TIMING OF THE SPRING PASSAGE OF DARK RED-TAILED HAWKS PAST DERBY HILL BIRD OBSERVATORY

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The Red-tailed Hawk (*Buteo jamaicensis*) is one of the most frequently encountered *Buteos* across North America. In western states and provinces, the species is highly polymorphic, with many individuals showing varying degrees of melanism and erythrism (Dickerman & Parkes 1987, Hull et al. 2010). Across the eastern states and provinces, the plumage of Red-tailed Hawks is typically far less variable, and it is generally agreed that the widespread eastern subspecies *B.j. borealis* (including the northernmost populations, sometimes treated as *B.j. abieticola*) does not exhibit dark forms (Dickerman & Parkes 1987, Wheeler 2003). Thus, dark individuals occasionally documented in the East have generally been interpreted as vagrants of the western subspecies *B.j. calurus*, though the possibility that dark individuals occur at low frequency in some portion of *B.j. borealis'* extensive range cannot be ruled out.

Independent of subspecific speculations, the timing of the movements of dark birds is an easily documentable phenomenon at any eastern hawkwatch recording large numbers of Red-tailed Hawks. Derby Hill Bird Observatory, a sanctuary owned and operated by the Onondaga Audubon Society, hosts such a hawkwatch every spring from late February through the end of May, the average Red-tailed Hawk count from 1979 to 2012 being just shy of 6,500 birds per season. Dark birds are of near-annual occurrence amidst those kinds of numbers.

Assuming eastern dark birds are vagrants from the west, one might expect their dates of passage to be clumped according to theories of differential migration of distinct populations (Smith et al. 2003, Hull et al. 2009). Especially if vagrants were originating from a particular western subpopulation and maintaining migration timing cues from their origin population, one would expect a pattern in which dark birds would pass eastern sites in a distinctive temporal window relative to the mean date of passage of the bulk of migrating Red-tailed Hawks. On the other hand, if these dark birds were not from a specific population, one would expect their dates of passage to be spread out across the entire season.

METHODS

Derby Hill Bird Observatory is located on the southeast corner of Lake Ontario (N 43° 31' 39", W 76° 14' 22") and is at just about the extreme eastern end of the diversion line created by the south shores of Lakes Erie and Ontario in spring migration. Standardized spring migratory raptor counts have been conducted annually at the site since 1979, with the count season typically starting in late February or early March and continuing through the end of May and making for an average of 517 hours of observations per season. Counts are conducted under a standardized protocol from one of two lookouts located just over 1 kilometer apart. It is generally left to the discretion of the individual counter as to what data are collected on the birds beyond species and number. Specific information on the dates of passage of dark Red-tailed Hawks were documented and available from the years 1994, 1995, 1999, 2001-2006, 2009, and 2012. The term "dark" is used herein to refer to both dark morph birds and the rufous or intermediate morph

birds as described by Wheeler (2003) where the majority of the underwing coverts were dark, obscuring the patagial marks and commas. Light morph birds with heavy orange wash to the underparts but retaining prominent patagial marks and commas (birds to whom the term rufous morph has been misapplied) were not included.

All statistics were performed with Microsoft Excel, with all calendar days being converted to Julian dates for ease of calculations. In an attempt to normalize the effects of weather on the timing of spring migration of Red-tailed Hawks past Derby Hill, mean dates of passage and standard deviations were calculated for all migrating Red-tailed Hawks for each year examined.

RESULTS

A total of 44 individual dark Red-tailed Hawks were observed in the eleven years examined. As many as 11 were observed in a single season (1995) while in two springs (2003 and 2006), only one dark bird was documented. The earliest dark Red-tailed was recorded on 13 March and the latest bird passed the site on 19 April, with the standard deviation for all 44 dark birds being 10.8 days.

Mean date of passage for all Red-tailed Hawks varied from 30 March in 1995 to 10 April in 1997. Standard deviations from the mean date of passage varied from 13.5 days in 2001 to 21.3 days in 2012, with an average standard deviation (amongst all 11 years) of 16.1 days.

Altogether, 20 dark individuals passed the site before the mean date of passage for all Red-tailed Hawks for their respective years, while 24 dark birds passed after their year's mean date for all Red-taileds. 34 of the 44 dark Red-tailed Hawks passed the site within (plus or minus) one standard deviation of the mean date of passage for all Red-tailed Hawks for their respective years. The remaining ten individuals passed the site between plus one and plus two standard deviations from the mean; no dark birds passed the site earlier than one standard deviation before their year's mean date of passage for all Red-tailed Hawks.

DISCUSSION

These data indicate little difference between a mean date of passage for all of Derby Hill's spring Red-tailed Hawk flight and the date of passage of dark birds. The standard deviation for the dark birds is slightly lighter than that for all Red-tailed Hawks, but this is perhaps to be expected given the discrepancy in sample sizes of 44 dark individuals versus tens of thousands of normal birds. It does not appear the dark birds were clumped in a specific temporal window relative to the movement of all Red-tailed Hawks past Derby Hill.

Although there were more dark birds moving after the mean date of passage than there were before, and the latest birds were, temporally, further from the mean date of passage than the earliest birds, two main realities of the northbound movements of Red-tailed Hawks past Derby Hill probably account for this discrepancy.

Dates of passage of all Red-tailed Hawks are not entirely normally distributed; in each year addressed, the right tail, after mean date of passage, was larger than the left. The standard deviations used herein are calculated assuming a normal distribution. Quartiles or other percentiles might seem a better way to deal with the real data. The nature of the flights however, having big pushes of hundreds and sometimes thousands of birds on a few select days throughout the season, dictate that the desired percentile would fall on those big days, not on an appropriate or more meaningful length of time form the

mean (or median) date of passage. In four of the eleven years, either the first or third quartile

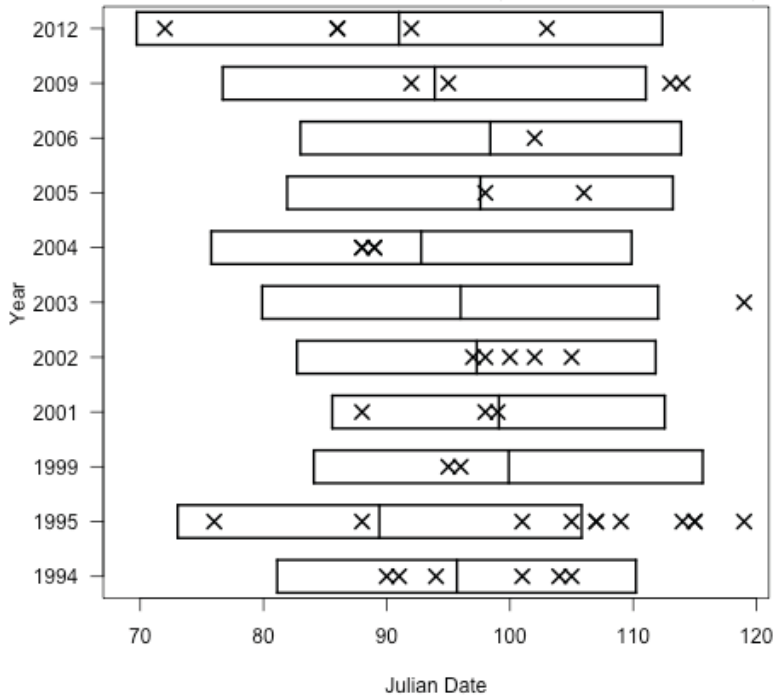

Figure 1: Timing of dark Red-tailed Hawks (Xs) relative to all Red-tailed Hawks passing Derby Hill Bird Observatory (mean date of passage plus and minus one standard deviation).

fell within five days of the median date of passage of all birds. In 2001, the first and third quartile were separated by only seven days, and the nature of March weather and therefore the March flight in 2004 made for the first quartile falling on 28 March while the second quartile fell on 29 March.

Secondarily, or perhaps helping to account for the non-normal distribution, is the fact that Red-tailed Hawks hatched the previous summer move north later than those birds that are over a year old. There are far fewer young birds than there are adults documented each spring at Derby Hill, so a bimodal distribution is not apparent or extractable from the raw numbers. In 2009 and 2012, however, data were collected on the age of the Red-tailed Hawks passing the site when the counter was not overwhelmed by volumes of birds. In 2009, 1,748 Red-tailed Hawks were identified as adult type birds (having undergone at least one (incomplete) prebasic molt) with a mean date of passage of 29 March while 232 individuals were identified as the young of the previous summer with their mean date of passage being 17 days later on 15 April. For 2012, 1,726 Red-tailed Hawks were identified as adult types, with a mean date of passage of 24 March, while 296 individuals were identified as the young of the previous summer, their mean date of passage being again exactly 17 days later on 10 April.

While age data were not collected on all of the dark Red-taileds included in this study, it can easily be speculated that most later individuals, perhaps a bulk of those

passing later than one standard deviation after the mean date of passage for the species, were young birds.

Speculations on ages aside, the data do not reveal any distinctive pattern or signal that directly support origins from specific (western) populations of Derby Hill's dark Red-tailed Hawks. In particular, the data are contrary to what one would expect if these dark birds were from a single subpopulation beginning their northbound migrations from western wintering areas (within the normal winter range of *B.j. calurus*). A less distinctive or strongly clumped signal could be attributed to dark birds occurring with varying frequencies through the west, not just in one or two specific subpopulations. Furthermore, there is an equally probable chance dark birds of western origins wintered broadly in the eastern United States (within the wintering range of *B.j. borealis*) with cues for northbound movement being distorted by any number of factors, which would accordingly further distort the signal in the data.

With all of these confounding variables, the timing of readily identifiable individuals cannot in and of itself confirm or rule out vagrant origin hypotheses. Further studies of dark Red-tailed Hawks in the East, preferably including the timing of their fall movements, and ideally based on band recoveries and/or stable isotope analysis of feathers would be greatly insightful. With available data, interpretation of the origins and destinations of dark Red-tailed Hawks in the east remains curious but largely speculative.

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