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WINTERING KIRTLAND'S WARBLER AND ASSOCIATED SPECIES IN THE BAHAMAS:
THE FIRST FIELD SEASON

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Abstract.—As one of North America's most endangered bird species, the Kirtland's Warbler (KW, *Dendroica kirtlandii*) has been the focus of an intensive recovery effort on its Michigan breeding grounds. In contrast to the breeding grounds, little is known about the species on its wintering areas where it is confined to the Bahamas Archipelago. Recent studies indicate that wintering ground events can affect migrant populations and the absence of wintering ground information and conservation efforts could compromise KW breeding ground conservation efforts. Thus there is a need for more information regarding the KW and its winter habitat, as well as a need to build the capacity of island residents to undertake conservation management activities in the Bahamas. The research and training project discussed in this paper addresses these needs by involving Bahamian students in field research focusing on KW winter habitat and associated bird species. This project has the potential to increase our knowledge of the winter habitat requirements of the KW and associated species while building the capacity of Bahamians to undertake conservation management activities.

Key words: Bahamas, conservation training, *Dendroica kirtlandii*, Kirtland's Warbler, student research participation

Resumen.—UN PROGRAMA DE INVESTIGACIÓN Y CAPACITACIÓN PARA LA CONSERVACIÓN DE LA REINITA DE KIRTLAND Y ESPECIES RELACIONADAS EN SU HÁBITAT DE INVERNADA: LA PRIMERA TEMPORADA. Siendo una de las especies más amenazadas de América del Norte, la Reinita de Kirtland (RK, *Dendroica kirtlandii*) ha sido objeto de un esfuerzo de recuperación intenso en su territorio de cría en Michigan. A diferencia de los territorios de cría, poco se sabe acerca de la especie en los territorios de invernada, los cuales se restringen al archipiélago de las Bahamas. Estudios recientes demuestran que los sucesos en las áreas de invernada pueden afectar las poblaciones de aves migratorias y que la falta de información sobre éstos y de proyectos de conservación en los cuarteles invernales pueden comprometer los esfuerzos en las áreas de cría. Por lo tanto, es necesario obtener más información sobre la RK en su hábitat invernal además de capacitar a los residentes isleños para que lleven a cabo gestiones de manejo en las Bahamas. El proyecto de investigación y capacitación discutido en este artículo aborda estas preocupaciones incluyendo a estudiantes bahameses en la investigación de campo centrada en el hábitat invernal de la RK y especies relacionadas. Este proyecto posee el potencial de aumentar nuestro conocimiento de los requisitos del hábitat de invernada de la RK y especies asociadas al mismo tiempo que se incrementa la capacidad de los bahameses para realizar actividades de manejo y conservación.

Palabras clave: Bahamas, capacitación para la conservación, *Dendroica kirtlandii*, participación estudiantil en investigaciones, Reinita de Kirtland

Résumé.—UN PROGRAMME DE RECHERCHE ET DE FORMATION POUR LA CONSERVATION DE LA PARULINE DE KIRTLAND ET D'AUTRES ESPÈCES ASSOCIÉES HIVERNANTES AUX BAHAMAS : PREMIÈRE SAISON D'ÉTUDE DE TERRAIN. En tant qu'une des espèces d'oiseaux les plus menacées d'Amérique du Nord, la Paruline de Kirtland (PK, *Dendroica kirtlandii*) a fait l'objet d'efforts intensifs de reconstitution des populations dans ses zones de reproduction du Michigan. A la différence de la situation dans ses zones de nidification, peu de choses sont connues pour cette espèce dans son aire d'hivernage confinée à l'archipel des Bahamas. Des études récentes indiquent que des événements survenant sur les terres d'hivernage peuvent affecter les populations migratrices et que l'absence d'information et d'efforts de conservation dans ces zones peut compromettre ceux développés dans son aire de nidification. Il y a donc nécessité d'avoir plus de connaissances sur le PK et son habitat en hivernage ainsi que de développer la capacité des habitants des îles à mettre en œuvre des activités de gestion pour la conservation dans les Bahamas. Le projet de recherche et de formation discuté dans cette présentation examine ces besoins en impliquant des étudiants des Bahamas dans la recherche de terrain en se concentrant sur les habitats d'hivernage de la PK et des espèces associées. Ce projet devrait permettre d'améliorer notre connaissance des besoins du PK et des espèces associées dans leurs habitats d'hivernage tout en formant des bahamiens à prendre la responsabilité des activités de gestion et de conservation.

Mots-clés: Bahamas, formation à la conservation, *Dendroica kirtlandii*, Paruline de Kirtland, participation des étudiants à la recherche

THE KIRTLAND'S WARBLER (*Dendroica kirtlandi*) is one of North America's most endangered migratory birds, notable for its limited geographic distribution on both its breeding and wintering grounds. Intensive recovery efforts have concentrated on the control of brood parasitism by Brown-headed Cowbirds (*Molothrus ater*) and management of fire-dependent jack pine (*Pinus banksiana*) to ensure that adequate habitat is available on the central Michigan breeding grounds. The success of these management efforts is evident in the Kirtland's Warbler population increase from approximately 1000 birds in 1951 (Mayfield 1953) to approximately 2100 breeding warblers in 2002.

In contrast to the intensive management efforts for the Kirtland's Warbler on the breeding grounds, no management activities have been conducted on behalf of the warbler in the Bahama Archipelago wintering grounds, partly because of the belief that wintering ground events and habitat were not limiting to the Kirtland's Warbler population (e.g., Sykes and Clench 1998). Recent studies, however, have indicated that events on the tropical or subtropical wintering grounds may have serious population consequences for many migrants (Rappole *et al.* 1989, Robbins *et al.* 1989, Sherry and Holmes 1995, Marra *et al.* 1998, Sillett 2000), including the Kirtland's Warbler (Haney *et al.* 1998). Given recent studies indicating that wintering ground events can affect migrant populations, the absence of wintering ground information and conservation efforts could compromise Kirtland's Warbler breeding ground management efforts. It is for this reason that the Kirtland's Warbler recovery plan (US Fish and Wildlife Service 1985) ranks studies of wintering Kirtland's Warblers and its habitat as a high priority, and also recommends building the capacity of island residents to undertake conservation management activities in the Bahamas.

To initiate and maintain conservation management of protected areas in the Bahamas requires appropriately trained personnel. Unfortunately, the Bahamas, as well as many other island territories of the Caribbean, lacks citizens who are trained in natural resources management or other closely related fields. This problem partly arises from lack of exposure to field biology, as well as a lack of employment opportunities for island residents. Thus there is a need to train Bahamian students in field biology and natural resources management.

In addition to a need for training Bahamians, there is a need for basic studies of Bahamian birds, particularly endemics or near-endemics, many of which

have been studied poorly. For example, few studies have been conducted on the Bahamas Yellowthroat (*Geothlypis rostrata*), Thick-billed Vireo (*Vireo crassirostris*), Bahama Swallow (*Tachycineta cyaneoviridis*), Western Stripe-headed Tanager (*Spindalis zena*), Bahama Mockingbird (*Mimus gundlachii*), and West Indian Woodpecker (*Melanerpes superciliosus*), as well as other resident and migrant species found in the Bahamas. Basic ecological studies of these species and their habitats are fundamental for future conservation activities in the Bahamas.

Given these needs for studies of the winter biology and habitats of the Kirtland's Warbler and ecological studies of other bird species in the Bahamas, as well as a need for training Bahamians in the methods of field biology and natural resources management, we have developed a project with the following objectives:

1. Characterize winter habitat, potential resources, and stresses for wintering Kirtland's Warblers in the Bahamas.
2. Characterize population biology and ecology of focal Nearctic/Neotropical migrants and endemic or near-endemic birds in habitats occupied by Kirtland's Warblers.
3. Strengthen the capacity of Bahamians to monitor, manage, and protect ecosystems to conserve threatened and endangered resident and migrant species.

The First Field Season.—During 13 January to 7 April 2002, the project successfully completed an exploratory field season, which was designed to survey habitats for Kirtland's Warblers and associated focal species and to initiate preliminary field studies to fine-tune the study design for the next three winters. As planned, the project also involved two Bahamian students, who were trained in basic field methods as they assisted with survey activities. As specified in the original proposal, the fieldwork and training occurred on the island of Andros in a region designated for national park status. Here, in the course of our surveys, one and possibly two Kirtland's Warblers were observed. In addition to the completion of activities specified in the original proposal, we captured and color-banded six Kirtland's Warblers and made preliminary observations of these Kirtland's Warblers and their habitat at a high-density Kirtland's Warbler site discovered by the Ornithology Group of the Bahamas National Trust on Eleuthera. The findings from these exploratory activities will guide our studies for the

PROJECT ACTIVITIES DURING
THE FIRST FIELD SEASON

The project started with a series of short meetings in Nassau with various government officials, staff of the College of the Bahamas, the Bahamas National Trust, and members of the Ornithology Group of the Bahamas National Trust, as well as others interested in the project. These meetings helped us to introduce the project and its objectives to potential cooperators and other interested persons. We initiated the project on Andros with an orientation to Andros natural history by Michael Baltz (The Nature Conservancy, Illinois) and an introduction to plant identification and fire ecology by Chris Bergh (TNC, Florida). Our project was based at the Bahamas Environmental Research Center in Stanieland Creek, operated jointly by the College of the Bahamas and George Mason University.

Two College of the Bahamas biology students participated for the duration of the project: Ancileno Davis, a recent graduate from Nassau, and Jasmine Turner, a second-year student from Andros Island. Financial support was raised to enable the two students to participate in Kirtland's Warbler recovery activities in Michigan during summer 2003. The research and student training activities based at the Bahamas Environmental Research Center on Andros included the following:

1. *Training in avian identification.*—The Bahamian participants received field training in identification of both migrant and resident species on Andros. This has involved intensive fieldwork with experienced observers to help them learn to identify the birds of Andros by sight and sound. In addition, basic natural history and conservation status were discussed.
2. *Avian census methods.*—Students were introduced to both transect and point count methods for monitoring and surveying terrestrial birds.
 - a. *Point counts.* Students participated in 180 point count bird censuses run in a variety of habitats, reflecting different fire histories. This involved fixed-radius point counts in which all birds detected in a 25-m radius were recorded during a 5-min period of silence followed by a 5-min period in which a tape recording of mixed migrant chips was played. Point counts were located at intervals of 150 m or more, and 30 point counts were run per habitat. A GPS unit was used to

quantifying the position of each point count location. Counts were run from sunrise until 10:00 h. The following six typical Bahamian terrestrial habitats were surveyed:

- Pine forest with low understory (<1.5 m) primarily of poisonwood and palms.
- Pine forest with 2–3 m broadleaf shrub understory.
- Pine forest with bracken fern understory (1–1.5 m).
- Shrubby abandoned agricultural field, with mix of herbaceous plants and scattered shrubs (1–2 m).
- Tall Coppice—broadleaf dry forest with closed canopy at 12–15 m.
- Short Coppice—broadleaf shrubby habitat with broken canopy at 3–4 m.

- b. *Tape playback transects.* Between each point count site, observers walked for 150 m or more between points while playing tape recordings of Kirtland's Warbler songs and call notes. The tape recorder volume was set so that vocalizations could be heard at least 25 m to either side of the tape recorder. Thus transects were run between the 30 points conducted in the six habitats.

3. *Quantification of vegetation structure.*—Vegetation structure relevant to avian habitat use was quantified in the six habitats sampled with point counts to provide a description of the habitats. Within each habitat two point count sites were randomly selected for sampling. Sampling occurred within a circle of 0.02 ha and included measures of ground and canopy cover, shrub density, foliage height profiles, and basal area of pine and broadleaf trees.
4. *Mist-netting and banding.*—Mist-netting and banding of focal species (Bahamas Yellowthroat, Thick-billed Vireo, Prairie Warbler *Dendroica discolor*, Palm Warbler *D. palmarum*) were conducted to provide information on avian distribution, movements, and physical condition in the different habitats. All focal species were given unique combinations of color-bands to allow identification of individuals on their wintering territories and to enable studies of winter site fidelity. All migrant species were banded with a US Fish and Wildlife band. Mist-netting and banding were conducted in some of the habitats in which point counts were run and include: pine forest with 2–3 m broadleaf shrub

understory; shrubby abandoned agricultural field with a mix of herbaceous plants and scattered shrubs (1–2 m tall); tall coppice with broadleaf canopy at 12–15 m; and short coppice with broken broadleaf canopy at 3–4 m.

5. *Data entry and analysis.*—Field data were entered on computer spreadsheets and elementary descriptive statistics calculated to compare bird populations among habitats as well as documenting differences in vegetation among the sites.
6. *Summary reports.*—Students each wrote two summary reports based on their field experiences and analysis of various aspects of the field data. The reports required the students to carefully examine the field data and identify patterns of avian distribution and vegetation structure, as well as provided an opportunity to summarize their project experiences.

PRELIMINARY FINDINGS

Our point count and mist-netting results provided valuable documentation of avian abundance and distribution in some of the major habitats in the area proposed as a national park on Andros. A total of 38 species was detected in 180 fixed-radius point counts conducted in the six habitats on Andros Island. Mist-net captures of birds in four habitats supplemented the point counts. A total of 435 individual birds of 34 species was captured in the four habitats.

One and possibly two Kirtland's Warblers were detected on Andros Island. One Kirtland's Warbler observation was made by Matthew Anderson and Ancilleno Davis on 21 February 2002 in tall coppice when a Kirtland's Warbler responded during the warbler chip-note playback session of a point count. A second Kirtland's Warbler observation was made by Jasmine Turner on 21 February 2002 during a tape playback transect in the pine forest with shrubby understory, 1033 m from the site where Anderson and Davis observed their Kirtland's Warbler. Given previous findings which indicate that wintering Kirtland's Warblers can have home ranges of 8 ha, it is possible that the two sightings were of the same unbanded individual.

Wunderle made two trips to Eleuthera to observe and capture Kirtland's Warblers at the site where Paul Dean and the Ornithology Group of the Bahamas National Trust discovered several Kirtland's Warblers. Four individuals were captured with tape recorded playback and uniquely color-banded and released during the first visit (17–18 March 2002).

During the second visit (3–6 April 2002), the color-banded Kirtland's Warblers were resighted, each within 20 m of its original capture site. In addition, two other individuals were captured at the site and two unbanded Kirtland's Warblers were observed, indicating that at least eight individuals were present along 235 m of a rural road. Vegetation measurements were made at four of the six Kirtland's Warbler capture sites. The warblers on Eleuthera were all observed in a shrubby second-growth site (vegetation 2–3 m tall) in which the shrub, black torch (*Erithalus fruticosus*, Rubiaceae) was common and provided fruits which were consumed by the Kirtland's Warblers.

PLANS FOR THE NEXT FIELD SEASON

Given the unexpected finding of an extraordinary concentration of Kirtland's Warblers on Eleuthera, we plan to return to that island in October 2002 to continue studies of the Kirtland's Warblers at that site, pending permission by the landowner. Thus, we plan to shift our field studies from Andros to Eleuthera to enable us to study the wintering Kirtland's Warblers, their habitat, and associated bird species. Using the methods specified in the original proposal we will study warbler foraging behavior, site fidelity, home range (territory) size, movements, and interactions between the sexes. Capture of wintering Kirtland's Warblers will enable us to document body condition and allow us to color-band birds for individual recognition in the field. In addition, we will initiate habitat studies to quantify food resources (fruit and insects) and document seasonal changes in food supply. We will also initiate radio telemetry studies on focal species (e.g., Bahama Yellowthroat, Thick-billed Vireo) to develop our telemetry skills and obtain experience that may be applied to future telemetry studies of the wintering Kirtland's Warblers. These studies will be designed to document the behavior of Kirtland's Warblers at this site and to characterize the habitat so as to determine why this particular Eleuthera site is so attractive to wintering Kirtland's Warblers. Once we understand why Kirtland's Warblers are so abundant at this site and the value of this habitat to the warblers, we will focus on the ecological factors that produce such habitats. We are excited with the potential of these studies to enable us to identify the characteristics of high quality Kirtland's Warbler winter habitat and how such habitats can be produced and managed.

Student training will continue to be an integral part of the research activities. We are working

closely with the College of the Bahamas to identify potential student participants and to enable students to obtain research credit through the college. A better working relationship with the College of the Bahamas will help to publicize field opportunities for students.

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