Body Masses of Some Cloud Forest Birds in Costa Rica

Spencer Sealy
Department of Biological Sciences
University of Manitoba
Winnipeg, MB R3T 2N2
Spencer.Sealy@umanitoba.ca
*Corresponding author

Diane L. H. Neudorf
Department of Biological Sciences
Sam Houston State University
Huntsville, TX 77341-2116

ABSTRACT

Masses are presented for 918 individuals of 55 species of tropical resident birds and 54 individuals of seven species of Neotropical migrants. Individuals were color-marked and released in a cloud forest (2360 m asl) located at the northern end of the Cordillera de Talamanca in central Costa Rica, during eight netting periods conducted between mid-Jan and early May, 1987-1993, and also including 29 Jul - 6 Aug 1988.

INTRODUCTION

Knowledge of mass is important for physiological, ecological and evolutionary studies of birds (Clark 1979, Biermann and Sealy 1985, Dunning 2008). Although data for tropical resident birds have been accumulating, it is still important to record body mass from different localities in the tropics because many resident species and subspecies are endemic to single mountain ranges or islands (Buckley et al. 1985) and many Neotropical migrants are faithful to specific wintering sites (Keast and Morton 1980). For example, few data for body mass have been published for birds in the highland forests of the Cordillera de Talamanca, Costa Rica. We augment information from the northern portion of this mountain range, listing weights obtained from birds mist netted during studies of distress calls (Neudorf and Sealy 2002) and winter site fidelity of Neotropical migrants (Sealy 2002) in this cloud forest.

METHODS

Study Site. We conducted our research within a 30-ha nature preserve (Genesis II) in a lower montane rain forest in Costa Rica (Tosi 1969, Wolf 1976, Kappelle 1992), on the Caribbean slope just below the continental divide, at the north end of the Cordillera de Talamanca, about 4 km northeast of El Cañon (9° 41' N, 83° 55' W, 2350 m asl), Cartago Province (Neudorf and Sealy 2002). The tract of forest in which we worked was selectively logged several decades prior to our study. It was bordered on one side by pastureland, on two sides by forest where logging occurred apace, and the fourth, northeastern side, was continuous with the Rio Macho forest preserve that eventually emerges with the Refugio Nacional de Fauna Silvestre Tapanti. Several tributaries of the Rio Macho run along and through the study area.

Banding. Most published lists of masses of tropical birds have been compiled from weights taken from specimens collected during field work (Strauch 1977, Steadman et al. 1980, Olson 1985). Our data were generated from 972 mist-netted birds of 62 species that were weighed, color banded and released (Prŷs-Jones 1982, Schreiber and Schreiber 1984), but also included the mass of three birds collected on the study site. Nets (12-m long, 4 shelves, 30- and 36-mm mesh) were operated during eight periods from 1987 to 1993: 17 Jan - 6 Feb (740 net-hr) and 29 Apr - 9 May 1987 (489.5 net-hr), 20 - 31 Mar (657.5 net-hr) and 29 Jul - 6 Aug 1988 (443 net-hr), 10 - 21 Feb 1990 (1001.5 net-hr), 18 - 29 Jan 1991 (893 net-hr), 25 Apr - 5 May 1992 (997.5 net-hr), and 9 - 17 Feb 1993 (922 net-hr), for a total of 6,144 net-hr. Some species were recorded nesting during this time. Mist nets were erected along about 700 m of trails that penetrated most reaches of the study area. Some net sites were permanent and were operated across all netting periods, whereas, other nets were rotated every four to five days.

Six to 10 nets were operated each day from about 0600 to 1630 CDT, except when it rained or when winds were strong. Most nets were inspected at least every 30 min. SGS netted during all periods; whereas, DLHN netted in 1992 and 1993.

Each bird was weighed to the nearest 0.1 g on a triple-beam balance. Black-billed Nightingale-Thrushes (scientific names in "Species Accounts", below), Large-footed Finches and all Neotropical migrants received aluminium bands in combination with Darvic color bands (A.C. Hughes Ltd., Middlesex, UK). An outer rectrix was notched in the hummingbirds, some of which may have been weighed again in subsequent netting periods after the notched rectrices were replaced. Masses of recaptured individuals are not presented.

Individual masses are given for samples of seven or fewer birds, following an earlier compilation (Steadman et al. 1980); mean ± standard deviation, range, and sample size are given for larger samples. In sexually dimorphic species, individuals were sexed on the basis of age-based plumage characteristics. In sexually monomorphic species, individuals were not sexed, nor were fledglings (hatch year, HY). Except where otherwise stated, masses given in Species Accounts (see below), regardless of whether individuals were sexed, were aged as after hatch year.

RESULTS

Masses are listed below for 918 individuals of 55 resident species and 54 individuals of seven species of Neotropical migrants, for a total of 972 individuals of 62 species. Included are the mass and sex of single specimens of Alder Flycatcher and Slaty Flower-Piercer deposited in the bird collection of the Universidad de Costa Rica (UCR).One egg-laying Silvery-throated Jay (post-ovulatory follicle, enlarged ova) found dead on 3 May 1992 was weighed but not preserved.

Species Accounts. Species also weighed by Hartman (1961) are denoted H; additional species weighed by Dunning (1992, 2008) are denoted D1 and D2, respectively. Species with an asterisk present the first published mass data for Costa Rica.

Residents

* Bicolored Hawk (*Accipter bicolor*): ♂ 249.7 H

* Buff-fronted Quail-Dove (*Geotrygon costaricensis*): 253.1 H

* Lesser Violetear (*Colibri cyanotus*): 4.4 ± 1.49 (4.0 - 6.0, 48) H. [Note: This species was recognized as Green Violetear (*Colibri thalassinus*) when these data were obtained. Based on morphology, Remsen et al. (2015) recommended splitting Green Violetear into Mexican Violetear (*C. thalassinus*), resident from Mexico through Nicaragua, and Lesser Violetear (*C. cyanotus*), resident in mountains of Costa Rica and western Panama, and in montane South America from Colombia and northern Venezuela south in western Andes to western Ecuador and central Bolivia. This change was accepted by the American Ornithologists' Union (Chesser et al. 2016).]

Fiery-throated Hummingbird (*Panterpe insignis*): 5.4 ± 1.2 (4.6 - 8.1, 37) D1

* Stripe-tailed Hummingbird (*Eupherusa eximia*): 3.6, 4.1 H

Purple-throated Mountaingem (*Lampornis calolaemus*): ♂♂ 6.7 ± 0.6 (5.9-7.1, 9); ♀♀ 4.9 ± 0.8 (4.5 - 5.6, 33) D2

Magnificent Hummingbird (*Eugenes fulgens*): ♂♂ 9.4 ± 2.0 (8.3 - 10.8, 26); ♀♀ 8.4 ± 0.5 (7.5 - 9.5, 32); HY 7.5, 7.6, 7.7 D1

Volcano Hummingbird (*Selasphorus flammula*): ♂ 2.3; ♀♀ 2.4 ± 0.7 (2.0 - 2.9, 12) D1

* Scintillint Hummingbird (*Selasphorus scintilla*): 2.2, 2.2, 2.5, 2.8 H

* Collared Trogon (*Trogon collaris*): ♀ 60.8, 64.1, 67.3; HY 61.5 H

Resplendant Quetzal (*Pharomachrus mocinno*): ♀ 195.5 H

Prong-billed Barbet (*Semnornis frantzii*): ♂♂ 57.5 ± 4.4 (49.9 - 64.5, 8); ♀♀ 55.5 ± 4.3 (50.9 - 57.7, 9) D1

Emerald Toucanet (*Aulacorhynchus prasinus*): ♂ 163.3; ♀ 174.5; 163.9; HY 142.9 H

* Hairy Woodpecker (*Picoides villosus*): ♂ 48.6; ♀♀ 39.1, 39.8, 42.9

* Spotted Barbtail (*Premnoplex brunnescens*): 16.6 H

* Ruddy Treerunner (*Margarornis rubiginosus*): 16.6 ± 2.6 (15.0 - 18.3, 37) H

* Streak-breasted Treehunter (*Thripadectes rufobrunneus*): 53.2 ± 2.6 (49.4 - 57.8, 13; HY 51.2, 55.0 H

* Black-banded Woodcreeper (*Dendrocolaptes picumnus*): 54.0 D1

* Spot-crowned Woodcreeper (*Lepidocalaptes affinis*): ♀ 33.7, 35.1, 36.3, 36.8 D1

Silvery-fronted Tapaculo (*Scytalopus argentifrons*): ♂ 15.1; ♀♀ 14.1, 14.9, 17.1; HY 13.6 D1

* Mountain Elaenia (*Elaenia frantzii*): 19.3, 19.9, 20.1, 20.3, 20.8 H

* Olive-striped Flycatcher (*Mionectes olivaceus*): 13.2 ± 1.0 (11.9 - 15.4, 13) H

* Rough-legged Tyrannulet (*Phyllomyias burmeisteri*): 11.1 D1

* Paltry Tyrannulet (*Zimmerius villissimus*): 9.3 D1

* Tufted Flycatcher (*Mitrephanes phaeocercus*): 8.4, 8.4 H

Black-and-yellow Silky-Flycatcher (*Phainoptila melanoxantha*): ♂♂ 58.5 ± 3.2 (55.2 - 67.3, 17); ♀♀ 58.1 ± 2.4 (53.0 - 60.5, 10); HY 52.1, 54.7 D1

Ochraceous Pewee (*Contopus ochraceus*): 20.9, 21.9 D1

* Yellowish Flycatcher (*Empidonax flavescens*): 12.3 ± 0.68 (11.7 - 13.8, 17); HY 10.7, 11.7, 11.9 H

Black-capped Flycatcher (*Empidonax atriceps*): 8.7 ± 0.4 (8.1 - 9.7, 12) D1

* Golden-bellied Flycatcher (*Myiodynastes hemichrysus*): 39.9 D1

* Barred Becard (*Pachyramphus versicolor*): ♂ 12.7; ♀ 14.5 H

* Ochraceous Wren (*Troglodytes ochraceus*): 9.4 ± 2.8 (9.0 - 11.7, 13) H

* Gray-breasted Wood-Wren (*Henicorhina leucophrys*): 15.5 ± 2.3 (14.4 - 19.0, 37); HY 14.2, 14.2, 16.1, 17.3, 18.9 H

* Silvery-throated Jay (*Cyanolyca argentigula*): 60.7, egg-laying ♀ 77.9 H

Yellow-winged Vireo (*Vireo carmioli*): 12.9, 13.0, 14.2 H

* Rufous-browed Peppershrike (*Cyclarhis gujanensis*): 32.2 H

* Black-faced Solitaire (*Myadestes melanops*): 31.8, 31.9, 35.3 H

Black-billed Nightingale-Thrush (*Catharus gracilirostris*): 19.4 ± 2.7 (18.1 - 22.8, 54); HY 19.1, 19.7, 19.9, 20.0 D1

* Ruddy-capped Nightingale-Thrush (*Catharus frantzii*): 31.1 ± 1.9 (27.9 - 34.5, 24) H

* Mountain Robin (*Turdus plebejus*): 82.6 ± 7.6 (67.7 - 95.9, 28) H

* Flame-throated Warbler (*Parula gutteralus*): 10.0 ± 0.8 (8.3 - 11.4, 10) D1

* Collared Redstart (*Myioborus torquatus*): 9.7 ± 2.7 (8.5 - 11.9, 25) H

* Black-cheeked Warbler (*Basileuterus melanogenys*): 11.5 ± 3.2 (11.0 - 14.4, 42); HY 11.6, 13.0, 13.0, 14.3, 14.4 H

Wrenthrush (*Zeledonia coronata*): 19.9 ± 2.9 (17.8 - 23.1, 21); HY 15.8, 17.5, 19.3, 19.5 D1

* Common Bush-Tanager (*Chlorospingus ophthalmicus*): 18.4 D1

* Sooty-capped Bush-Tanager (*Chlorospingus pileatus*): 20.1 ± 1.2 (17.9 - 23.3, 38); HY 17.9, 18.8, 20.2, 21.0, 21.2 H

Spangle-cheeked Tanager (*Tangara dowii*): 20.3 ± 1.62 (17.2 - 23.0, 11); HY 19.2, 20.6

* Black-thighed Grosbeak (*Pheucticus tibialis*): 59.7, 62.2 D1

* Yellow-thighed Finch (*Pselliophorus tibialis*): 30.6 ± 1.7 (28.2 - 33.6, 43); 30.0, 30.4, 31.7, 32.8 H

* White-naped Brush-Finch (*Atlapetes albinucha*): 31.3 H

Yellow-billed Cacique (*Amblycercus holosericeus*): 62.0, 64.6, 64.9, 66.6, 66.9 D1

Peg-billed Finch (*Acanthidops bairdi*): ♂♂ 17.1, 17.1, 18.3; ♀♀ 15.4, 17.1; 15.6, 16.3, 16.6, 17.7 D1

* Slaty Flower-Piercer (*Diglossa plumbea*): ♂♂ 8.8 ± 0.5 (8.3 - 9.6, 10); ♀♀ 8.7 ± 0.43 (8.1 - 9.6, 14); HY 8.9; ♂ (UCR 3504), 21 Mar 1990, 8.1 D1

* Large-footed Finch (*Pezopetes capitalis*): 55.7 ± 4.7 (47.1 - 64.6, 33); HY 37.6 H

* Rufous-collared Sparrow (*Zonotrichia capensis*): 21.0, 22.0, 20.7, 24.5; HY, 18.9 H

Western Wood-Pewee (*Contopus sordidulus*): 13.7, 13.7 D1

Alder Flycatcher (*Empidonax alnorum*): ♂ (UCR 3505), 8 May 1987, 13.6 D1

Swainson's Thrush (*Catharus ustulatus*): 30.8, 33.5, 35.9 D1

Golden-winged Warbler (*Vermivora chrysoptera*): ♂ 9.3; ♀♀D 8.4, 8.8, 9.2, 9.4 H

Mourning Warbler (*Geothlypis philadelphia*): ♂ 13.4 H

Wilson's Warbler (*Cardellina pusilla*): ♂♂ 7.9 ± 0.4 (7.4 - 8.7, 24); ♀♀ 7.9 ± 0.8 (6.9 - 9.5, 17) H

Summer Tanager (*Piranga rubra*): ♂ 29.3 H

DISCUSSSION

Body masses of all but two species listed above have been published previously, but apparently none of the weights were derived from the northern portion of the Cordillera de Talamanca. Hartman (1961), in a comprehensive list of body masses compiled for a study of locomotor mechanisms of birds, included data for 31 tropical species, weighed in the contiguous Chiriqui highlands of northwestern Panama, and four Neotropical migrants (denoted H in "Species Accounts"). Dunning (1992) presented masses for an additional 21 tropical species and three Neotropical migrants (denoted D1). Dunning (2008) added Purple-throated Mountaingem (denoted D2) and augmented sample sizes for both sexes of many species, with measurements from additional localities. Mean body mass of two species that were not listed by Dunning (2008), the southernmost subspecies of Hairy Woodpecker (*P. v. extimus*) and Spangle-cheeked Tanager, were given by Stiles and Skutch (1989): 42 g and 20 g, respectively, both within the range of values given above. Data presented in this paper, nevertheless, are the most comprehensive for the northern portion of the Cordillera de Talamanca.

In addition to varying with geography, body mass often varies with the individual's condition, stomach contents, and season or period within the life cycle of each particular species (Pyle 1997). Females with eggs in the oviduct may inflate body mass, as shown by the mass of the egg-laying Silvery-throated Jay (77.9 g) found dead on the study site. This female was ~ 17 g heavier than the other Silvery-throated Jay (60.7 g) we weighed. Stiles and Skutch (1989) gave a body mass for this species of 65 g (repeated by Madge and Burn 1994), but sample size and locality were not given. Our weights of this species are more than 110 g less than those of one female (190 g) and one male (210 g) collected by Hartman (1961) in Panama, and repeated by Dunning (2008). If those specimens were correctly identified, this reveals a considerable difference in size of Silvery-throated Jays in the two populations, and apparently contradicts expectations suggested by Bergmann's Rule; elevation may be a factor.

The mass values we found generally fell within a few grams of the mean or within the ranges for each species given by Dunning (2008); for example, males and females of the dimorphic Bicolored Hawk and Buff-fronted Quail-Dove, respectively. Including the mass of the Silvery-throated Jay discussed above, the other exception was the single 54-g Black-banded Woodcreeper (mean, 65 g in Stiles and Skutch 1989) that was ~ 30 g less than the mean of 82.5 g for males and ~ 40 g less than the mean of 92.7 g for females, respectively, recorded in Suriname, showing that variation in this species apparently follows Bergmann's Rule.

Body masses may vary within species in different geographic areas, even relatively short distances (Colombelli-Négrel 2016). Researchers have recently used body mass data from various sour -ces in meta-analyses to address broad ecological questions (Ashton 2002) and conservation issues in birds (Julliard et al. 2004). Researchers should continue to publish measurements of body mass from different populations of birds to aid in future studies.

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News, Notes, Comments

Modified Hall Trap

I have read in the history of hummingbird banding by Ellie Womack that the drop side trap was developed and perfected by "Mike Hall, the husband of bander Janet Hall, who used PVC tubing as the frame and curtain falling outside the base" (Womack, 1996, Hummingbird Hotline No 38).

My basic training in hummingbird banding at Princeton was done with Hall Traps. At least two of these traps had been hand crafted by members of the Princeton banding group. The traps worked just perfectly except that -- at odd times -- the weighted middle hoop pinned a hummingbird that was making its fast exit. It was suggest that if that middle hoop did not meet the bottom hoop with a crash, there would be no fear of harming hummingbirds.

I had been given the step-by-step plans for the fabrication of my own Hall Trap along with the wooden circular top from which hang all the strings that manage raising and lowering the fabric sides.

In fabricating my own Hall Trap, the hula hoops from which the Princeton traps were construction were no longer available at the Dollar Store. I resorted to 21 mm outside diameter (OD; 3/4 inch) plastic water line from a local hardware store. By using the formula for the circumference of a circle, the length of pipe for the desired trap diameter can be calculated. I added a 7 mm OD (1/4 inch) plastic pipe below the weighted middle hoop to meet the bottom hoop gently. I purchased wedding veil material for the fabric sides and 6.35 mm (¼ inch) netting (used to keep birds off fruit bearing shrubs) for the top and bottom of the trap (and which also served as a way for wasps to escape the trap). The veil material is doubled, deep enough with the 7 mm diameter pipe in the fold to meet the bottom hoop when hung from the top hoop. The