Communication

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Daytime sleeping behavior observed in a Black-and-white Warbler during spring stopover

Abstract: Nocturnally migrating birds experience loss of sleep during the migratory period especially when undertaking long, non-stop flights. We report a field observation of daytime sleeping behavior in a Black-and-white Warbler (Mniotilta varia) during spring migration. It is likely that this individual was compensating from sleep loss experienced during a trans-Gulf of Mexico flight. Only a few observations of daytime sleeping behavior have been reported in free-living migrants and all have been associated with long-distance flights in relation to ecological barriers.

Keywords: nocturnal migration, daytime sleep, stopover behavior

Doi: 10.1515/ami-2015-0001
received November 10, 2014; accepted January 20, 2015

1 Introduction

Most bird species are active during the day and sleep at night, except during migration when the migratory flights of most songbird species occur at night. Generally, a migratory bird begins a night’s flight shortly after sunset and flies for about half the night, which likely leads to loss of sleep [1]. If loss of sleep has negative consequences in migratory birds as it does in other taxonomic groups [2-3] then one would expect a compensatory response. Migratory birds may compensate for lost sleep during the migratory period by devoting more time to sleep during the day, possibly engaging in unihemispheric sleep while aloft, or by engaging in deeper sleep [1,4-6]. While studies of sleep loss have been studied in captive migrants, there are few published descriptions of daytime sleeping in free-living migrants. Observations of migrants shortly after migratory flights are likely to be revealing since compensatory sleep may necessary following prolonged, strenuous flights (e.g., long flights across ecological barriers). Nemeth [7] reported an observation of daytime sleeping behavior in a Hooded Warbler (Setophaga citrina) shortly after the individual crossed the Gulf of Mexico, at the same research site as the current report. However, the majority of published observations of daytime sleeping behavior have been in captive studies and questions remain as to how frequently this behavior is utilized in songbirds on stopover.

2 Observation

We report a field observation of apparent daytime sleeping behavior in a male Black-and-white Warbler (Mniotilta varia), during spring stopover. On 3 April, 2013 we were conducting behavioral foraging observations on color marked Black-and-white Warblers in a coastal forest near Johnson’s Bayou in Cameron Parish, Louisiana (29° 45’ N 93° 30’ W) where migrants are studied upon completing a migratory flight across the Gulf of Mexico. The area is a coastal plain consisting of a Live Oak (Quercus virginiana) dominated canopy and Southern Wax Myrtle (Myrica cerifera) understory.

The individual was captured via mist-net and banded approximately 3 hours prior to the beginning of our observation. Age was determined as after-second year and sex as male based on plumage criteria [8]. The individual’s fat class was scored as 1 (range 0 to 6) [9] and muscle class was scored as 2 (range 0 to 3) [10]. Mass of the individual was 10.1 grams at capture. Average mass of Black-and-white Warblers at our study site is 9.7 ± 0.03 (SE) based on 1,598 banding records from 1996 - 2013. A blood sample (~65 µl) was taken at the time of capture from which haematocrit was determined as 44%. While caution is necessary, studies into the effects of blood sampling on songbirds have failed to find any long- or short-term
influences on survival, condition, or recapture rate [c.f.11-12]. Therefore we do not believe that our obtaining a blood sample comprising approximately 0.65% of the bird’s body mass influenced its behavior. Additionally, while it has been documented that banding and handling of birds causes some levels of stress [13], given our anecdotal observations that BAWW resume typical behaviors within a few minutes of release, we do not believe the effects of banding influenced our observation. By all accounts, this individual was in good condition at the time of capture and we do not believe condition contributed to our observance of the sleeping behavior.

The observation began at approximately 1530 CST and was conducted about 12 meters from the individual with 10x50 binoculars and recorded digitally. Foraging observations were taken based on methods in [14]. We observed the individual foraging for 76 seconds before flying to a piece of downed Live Oak tree that was about 1 m long and lay horizontally on the ground, where he foraged for an additional 27 seconds. The bird then fluffed up its feathers and closed both eyes but stayed facing forward. He remained in that position for 159 seconds unmoving and apparently sleeping. During this time a Hooded Warbler foraged approximately 0.4 meters from the Black-and-white Warbler in a nearby Southern Wax Myrtle and a House Wren (Troglodytes aedon) foraged about 0.4 meters away on the same tree. After exhibiting the sleeping behavior, the individual preened for 36 seconds and then resumed foraging for an additional 38 seconds before he flew out of sight.

Prior to displaying the sleeping behavior the individual moved at a rate of 9.67 meters/minute with a foraging maneuver rate of 15.73 foraging maneuvers/minute. The average movement rate of Black-and-white Warblers during our study was 9.1 ± 0.6 (SE) meters/minute and average foraging rate was 16.7 ± 0.6 (SE) maneuvers/minute based on 148 separate observations. Given that the observed individual showed typical movement and foraging rates, we do not believe this individual was acting atypically nor do we believe his capture and handling contributed to the observed sleeping behavior.

3 Discussion

Migratory birds may compensate for loss of sleep by engaging in short bouts of daytime sleep [5-6], and our observation of a male Black-and-white Warbler behaviorally asleep for 159 seconds as well at that by Nemeth [7] are consistent with that mechanism. Further, Fuchs et al. [5] indicate that episodes of daytime sleep in migrants may typically last around 9 seconds and range up to 2-3 minutes. The feasibility of daytime sleeping behavior may be confounded by the need for vigilance against predators. However, there is some indication that birds can undertake unihemispheric sleep allowing for one eye to remain open [15-16] and thus migrants can still monitor their environment while engaging in sleeping behaviors. In our study, however, we observed that both eyes were closed and so unihemispheric sleep seems unlikely in this case. We also noted at least two other migrants foraging within 1 meter of our observed individual. As suggested by Nemeth [7] who reports a similar observation, migrants may be able to utilize cues and alarm calls of other birds while engaging in behaviors that would otherwise leave them vulnerable.

Migrants arriving on the northern coast of the Gulf of Mexico during spring migration have likely just completed an 18-22 hour non-stop flight originating in Central America [17]. As such, migrants may spend much of the daylight hours foraging so they can replenish their fuel reserves [18-19]. Alternatively, the importance of rest after such a flight may also be crucial for migrants to repair flight muscles catabolized during flight and to allow time for digestive organs to reconstitute [20-21].

Throughout our study we collected 148 separate foraging observations on no fewer than 57 individuals comprising over 200 minutes (12,437 seconds) of behavioral data on Black-and-white Warblers. That said, we only observed sleeping behavior in a single individual. It is unknown whether the daytime sleeping behavior observed is common in free living migrants. As noted, very few studies have reported such behavior in field studies. It is possible that given the short length of these sleeping episodes (lasting no longer than a few minutes) this behavior is difficult to observe in the field.

Both our observation and that of Nemeth [7] took place along the northern Gulf of Mexico coast on migrants who are presumed to have completed a long, non-stop flight just hours before. Schwilch et al. [22] in a study with songbirds having just completed a 14-16 hour flight which included crossing the Mediterranean Sea also reports sleep-like observations when birds were placed and observed in cages. They further report two instances where free-living migrants rested under vegetation shortly after arriving into the study area and remaining there for several hours. Similarly, Biebach et al. [23] notes several hours of resting behavior in autumn migrants after completing a trans-Mediterranean flight and prior to undertaking a trans-Saharan flight. While studies have indicated a general resilience to sleep-deprivation in songbird migrants, the standard migratory flight does not
last the entire night and thus does allow for some nighttime sleep [1]. It is possible that these limited observations may then be a result of longer, non-stop flights may that require bird to compensate with daytime sleep behavior.

Acknowledgements: This study was supported by research grants to KMC from the Eastern Bird Banding Association and the Wilson Ornithological Society. The field work was supported by an NSF grant (IOS 0844703). We thank W. Lewis, T. Jones, E. Ospina, and L. Derderian for their assistance with the banding operation at Johnson’s Bayou, and F. R. Moore whose valuable comments helped to improve this manuscript. We are also thankful to the Gray Estate for granting us permission to conduct research on their property.

Conflict of Interest: K.M. Covino is an assistant editor of the journal, Animal Migration.

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