de *Strix occidentalis*, a través del exámen de especímenes vivos y de museo. Se colectaron siete especies de ectoparásitos correspondientes a cinco órdenes de artrópodos. Entre las especies que se colectaron están *Dermacentor occidentalis, Euschoengastia* sp. y *Opisodasys vesperalis*, aunque presumimos que son accidentalmente arrastrados por las presas mayores de *S. occidentalis. Strigiphilus* se encontró en todas las subespecies de *S. occidentalis*, mientras que *Kurodaia magna* se colectó solamante en *S. o. caurina*, la especie del norte. *Icosta americana* se encontró en *S. o. occidentalis* de California; previamente también ha sido bien documentada en la subespecie del norte. *Ornithoica vicina* se encontró infectando a *S. o. lucida*.

[Traducción de Ivan Lazo]

Ectoparasites are a potentially important yet relatively unstudied aspect of avian biology. Ectoparasites can impair thermoregulatory ability (Booth et al. 1993), reduce nestling body mass and survivorship (Møller 1990), influence sexual selection (Clayton 1990a), and transmit endoparasites and pathogens (Baker 1967, Clayton 1990a). Ectoparasites and their hosts also offer unique opportunities to study coevolution and community ecology, and can help elucidate phylogenetic relationships among related bird taxa (Marshall 1981).

The spotted owl (*Strix occidentalis*) has generated considerable scientific and political interest (USDI 1992). Consequently, all aspects of its biology are potentially important to biologists and managers. Recent surveys have described some endoparasites which infect spotted owls (Gutiérrez 1989, Hoberg et al. 1989, Hoberg et al. 1993, Young et al. 1993). We initiated a survey of spotted owl ectoparasite richness, including each of the three subspecies (AOU 1957).

METHODS

Between 1987 and 1993 approximately 1000 spotted owls were captured and released during demographic studies in northwest California (Franklin et al. 1990), the central Sierra Nevada of California (Bias and Gutiérrez 1992), and central Arizona. Birds from these areas represented the northern (*S. o. caurina*), California (*S. o. occidentalis*), and Mexican (*S. o. lucida*) subspecies, respectively. Ectoparasites from these birds were collected incidentally when they were encountered during routine banding and data collection. Because no systematic methodology or special equipment were used, we did not attempt to quantify the prevalence or intensity of ectoparasites using data from live owls. During 1993, however, we specifically examined 18 live Mexican spotted owls for hippoboscids. These birds were examined for about 5 min each, with each body region (front, back, head, wings) being searched by looking at the surface and by deflecting

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feathers. No magnification or forceps were used. We used these data to estimate prevalence as the proportion of Mexican spotted owls infested, and mean intensity as mean number of hippoboscids per infested owl.

We also examined 13 northern, 13 California, and 28 Mexican spotted owl museum skins for phthirapteran chewing lice. Many chewing lice will not abandon dead hosts, and will remain attached to feathers after the bird has been processed into a museum specimen (Marshall 1981). The host specificity and high mortality away from hosts exhibited by chewing lice (Marshall 1981) reduced the probability that secondary transfer occurred between museum specimens. Owl specimens examined were housed in the Museum of Vertebrate Zoology; Humboldt State University Collection; American Museum of Natural History; Smithsonian Institution, Southwest Forest Science Complex; and the Museum of Northern Arizona. Owl specimens were originally collected at locations scattered throughout their respective ranges, except for northern spotted owl specimens which came solely from northwest California. Each museum specimen was searched with the naked eye for about 20 min by looking at the surface and by deflecting feathers, and any lice found were removed with forceps. Estimates of louse prevalence were calculated using data from museum specimens only.

All ectoparasites collected were placed in 70% ethyl alcohol. Representative specimens of each taxon were identified by cooperating taxonomists of the United States Department of Agriculture's Systematic Entomology Laboratory in Beltsville, Maryland.

RESULTS AND DISCUSSION

Seven species from five arthropod orders were collected: one tick (Parasitiformes), one mite (Acariformes), one flea (Siphonaptera), two chewing lice (Phthiraptera), and two hippoboscid flies (Diptera). Given the limited scope of our survey, we are confident that other ectoparasite taxa are yet to be collected from spotted owls.

We considered three of the seven ectoparasite species as accidental on spotted owls, probably originating from prey items. A larval *Dermacentor occidentalis* (Acari: Ixodidae) and a nymphal *D. occidentalis* were collected from live northern spotted owls. Small mammals act as hosts for immature *D. occidentalis* throughout western California and Oregon (Kohls 1937). We also collected a larval *Euschoengastia* sp. (probably *E. numerosa*) mite (Acari: Trombiculidae) from a Mexican spotted owl museum specimen that was collected in Phoenix, Arizona. *Euschoengastia* show a preference for rodents; *E numerosa* larvae parasitize a wide variety of bird and mammal taxa (Wrenn and Loomis 1974). We observed, but were unable to collect, an unidentified flea on a live Mexican spotted owl, and we collected an *Opisodasys vesperalis* (Ceratophyllidae) from a live northern spotted owl. This flea is a common parasite of northern flying squirrels (*Glaucomys sabrinus*) in the Pacific Northwest (Lewis et al. 1988). True hosts for each of these ectoparasite species were listed by Forsman et al. (1984) as spotted owl prey. Accidental ectoparasites are of interest because colonization of new host species may be a result of repeated transfers from true to accidental hosts (Marshall 1981, Clayton 1990b).

We found lice on five (38.5%) of the northern, two (15.4%) of the California, and one (3.6%) of the Mexican spotted owl museum skins. A possible explanation for the greater percentage of northern spotted owl museum specimens with lice was that based on specimen labels, most of these owls were collected after being found dead or injured. The single Mexican spotted owl museum specimen with lice was found dead, while all the remaining Mexican and California specimens were apparently healthy when they were collected. Unhealthy hosts often have higher louse loads, presumably as a result of decreased grooming activity (Marshall 1981). Any effect of Phthiraptera on spotted owls is unknown.

We collected *Strigiphilus syrnii* (Ischnocera: Philopteridae) from both live and museum specimens of northern spotted owls, and *Strigiphilus* sp. lice from museum specimens of California spotted owls that were collected in Mariposa County, California, but none from live California spotted owls. *Strigiphilus* sp. were found on a Mexican spotted owl museum skin that was collected in the Sacramento Mountains of New Mexico. *S. syrnii* were found on live Mexican spotted owls. Northern spotted owls are known hosts of this species (Clayton and Price 1984, Clayton 1990b). The previously published records of *S. syrnii* from spotted owls were from unspecified locations in California and British Columbia, Canada (Clayton and Price 1984). Other known hosts for *S. syrnii* are the great horned owl (*Bubo virginianus*), barred owl (*Strix varia*), great gray owl (*Strix nebulosa*), and rufous-legged owl (*Strix rufipes*; Clayton and Price 1984, Clayton 1990b).

We collected *Kurodaia magna* (Amblycera: Menoponidae) from live and museum specimens of northern spotted owls from northwest California, but none from California or Mexican spotted owls. This species had been previously collected from northern spotted owls from western Oregon (R.D. Price pers. comm.). The great horned owl and the barred owl are the other known hosts of *K. magna* (Price and Beer 1963).

Young et al. (1993) described in some detail the occurrence of hippoboscid flies on northern spotted owls from northwest California. Seventeen percent of the owls that they examined were infested with hippoboscid flies; mean intensity was 2.4. They collected one individual of *Ornithomya anchineuria,* while all additional flies were *Icosta americana.* We found *I. americana* on California spotted owls. Of the 18 Mexican spotted owls we examined for hippoboscids, 33.3% were infested with *Ornithoica vicina.* Mean intensity was 4.2 (range 2–6, SD = 1.5). Bequaert (1956) noted that subspecific distinctions are not known to influence host choice in hippoboscids, and cited verified records of *I. americana* from northern and Mexican spotted owls, and *O. vicina* from California and Mexican spotted owls (Bequaert 1954, 1955). While these hippoboscids may occur on any of the three subspecies, we found that northern spotted owls were primarily infested with *I. americana,* while Mexican spotted owls were primarily infested with *O. vicina.* The infestation of northern and Mexican spotted owls by two different species of hippoboscid may be explained by different climatic tolerances. *I. americana* has been found primarily in temperate northern climates, but not in subtropical climates (Bequaert 1952, Bennett 1961) whereas *O. vicina* is considered primarily a tropical and subtropical species (Bennett 1961). Other hosts of *I. americana* include *Accipiter* spp., red-tailed hawks (*Buteo jamaicensis*), ruffed grouse (*Bonasa umbellus*), barn owls (*Tyto alba*), great horned owls, and barred owls. *O. vicina* is one of the most common hippoboscids, and has been found on members of 10 avian orders including red-tailed hawks, ruffed grouse, great horned owls, barred owls, and a variety of passerines (Bequaert 1956).

Hippoboscids may affect spotted owls in several ways. Given the importance of hearing in owl foraging (USDI 1992), larviposition in the ears by *O. vicina* could reduce the fitness of individual owls. Bequaert (1952) cited two records of larviposition by *O. vicina,* one of which was in the ears of a great horned owl; we observed *O. vicina* exclusively within the ears of Mexican spotted owls. Hippoboscids also may affect spotted owls by acting as vectors for hematozoa (Gutiérrez 1989, Young et al. 1993) or other pathogens (Baker 1967). Increasing interactions between barred and spotted owls as a result of barred owl range expansion (USDI 1992) may expose spotted owls to new, more virulent pathogens. Finally, northern spotted owl nestlings have been observed with severe trauma as a result of hippoboscid infestation (USDI 1992).

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