TECHNICAL REPORT

MIGRATORY CONNECTIVITY AND ELEVATIONAL DISTRIBUTION OF THE CANADA WARBLER (CARDELLINA CANADENSIS) IN COLOMBIA

RESULTS WINTER 2014/2015

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SELVA: Research for Conservation in the Neotropics
& University of Saskatchewan
SUMMARY

The Canada Warbler is a declining Neotropical migratory bird that spends the non-breeding period primarily in the Andes of Venezuela, Colombia, Ecuador and Peru. Despite being a relatively abundant species in Andean forests, connectivity between the breeding and wintering grounds and the elevational distribution of the species have yet to be defined. There is only a limited body of work detailing the species’ habitat use. During the non-breeding period of 2014/2015, we visited six different regions of Colombia and targeted Canada Warblers for capture. At each site we also carried out passive five minute point counts and one minute long playback experiments. Targeted captures and an appeal for feathers from birds wintering in Colombia, gave rise to a sample of over 100 feathers, drawn from each of the three Andean chains and covering a broad latitudinal gradient. Both passive point counts (282 points) and playback experiments (301 points) in forest showed that Canada Warblers occurred at elevations between 1000 and 2250 m, with a tendency to be more abundant between 1250 and 1500 m. The species was more abundant in forest relative to shade coffee at the same elevation. There was a limited difference in the distribution of males and females with elevation. The probability of Canada Warblers being observed in mixed-species flocks increased with elevation.

INTRODUCTION

Colombia lies within the core of the wintering range of the Canada Warbler, a declining Neotropical migratory bird of conservation concern. The species is largely known from Andean forests but it will also use agroforestry systems such as shade coffee but rarely more open habitats such as silvopastures. While the species elevation distribution and habitat use is reasonably well known from anecdotal evidence, there have been no systematic studies to determine how its abundance varies with elevation or habitat. Further, the connectivity between breeding populations and wintering populations has yet to be examined. In order to effectively prioritize regions, habitats and elevations for the conservation of this species, it is essential to have the answer to all three of these questions.

For this reason SELVA, Environment Canada and the University of Saskatchewan, initiated a study of Canada Warblers in Colombia, with a view to determining the migratory connectivity between individuals wintering in Colombia and the breeding grounds, as well as determining the elevational distribution of the species and its habitat use. This report details the preliminary results from the non-breeding season of 2014/2015.
METHODS

Migratory connectivity
Canada Warblers were targeted for capture at six sites in Colombia between January and March, spanning all three Andean chains (the Eastern, Central and Western Andes), and a north-south gradient (Fig. 1). Feathers were also obtained from an ongoing study in Antioquia (NW Colombia), through a collaboration with Gabriel Colorado. At each site, birds were detected using playback – both male song and calls – and subsequently a 9 or 12 m net was installed and birds were lured to the net using playback. Not all birds detected could be captured and the success rate was approximately 0.25. For each individual captured, the first primary was removed and stored in an envelope for stable isotope analysis, and all birds were fitted with a uniquely numbered aluminum band. The following data were taken for each bird prior to release: age, sex, fat score, muscle score, wing and body mass.

Passive point counts
Point counts were separated by at least 100 m and lasted five minutes. Points were carried out between 6:00 am and 10:30 am. All migratory birds heard or seen during counts were recorded and their horizontal distance from the center of the point was estimated. For Canada Warblers, the age and sex of birds was determined where possible, and their vertical distance above the ground was also noted. For each point, we recorded the exact location to within 5 m using a GPS unit, and a series of habitat variables. Coordinates were later entered into Geoplaner V2.7 (www.geoplaner.com) to determine the elevation of each point. We did not rely on the elevation given by GPS units, as they are only accurate to within approximately 50 m. All point counts were carried out by one of three observers, Nicholas Bayly, Camila Gómez and Laura Cespedes.

Playback experiments
Either following passive point counts or at alternative points, the “chip” call of the Canada Warbler was played on the same speaker and MP3 player for one minute. Volume was kept constant by always having both units at full volume. If a Canada Warbler responded, either vocally or by approaching the speaker, its age and sex was recorded where possible. For all points, coordinates accurate to within 5 m were recorded using a GPS unit and elevation was determined by entering the coordinates into Geoplaner V2.7 (see above).
RESULTS

Migratory Connectivity
Targeted captures gave rise to 38 feather samples. Feather samples were also obtained from the ongoing study of Ana María Gonzalez (95 feathers, Cundinamarca, Eastern Andes) and from Gabriel Colorado (30 feathers, Antioquia, Western Andes) (Fig. 1). In total >163 feathers are available for stable isotope analysis and they were exported to Canada with the necessary permits in April 2015.

Figure 1 – Feather sampling sites in Colombia overlaid on the predicted non-breeding distribution of the Canada Warbler in Colombia. The number of feathers collected in the 2014/2015 season is listed and where feathers are available from 2013/2014 they are given in brackets. Some numbers are approximate, as we did not have exact numbers when creating the figure.
Passive point counts

We carried out 282 point counts in mature forest, 30 points in secondary forest and 26 points in shade coffee. We detected 77 Canada Warblers, all above 1000 m and below 2250 m. An analysis of the percentage of points at which birds were detected by elevation, reveals a relatively constant abundance between 1000 m and 2250 m, however, there was a tendency for birds to be more abundant between 1250 and 1500 m (Fig. 2).

Figure 2. Relative abundance of Canada Warblers at different elevations in Andean forests based on passive five-minute point counts.

The number of males and females detected during point counts at different elevations showed no clear pattern, however, females tended to occur with greater frequency at mid-elevations, while males were commoner at the two extremes of the distribution (Fig. 3). Canada Warblers did associate with mixed-species flocks but only at higher elevations, where up to 75% of birds were found in flocks (Fig. 4). The foraging height of Canada Warblers varied between 4 m and 16 m in forest, with most birds foraging at mid-heights, between 5 m and 15 m (Fig. 5). Average canopy height for points was approximately 20 m.
Figure 3. Proportions of male and female Canada Warblers detected during passive point counts at different elevations.

![Sex ratios by elevation](image)

Figure 4. Percentage of Canada Warblers detected in flocks as a function of elevation.

![Canada Warbler association with flocks by elevation](image)
Figure 5. The distribution of foraging heights in Canada Warblers detected in forest.

Playback experiments
We carried out 301 playback experiments in forest and 51 in shade coffee. Canada Warblers responded with greater frequency between 1250-1500 m and were not recorded above 2250 m (Fig. 6). One individual was recorded below 1000 m (750 m). Birds responded more frequently in forest relative to shade coffee at the same elevation.

Figure 6. Distribution of Canada Warblers by elevation based on playback experiments.
DISCUSSION

Canada Warblers were encountered with greater frequency in mature forests (canopy height >15 m) relative to secondary forests and shade coffee. Within forest, birds were distributed between 1000 m and 2250 m, with a tendency to show a peak in abundance between 1250 and 1500 m. Playback experiments revealed the occasional presence of birds below 1000 m and occasional wintering records also exist for the species above 2250 m. Nevertheless, it would appear that the species is most abundant between 1000 and 2250 m.

The distribution of male and female migrants can be used as an indicator of habitat quality, with males typically occupying the best habitats. The pattern that arose from passive point counts is not clear for Canada Warblers and further point counts are required to determine whether sex ratios vary with elevation and also between habitats.

Canada Warblers were generally observed foraging alone, although at higher elevations they showed a strong association with mixed-species flocks. When in forest, birds mostly foraged between 5 and 15 meters above the ground and were therefore neither associated with the understory or the canopy but instead with the mid-layers of vegetation. The presence of mid-level vegetation is largely associated with relatively mature forests and may be a factor limiting the habitat suitability for the species.

The data presented here are based on one wintering season and largely from the second half of the non-breeding season, which coincides with the end of the dry season. It is also based on a relatively limited number of points and detections. In order to confirm the patterns found here and be able to correct the data for differences in detectability and differences between sites, a second year of data is essential. Further detections may also help to clarify how genders and ages distribute themselves between habitats and elevations.

For more information contact Nicholas Bayly – nick.bayly@selva.org.co
ACKNOWLEDGEMENTS

We are extremely grateful for the hard work of our field assistants, Laura Cespedes, Jeyson Sanabria and Camila Gómez. We also thank Eibar Agara (Santa María), Angel Arturo Ciro (Santa María), Katerine Certuche (Ibagué), Gustavo Londoño, Mauricio Cabrera, Luisa Victoria Jamarillo and La Finca el Roble for their assistance in visiting the different sites. We thank Keith Hobson for his continued support of our work in Colombia. Environment Canada financed the field work carried out by SELVA, including the collection of feathers and point count surveys. The field study carried out by Ana María Gonzalez in Cundinamarca was financed by Environment Canada, who also received support from Bird Studies Canada, BirdLife International, USFWS NMBCA, Forest Service, Swarovski Optic.

BREAKDOWN OF EXPENSES – JANUARY – MARCH 2015 (Financed by Environment Canada)

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