

THE OCCURRENCE OF HIPPOBOSCID FLIES ON SOME SPECIES OF BIRDS IN SOUTHERN CALIFORNIA

By H. ELLIOTT McCLURE

The bird bander has opportunity to see and collect hippoboscid flies (Diptera, Hippoboscidae). These flies are of medical importance to birds (Baker 1967, Huff 1932, McClure et al. 1978, O'Roke 1930, Sargent and Sargent 1906) as well as of entomological interest (Maa 1966, 1969). This is a report concerning hippoboscid flies collected March 1977 through December 1982 from birds caught at my banding stations in Southern California.

LOCALITY AND METHODS

Collections and observations were made at Camarillo and at Camarillo Oak Grove County Park 8 km east of town, both in Ventura county. The location in Camarillo, the author's garden, is typical of the cultivated environments of Southern California, planted with exotic shrubbery and trees. Water in this habitat is provided by lawn sprinklers and pools. Food is provided by feeding stations, exotic fruits, and from native plants. The park habitat was made up of 8 ha of residual oak groves (*Quercus agrifolia*) with some exotic tree plantings, surrounded by coastal chaparral covered hills; including toyon, *Sumac*, *Opuntia*, *Yucca*, and *Senecio*, with walnut, willow, or sycamore in spring-fed gullies, and a host of desert or semidesert annuals. Water was provided by springs and lawn faucets.

Trapping was carried on one day each week from dawn to dusk at a feeding station in the Camarillo garden. Two Roger's 8-cell automatic drop traps and 2 single-celled traps were used. Birds were baited into the traps by grain. They were removed from the traps every few minutes and placed in cloth bags until processed a few minutes later. Each bird was banded, examined for ectoparasites, checked for molt, breeding condition, age, and body condition, and weighed with Pesola spring scales. Hippoboscid flies were collected from the bags or directly from the birds and were placed individually in small tubes of 70% ethyl alcohol and shipped to T. C. Maa in Taiwan for identification. Flies not captured were identified by size and action.

At the park 10 Japanese mist nets (black nylon, 6 or 12 m long, 4 panel, 2 m high, 24, 36, or 61 mm mesh) were stretched where birds were most often seen. Netting was done once each week from 0430 to 1230 and birds captured were processed in the same manner as those taken in town. They were released near where they were netted.

RESULTS

Birds examined.—Eighty species of birds were examined with a total of 23,695 individuals (Table 1). In all tables the totals given are for the

TABLE 1. Species of birds examined at Camarillo, California and vicinity and the numbers of hippoboscid flies recorded from them, expressed as Number of Flies/Number of Birds Examined. (Fly species: Ov = *Ornithoeca victma*; Si = *Stilbometopa impressa*; Mp = *Microlychnia pusilla*; Ih = *Iosta hirsuta*.)

| Species of bird | Species of fly | Town | County park | Total |
|--|----------------|--------|-------------|--------|
| Sharp-shinned Hawk (<i>Accipiter striatus</i>) | | 0/7 | | 0/7 |
| American Kestrel (<i>Falco sparverius</i>) | | 0/1 | | 0/1 |
| California Quail (<i>Callipepla californica</i>) | Si, Mp | | 5/34 | 5/34 |
| Ringed Turtle-Dove (<i>Streptopelia risoria</i>) | | 0/44 | | 0/44 |
| Spotted Dove (<i>Streptopelia chinensis</i>) | Ov, Si, Mp | 85/847 | 1/10 | 86/857 |
| Diamond Dove (<i>Geopelia cuneata</i>) | | 0/1 | | 0/1 |
| White-winged Dove (<i>Zenaida asiatica</i>) | | 0/2 | | 0/2 |
| Mourning Dove (<i>Zenaida macroura</i>) | Mp | | 1/20 | 1/20 |
| Common Ground-Dove (<i>Columbina passerina</i>) | | | 0/3 | 0/3 |
| Anna's Hummingbird (<i>Calypte anna</i>) | | | 0/93 | 0/93 |
| Costa's Hummingbird (<i>Calypte costae</i>) | | 0/1 | | 0/4 |
| Rufous Hummingbird (<i>Selasphorus rufus</i>) | | | 0/3 | 0/3 |
| Allen's Hummingbird (<i>Selasphorus sasin</i>) | | | 0/21 | 0/21 |
| Acorn Woodpecker (<i>Melanerpes formicivorus</i>) | | | 0/23 | 0/23 |
| Red-breasted Sapsucker (<i>Sphyrapicus ruber</i>) | | | 0/1 | 0/1 |
| Nuttall's Woodpecker (<i>Picoides nuttallii</i>) | | | 0/15 | 0/15 |
| Northern Flicker (<i>Colaptes auratus cafer</i>) | | | 0/11 | 0/11 |
| Gilded Flicker (<i>Colaptes auratus chrysoides</i>) | | | 0/1 | 0/1 |
| Western Wood-Pewee (<i>Contopus sordidulus</i>) | | | 0/1 | 0/1 |
| Western Flycatcher (<i>Empidonax difficilis</i>) | | | 0/23 | 0/23 |
| Black Phoebe (<i>Sayornis nigricans</i>) | | | 0/4 | 0/4 |
| Ash-throated Flycatcher (<i>Myiarchus cinerascens</i>) | | | 0/7 | 0/7 |
| Western Kingbird (<i>Tyrannus verticalis</i>) | | | 0/1 | 0/1 |
| Scrub Jay (<i>Aphelocoma coerulescens</i>) | Ov, Si, Mp, Ih | 16/80 | 14/79 | 30/159 |
| Plain Titmouse (<i>Parus inornatus</i>) | Ov | | 2/20 | 2/20 |
| Bush-tit (<i>Psaltriparus minimus</i>) | Ov | | 1/70 | 1/70 |
| White-breasted Nuthatch (<i>Sitta carolinensis</i>) | | | 0/1 | 0/1 |
| Cactus Wren (<i>Campylorhynchus brunneicapillus</i>) | | | 0/10 | 0/10 |
| Canyon Wren (<i>Catherpes mexicanus</i>) | | | 0/1 | 0/1 |
| Bewick's Wren (<i>Thryomanes bewickii</i>) | Ov | | 1/69 | 1/69 |

TABLE 1. Continued.

| Species of bird | Species of fly | Town | County park | Total |
|---|----------------|------|-------------|--------|
| House Wren (<i>Troglodytes aedon</i>) | Ov | | 0/15 | 0/15 |
| Ruby-crowned Kinglet (<i>Regulus calendula</i>) | | | 22/99 | 22/99 |
| Swainson's Thrush (<i>Catharus ustulatus</i>) | | | 0/1 | 0/1 |
| Hermit Thrush (<i>Catharus guttatus</i>) | Ov | | 4/256 | 4/256 |
| American Robin (<i>Turdus migratorius</i>) | | | 0/9 | 0/9 |
| Varied Thrush (<i>Ixoreus naevius</i>) | | | 0/1 | 0/1 |
| Wrentit (<i>Chamaea fasciata</i>) | Ov | | 1/126 | 1/126 |
| Northern Mockingbird (<i>Mimus polyglottos</i>) | | 0/6 | 0/70 | 0/76 |
| California Thrasher (<i>Toxostoma redivivum</i>) | | | 0/45 | 0/45 |
| Cedar Waxwing (<i>Bombycilla cedrorum</i>) | | | 0/8 | 0/8 |
| Phainopepla (<i>Phainopepla nitens</i>) | | | 0/15 | 0/15 |
| Loggerhead Shrike (<i>Lanius ludovicianus</i>) | Ov | 1/1 | 0/9 | 1/10 |
| European Starling (<i>Sturnus vulgaris</i>) | Ov | 1/2 | 0/57 | 1/59 |
| Warbling Vireo (<i>Vireo gilvus</i>) | | | 0/5 | 0/5 |
| Orange-crowned Warbler (<i>Vermivora celata</i>) | | | 0/17 | 0/17 |
| Yellow-rumped Warbler (<i>Dendroica coronata</i>) | | 0/1 | 0/278 | 0/279 |
| Black-throated Gray Warbler (<i>Dendroica nigrescens</i>) | | | 0/1 | 0/1 |
| Townsend's Warbler (<i>Dendroica townsendi</i>) | | | 0/1 | 0/1 |
| Common Yellowthroat (<i>Geothlypis trichas</i>) | | | 0/15 | 0/15 |
| Wilson's Warbler (<i>Wilsonia pusilla</i>) | | | 0/18 | 0/18 |
| Yellow-breasted Chat (<i>Icteria virens</i>) | | | 0/3 | 0/3 |
| Western Tanager (<i>Piranga ludoviciana</i>) | | | 0/4 | 0/4 |
| Black-headed Grosbeak (<i>Phenicucius melanocephalus</i>) | | 0/1 | 0/10 | 0/11 |
| Blue Grosbeak (<i>Guiraca caerulea</i>) | | | 0/2 | 0/2 |
| Lazuli Bunting (<i>Passerina amoena</i>) | Ov | | 1/40 | 1/40 |
| Red-crested Cardinal (<i>Paroaria cristata</i>) | | | 0/2 | 0/2 |
| Green-tailed Towhee (<i>Pipilo chlorurus</i>) | | | 0/1 | 0/1 |
| Rufous-sided Towhee (<i>Pipilo erythrophthalmus</i>) | Ov, 1h | | 10/308 | 10/308 |
| Brown Towhee (<i>Pipilo fuscus</i>) | Ov | 2/87 | 7/359 | 9/437 |
| Rufous-crowned Sparrow (<i>Aimophila ruficeps</i>) | Ov | | 1/65 | 1/65 |
| Chipping Sparrow (<i>Spizella passerina</i>) | | 0/12 | 0/4 | 0/16 |
| Lark Sparrow (<i>Chondestes grammacus</i>) | Ov | | 8/125 | 8/125 |

TABLE 1. Continued.

| Species of bird | Species of fly | Town | County park | Total |
|---|----------------|----------|-------------|----------|
| Sage Sparrow (<i>Amphispiza belli</i>) | | | 0/7 | 0/7 |
| Savannah Sparrow (<i>Passerculus sandwichensis</i>) | | | 0/15 | 0/15 |
| Fox Sparrow (<i>Passerella iliaca</i>) | Ov | 0/5 | 1/13 | 1/18 |
| Song Sparrow (<i>Melospiza melodia</i>) | Si, Ov, Mp | | 9/85 | 9/85 |
| Lincoln's Sparrow (<i>Melospiza lincolni</i>) | | 0/3 | 0/23 | 0/26 |
| White-throated Sparrow (<i>Zonotrichia albicollis</i>) | | | 0/2 | 0/2 |
| Golden-crowned Sparrow (<i>Zonotrichia atricapilla</i>) | Ov | 0/11 | 4/199 | 4/210 |
| White-crowned Sparrow (<i>Zonotrichia leucophrys</i>) | Ov | 103/4575 | 7/470 | 110/5045 |
| Dark-eyed Junco (<i>Junco hyemalis</i>) | Ov | | 4/248 | 4/248 |
| Red-winged Blackbird (<i>Agelaius phoeniceus</i>) | Ov | 0/39 | 0/10 | 0/49 |
| Brewer's Blackbird (<i>Euphagus cyanocephalus</i>) | Ov | 25/538 | 2/128 | 27/666 |
| Brown-headed Cowbird (<i>Molothrus ater</i>) | Ov | 12/45 | | 12/45 |
| Hooded Oriole (<i>Icterus cucullatus</i>) | | | 0/5 | 0/5 |
| Northern Oriole (<i>Icterus galbula</i>) | | | 0/67 | 0/67 |
| House Finch (<i>Carpodacus mexicanus</i>) | Ov, Mp | 156/8753 | 17/1220 | 173/9973 |
| Lesser Goldfinch (<i>Carduelis psaltria</i>) | Ov | | 1/136 | 1/136 |
| Lawrence's Goldfinch (<i>Carduelis lawrencei</i>) | | | 0/3 | 0/3 |
| American Goldfinch (<i>Carduelis tristis</i>) | | | 0/4 | 0/4 |
| House Sparrow (<i>Passer domesticus</i>) | Ov, Mp | 372/3504 | | 372/3504 |
| Bird Species Infested | | 10 | 23 | 27 |
| Other Species Examined | | 14 | 50 | 53 |
| Total Birds Examined | | 18,566 | 5129 | 23,695 |
| Total Flies | | 773 | 124 | 897 |
| Flies per 100 birds of infested species | | 4.2 | 3.0 | 4.0 |

series of birds or flies presented in that table and are not to be construed as totals for the entire study.

Hippoboscids present.—Use of traps for capturing birds was more productive of hippoboscids than use of nets. Because of food availability in the trap, birds struggle less to escape and the flies do not leave their plumage. Caught in a net, birds struggle and their feathers become ruffled. This disturbs the hippoboscids and they fly from the plumage.

Flies of the family Hippoboscidae are parasitic on birds or mammals and are pupiparous (viviparous). One of two ovaries supplies a single egg to the uterus. Large convoluted glands secrete fluids which nourish the larva that hatches within and is retained in the uterus until full grown. In the genera listed here the female deposits the larva among the feathers from which it immediately drops. The larva is immobile and pupates where it falls on the soil surface or nest debris. Length of the life cycle and the number of generations per year at this latitude in California remain to be determined (Swan and Papp 1972, Metcalf and Flint 1939).

Nearly 900 flies were observed and 254 were sent to T. C. Maa for identification. Taxonomic, host, and distribution notes are from Maa (1966, 1969). Maa reported the following: *Ornithoica vicina* (Walker), 188 individuals: 53 males, 128 females, and 7 gynandromorphs. This is a species widespread in North and South America and recorded as parasitizing 10 orders, 25 families, and 86 genera of birds. *Stilbometopa impressa* (Bigot), 6 individuals: 3 males and 3 females. This is a parasite from south-western U.S.A. and Mexico, mainly of the Accipitridae and Phasianidae. *Microlynchia pusilla* (Speiser), 58 individuals: 31 males and 27 females. This is another widespread species from much of North and South America. It has been recorded from 8 orders, 10 families, and 17 genera, but is mainly a parasite of the Columbidae in North America. *Icosta hirsuta* (Ferris), 2 males only. This large fly is nearly limited to the California subregion and is usually found on Phasianidae. The host relationships for these species in the Camarillo area are shown in Table 1. The flies examined by Maa, and others I identified, included 801 *O. vicina*, 86 *M. pusilla*, 7 *S. impressa*, and 2 *I. hirsuta*. They averaged 1.2 flies per infested host.

Seasonality of the flies.—Seasonality as well as host specificity have been shown for many species (Maa 1966, 1969). Because of the mild climate of southern California I would expect that louse flies would be seen during all months. Furman (Maa 1969) showed that *I. hirsuta* was absent from the Chiles Valley, Napa County, in California from January into May and in greatest abundance from August into October. This valley is about 650 km north of Camarillo.

Table 2 compares the monthly infestation or prevalence of flies at Camarillo and at Camarillo Grove. The flies were present in both localities every month, but because of the collecting method, fewer were taken at the park. Prevalence of flies among their hosts on a monthly basis is shown in Table 3. Peak abundance of *O. vicina* appeared to be

TABLE 2. A comparison of the monthly infestation rate of hippoboscid flies among birds at Camarillo and at Camarillo Grove as indicated by the number of flies seen per 100 birds examined.

| | Total birds examined | Prevalence based upon those species parasitized | | | | | | | | | | | | Ave |
|-----------------|----------------------|---|------|------|------|------|------|------|------|------|------|------|------|------|
| | | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | |
| 1977 | 1125 | | | 0.0 | 1.1 | 0.0 | | 6.8 | 5.2 | 22.3 | 12.8 | 17.2 | 3.8 | 7.7 |
| 1978 | 2460 | 1.9 | 1.2 | 0.3 | 0.0 | 2.2 | 1.2 | 1.8 | 9.5 | 15.3 | 21.0 | 1.9 | 0.6 | 4.7 |
| 1979 | 3996 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 1.1 | 9.9 | 9.0 | 9.5 | 4.6 | 1.4 | 3.0 |
| 1980 | 5115 | 0.4 | 0.0 | 0.4 | 0.0 | 1.1 | 2.7 | 3.6 | 8.6 | 14.8 | 11.0 | 10.9 | 3.1 | 4.7 |
| 1981 | 5296 | 3.2 | 1.8 | 1.7 | 1.2 | 2.4 | 9.7 | 7.7 | 13.6 | 18.7 | 15.6 | 2.3 | 2.7 | 6.7 |
| 1982 | 5703 | 1.5 | 0.3 | 0.0 | 0.0 | 0.0 | 2.9 | 5.9 | 8.1 | 12.0 | 10.5 | 9.3 | 4.9 | 4.1 |
| Camarillo | 18,566 | 1.7 | 0.5 | 0.5 | 0.4 | 1.3 | 4.3 | 5.5 | 11.2 | 21.1 | 14.3 | 6.6 | 2.3 | 4.2 |
| Camarillo Grove | 5129 | 1.4 | 0.8 | 0.8 | 0.0 | 0.2 | 2.4 | 3.4 | 6.0 | 3.5 | 5.8 | 4.1 | 2.5 | 3.0 |
| Average | | 1.5 | 0.7 | 0.6 | 0.2 | 0.8 | 3.3 | 4.5 | 8.6 | 12.3 | 10.0 | 5.4 | 2.4 | 4.0 |
| Total birds | 23,695 | 2063 | 2359 | 2685 | 1783 | 1474 | 1869 | 2689 | 1904 | 1558 | 1365 | 1562 | 2384 | 1974 |

TABLE 3. The monthly prevalence of hippoboscid flies among infested hosts as indicated by the number of flies per 100 birds examined.

| Species | Birds | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Ave |
|-------------------------------------|-------|------|------|-----|------|------|------|------|------|------|------|------|------|------|
| <i>Microlynychia pusilla</i> | | | | | | | | | | | | | | |
| Spotted Dove | 857 | 5.9 | | | | 2.6 | 3.8 | 1.0 | 13.5 | 36.4 | 34.0 | 45.1 | 10.3 | 14.6 |
| Percent of year's high ^a | 13 | | | | | 6 | 8 | 2 | 30 | 81 | 75 | 100 | 23 | |
| <i>Ornithoica vicina</i> | | | | | | | | | | | | | | |
| Scrub Jay | 159 | | | | | | | 21.2 | 77.7 | 35.4 | 26.7 | 25.0 | | 20.7 |
| Hermit Thrush | 256 | | | | | | | | | | 2.7 | 4.3 | | 1.6 |
| Ruby-crowned Kinglet | 99 | 33.3 | 8.3 | | | | | | | | 28.5 | 25.8 | 38.0 | 25.3 |
| Wrenit | 126 | | | | | | | | | | | 5.3 | | 0.8 |
| Song Sparrow | 85 | | | | | | 14.3 | 20.0 | 37.5 | | | | | 12.8 |
| Golden-crowned Sparrow | 210 | 1.9 | 2.3 | 5.3 | | | | | | | | 4.0 | | 2.1 |
| White-crowned Sparrow | 5045 | 2.4 | 1.0 | 1.0 | 1.0 | | | | | | 11.5 | 7.0 | 2.5 | 2.4 |
| Dark-eyed Junco | 258 | | | | | | | | | | | 10.0 | | 2.0 |
| Lark Sparrow | 125 | | | | | | 14.3 | 2.6 | 11.8 | | | | | 6.5 |
| Rufous-sided Towhee | 308 | 2.8 | | | | | | 2.1 | 3.0 | 9.3 | 12.0 | | | 3.4 |
| Brown Towhee | 437 | | 11.1 | | | | | 1.6 | 6.0 | 2.8 | 9.0 | | | 2.1 |
| Brewer's Blackbird | 666 | | | | | 2.7 | | 2.9 | 9.4 | 32.3 | 3.2 | | | 4.2 |
| Brown-headed Cowbird | 45 | | | | | 20.0 | 50.0 | 50.0 | | | | | | 26.6 |
| Lesser Goldfinch | 136 | | | | | | | | 25.0 | | | | | 0.8 |
| House Finch | 9973 | 0.6 | 0.2 | 0.2 | 0.1 | 0.1 | 2.3 | 3.7 | 7.2 | 10.1 | 2.4 | | 1.0 | 1.8 |
| House Sparrow | 3504 | 1.7 | | | | 2.3 | 6.1 | 8.0 | 13.2 | 23.6 | 27.2 | 3.1 | 0.5 | 10.9 |
| 16 species average | | 2.7 | 1.4 | 0.4 | 0.07 | 1.6 | 5.4 | 7.0 | 11.9 | 7.1 | 7.7 | 5.3 | 2.6 | 4.4 |
| Percent of year's high ^a | | 22 | 12 | 3 | 0.5 | 13 | 45 | 59 | 100 | 59 | 64 | 44 | 22 | |

^a Percentage of the year's high is based upon the prevalence in the month of heaviest infestation.

TABLE 4. The annual prevalence of parasitism by hippoboscid flies among selected avian hosts during the years 1977 through 1982. The number of birds examined is given in parentheses; frequency of flies is given per 100 birds.

| | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | Total |
|------------------------|------------|------------|------------|------------|------------|------------|-------------|
| Spotted Dove | 0.0 (3) | 0.0 (18) | 20.7 (53) | 17.7 (186) | 17.5 (171) | 19.0 (425) | 14.6 (856) |
| Scrub Jay | 0.0 (6) | 10.0 (20) | 29.4 (44) | 21.7 (46) | 15.4 (26) | 8.3 (12) | 20.7 (154) |
| Hermit Thrush | | 0.0 (6) | 0.0 (34) | 4.5 (88) | 0.0 (57) | 0.0 (71) | 1.6 (256) |
| Ruby-crowned Kinglet | | 0.0 (3) | 87.5 (8) | 6.3 (32) | 39.3 (28) | 50.0 (28) | 25.3 (99) |
| Wren-tit | | | 0.0 (13) | 1.0 (97) | 0.0 (9) | 0.0 (7) | 0.8 (126) |
| Golden-crowned Sparrow | | | 0.0 (41) | 3.6 (55) | 5.4 (37) | 4.6 (65) | 2.1 (198) |
| White-crowned Sparrow | 2.6 (380) | 1.7 (660) | 3.0 (731) | 2.0 (1102) | 4.0 (1011) | 1.6 (1154) | 2.4 (5038) |
| Dark-eyed Junco | | 0.0 (8) | 0.0 (29) | 15.8 (19) | 1.1 (89) | 0.9 (108) | 2.0 (253) |
| Rufous-sided Towhee | | 0.0 (2) | 7.2 (83) | 0.7 (148) | 6.1 (49) | 7.7 (26) | 3.4 (308) |
| Brown Towhee | 0.0 (8) | 0.0 (18) | 2.5 (119) | 4.0 (99) | 1.1 (87) | 0.9 (106) | 2.1 (437) |
| Brewer's Blackbird | 0.0 (24) | 3.2 (63) | 3.2 (187) | 3.5 (171) | 9.1 (143) | 1.1 (93) | 4.2 (681) |
| House Finch | 1.7 (348) | 1.9 (1005) | 1.1 (1645) | 1.6 (2105) | 2.5 (2508) | 1.8 (2362) | 1.8 (9973) |
| House Sparrow | 14.9 (322) | 7.3 (588) | 6.1 (723) | 11.9 (589) | 18.5 (655) | 14.4 (627) | 10.9 (3504) |
| 13 species average | 5.9 | 3.3 | 3.4 | 4.1 | 6.0 | 8.5 | 5.2 |

Microlynychia pusilla

Ornithoeca vicina

TABLE 5. The activity of hippoboscids as related to the time of day. Comparing the percentage of the total flies observed with the percentage of the birds captured during June, July, August, and September.

| Time | <i>O. vicina</i> ^a | | <i>M. pusilla</i> ^b | |
|-----------|-------------------------------|---------------|--------------------------------|---------------|
| | Percent flies | Percent birds | Percent flies | Percent birds |
| 0700-0759 | 12.2 | 4.5 | 0.0 | 0.0 |
| 0800-0859 | 16.7 | 10.7 | 9.7 | 1.9 |
| 0900-0959 | 10.7 | 8.5 | 3.9 | 7.5 |
| 1000-1059 | 5.8 | 10.2 | 8.4 | 6.2 |
| 1100-1159 | 9.3 | 8.6 | 6.4 | 7.5 |
| 1200-1259 | 8.7 | 8.9 | 14.2 | 5.6 |
| 1300-1359 | 5.0 | 7.8 | 11.6 | 15.0 |
| 1400-1459 | 7.5 | 6.7 | 14.2 | 8.1 |
| 1500-1559 | 5.8 | 6.5 | 15.5 | 10.0 |
| 1600-1659 | 5.2 | 4.7 | 10.7 | 17.5 |
| 1700-1759 | 4.7 | 5.3 | 2.6 | 6.9 |
| 1800-1859 | 7.8 | 10.0 | 2.6 | 13.8 |

^a From House Finches and House Sparrows.

^b From Spotted Doves.

in August, while that of *M. pusilla* on the doves came in November. Both species had maximum populations during summer and fall months: 79% of *O. vicina* were seen from May into September and 86% of *M. pusilla* were seen from August into November.

The sex ratio upon emergence is probably 1:1. The males are short lived, need fewer blood meals, and are active in flitting from bird to bird for new mates. The females are longer lived, need more nutrients to nourish larvae developing in their bodies, and are less active partly because of heavier bodies. Therefore the females have to spend more time on the birds. This would explain why male flies on birds are generally out-numbered by the females (T. C. Maa correspondence). The monthly distribution of males among the 188 *O. vicina* that Dr. Maa examined was: January 42.8%, February 50%, March 40%, April no collection, May 50%, June 33.3%, July 19.2%, August 30.2%, September 30.2%, October 14.3%, November 40%, December 16.6%. Among the 58 *M. pusilla* that he examined 53.4% were males. During fall months the percent of males was: August 44.4%, October 55.5%, November 76.5%.

Table 4 summarizes the information concerning annual differences of 1977 through 1982 in the numbers of *M. pusilla* and *O. vicina* seen. High and low prevalence among the host species was not consistent from year to year. Although there is a wide discrepancy in the number of hosts examined, more flies were found on Scrub Jays and Ruby-crowned Kinglets in 1979, but fewer on the House Finches in this than in other years. The year 1980 was one of low prevalence on Ruby-crowned Kinglets, White-crowned Sparrows, and Rufous-sided Towhees. Of the 6 years, peak infestation in the House Sparrows was during 1981. The

monthly prevalence of flies among all hosts and by year is shown in Table 2. The annual period of abundance, by this arrangement, still falls from August into October with peak prevalence in one of these 3 months.

Diurnal activities of the hippoboscids.—While working with the captured birds the prevalence of *O. vicina* on House Finches and House Sparrows appeared to be greater during the early morning hours. When the percentage of the total flies observed each hour is compared with the percentage of the two hosts captured (Table 5) this difference between the flies seen in early morning hours and the numbers seen in later hours is not great. Finch and sparrow activity at the feeders was fairly uniform through the day and the flies seen followed this pattern. *M. pusilla* on the dove was most often seen at mid-day when the doves were most often captured. Between 0700 and 1100, 45.4% of the *O. vicina* were seen upon 33.9% of the finches and sparrows. During the same period 22.0% of the *M. pusilla* were noted on 15.6% of the doves. From 1200 to 1600, 32.2% of *O. vicina* were active on 34.6% of their hosts while 66.2% of *M. pusilla* were on 56.2% of the doves. From 1800 to sundown only 7.8% of the flies were on 10.0% of the finches and sparrows and only 2.6% of them on 13.8% of the doves. During June, July, August, and September, when the flies were most abundant, 52.4% of *O. vicina* were seen on or leaving their hosts during the 4 h period from 0700 to 1100 in 1981. In 1982 this figure was 40.0%, while from additional observations made in 1983 this figure was 48.6%. Activities of the flies are probably related to the feeding activity of their hosts. Gregarious hosts feeding in groups would permit an easy exchange of flies between individuals.

SUMMARY

Four species of hippoboscid flies were collected from 27 species of birds in Ventura County, California, at or near Camarillo. The most prevalent fly was *Ornithoica vicina* (Walker) found on 27 species. *Microlynychia pusilla* (Speiser) was abundant but almost limited to doves. *Stilbometopa impressa* (Bigot) was nearly limited to California Quail, and *Icosta hirsuta* (Ferris) was rarely seen. The examination of 23,695 birds over the 6-year period, 1977 through 1982, established that populations of *O. vicina* and *M. pusilla* were present throughout the year, and increased from a low in spring to a high during fall months. The average number of flies seen per 100 birds examined was fairly constant from year to year, but varied seasonally and annually with any given host species.

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NOTES AND NEWS

Joint E.B.B.A. and N.E.B.B.A. 1985 Meeting.—The Eastern and Northeastern Bird Banding Associations announce that they will hold a joint meeting 26 April through 28 April 1985 at the National 4-H Center in Washington, DC. The meeting will be hosted jointly by the Mid-Atlantic Bird Banding Group and the Maryland Ornithological Society.

Accommodations will be available at the 4-H center at an approximate cost of between \$42 and \$127 for the 2-night stay, including meals. Commuter price will be approximately \$26, including Saturday lunch and the banquet.

One of the highlights of the meeting will be the opportunity to tour the Bird Banding Laboratory and Patuxent Wildlife Research Center. Field trips to some of the Mid-Atlantic region's best birding spots will be scheduled for Sunday.

Those interested in presenting papers or displaying posters should contact Dr. John S. Weske, Box 116, Sandy Spring, MD 20860 (301-774-7564). Anyone willing to give a workshop should contact Joe Schreiber, 2910 Hilcrest Ave., Baltimore, MD 21234 (301-661-8340) or Barbara Ross, 308 Thornhill Rd., Baltimore, MD 21212 (301-435-7166). Please provide a brief description of your topic and a biographical sketch.

Registration forms will be mailed to E.B.B.A. and N.E.B.B.A. members in late February 1985. However other banders who plan to be in the Washington area during the meetings and who would like to take advantage of these attractive rates and spend extra time in Washington should contact M. Kathleen Klimkiewicz, Biologist, Bird Banding Laboratory, Laurel, MD 20707 (301-498-0423).