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Notes from Wood Thrush (*Hylocichla mustelina*) telemetry: Synchronous tail replacement in prebasic molt and single-male nest provisioning

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ABSTRACT—We tracked 47 Wood Thrushes (*Hylocichla mustelina*) using radio telemetry over 2 breeding seasons in Virginia, USA. Here we present 2 noteworthy observations from this effort. First, we recorded one adult male with synchronous tail replacement in post-breeding molt during tracking from the early breeding season until the fall migration. Synchronous tail molt is seldom documented in Passeriformes and may have consequences for behavior and habitat use during this period of reduced mobility. Second, we recorded a widower male providing parental care by feeding young for nearly the entire nestling period. These observations highlight both the vulnerability of the Wood Thrush immediately following the breeding season and its potential reproductive resilience in the case of mate loss. *Received 19 May 2019. Accepted 30 July 2020.*

Key words: habitat use, male parental care, mate loss, post-breeding habitat, roost, widower.

RESUMEN (Spanish)—Rastreamos 47 individuos del *Hylocichla mustelina* usando radiotelemetría durante dos temporadas de reproducción en Virginia, EEUU, y presentamos dos observaciones notables de este esfuerzo. Primero, registramos el reemplazo sincrónico de las rectorices durante la muda post-reproductiva en un macho adulto, el cual rastreamos desde el inicio de la temporada reproductiva hasta la migración del otoño. La muda sincrónica de las rectorices rara vez se documenta en Passeriformes y puede tener consecuencias en el comportamiento correspondiente y uso del hábitat durante este período de movilidad reducida. En segundo lugar, documentamos a un macho viudo aprovisionando por sí solo a sus polluelos durante casi todo el período de cría. Estas observaciones resaltan tanto la vulnerabilidad de *Hylocichla mustelina* inmediatamente después de la temporada de reproducción, así como su potencial de resiliencia reproductiva en caso de pérdida de la pareja.

Palabras clave: cuidado parental del macho, dormitorio, hábitat post-reproductivo, pérdida de pareja, uso del hábitat, viudo.

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Intensive tracking of radio-tagged birds may yield natural history insights beyond the primary research objectives. In our research studying roosting ecology (Jirinec et al. 2015) and habitat requirements (Jirinec et al. 2016), we radio-tracked

37 male and 10 female Wood Thrushes (*Hylocichla mustelina*) and made 2 noteworthy observations that were unintended byproducts of the original study. In this note, we describe observations of synchronous tail replacement during prebasic molt and nest provisioning by a widower male that occurred over the 2013 and 2014 breeding seasons.

Methods

We conducted fieldwork at 8 parks and 1 military base on the coastal plain in southeastern Virginia, USA (37°15'N, 76°40'W). Study sites were tracts of mature eastern deciduous or mixed forest at low elevation (<50 m a.s.l.) embedded within a landscape that contained urbanized areas (Jirinec et al. 2016).

In May and June of each year we captured birds for tracking with radio-telemetry. First, we caught males with mist nets using playback of conspecific song as a lure. The species is sexually monochromatic (Pyle 1997), but males can be identified by their vocalizations, active territorial defense, and, while in hand, by the presence of cloacal protuberance. After capture, males were banded and marked with a 1.3 g radio transmitter (BD-2; Holohil Systems, Carp, Ontario, Canada). Similar to many tracking studies on small to medium songbirds (e.g., Whitaker et al. 2018), we attached transmitters with an elastic jewelry cord (0.7 mm diameter; Stretch Magic, Pepperell Braiding, Pepperell, Massachusetts, USA), which we fashioned into a figure-8 leg harness (Rappole and Tipton 1991). Birds were tracked opportunistically but often for the duration of the transmitter's life (~60 d), a mean of 53.9 locations (SD 7.7), with notes on whether the male produced a territorial song associated with each location fix. See Jirinec et al. (2015) for more details on telemetry methods.

While radio-tracking males (typically in June), we often located their nests for monitoring and for tracking of females. For 10 nests, we successfully target-netted attending females using various configurations of mist nets stacked on poles from bamboo stalks, which effectively yielded 12 m × ~5 m nets (30 mm mesh size) that were placed in the vicinity (5–10 m) of the nest. Observers visually monitored the attending females and their nests during trapping, and thus verified the female's identity when she was caught during a

foraging bout. As with males, we attached a radio transmitter and tracked both mates for the duration of the transmitter's life.

Results

Synchronous tail replacement

In 2013, we replaced the radio transmitter on one of the study males (COLW4) during mid-breeding season. This allowed us to follow the individual for 113 d, which is more than twice as long as the rest of the study birds (mean 50.1 d) and extended the tracking interval until the beginning of fall migration.

We tracked COLW4 continuously from 22 May to 18 July 2013, at which point we had reached the desired number of locations (see Jirinec et al. 2015). Because we knew the transmitter was still active, we checked COLW4 on 1 September (45 d since previous survey) to see whether the bird was still in his home range and found him near the May capture location. COLW4's radio signal remained in the same small area during checks on 2 and 6 September but disappeared sometime before the final inspection on 12 September. We therefore presume the bird had commenced its fall migration in the week leading up to 12 September.

The 6 September survey included a visual observation at a nocturnal roost that revealed COLW4 to be in prebasic molt with synchronous tail growth. All bird locations we refer to here were diurnal detections via telemetry—except for the survey on 6 September. The Wood Thrush is a secretive bird seldom seen during the day, but nighttime often offers better viewing of radio-tagged individuals (Jirinec et al. 2015). COLW4 was roosting in a thick stand of bamboo (*Phyllostachys aurea*) where we were able to take several photos that showed the bird having a stubby tail, indicating partially grown rectrices that were being replaced synchronously (Fig. 1).

Although birds can lose their tails in encounters with predators, resulting in synchronous tail replacement, none of the 47 birds captured in this study had missing tails at capture or during visual observations at roost sites in June and July (Jirinec et al. 2015).

Single-male nest provisioning

In 2014, we radio-tagged a Wood Thrush pair on their territory near a 2-lane road. We first captured

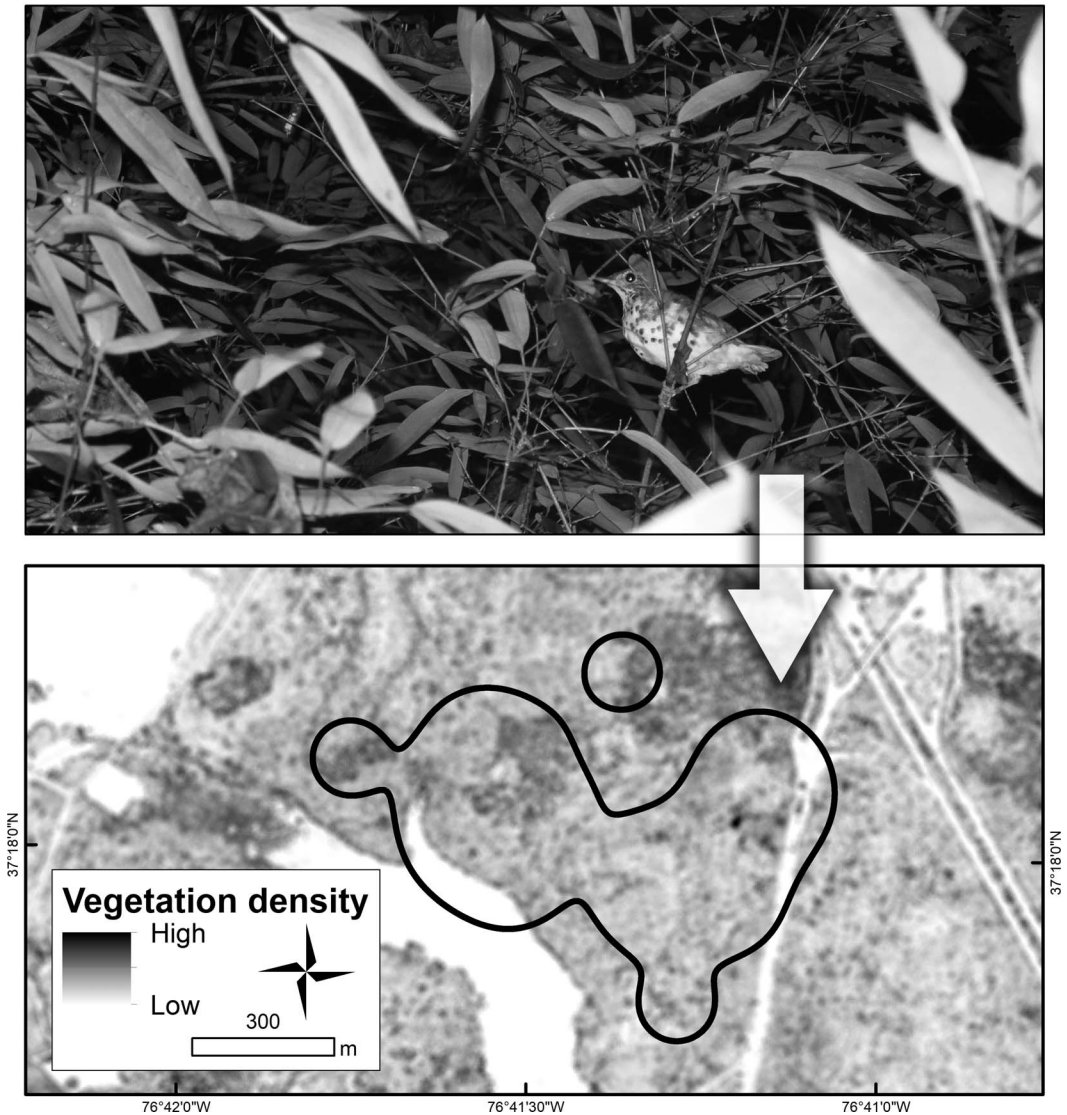


Figure 1. The breeding season home range (95% isopleth of kernel density estimation; black polygon) of a radio-tagged Wood Thrush (*Hylocichla mustelina*) male known as COLW4 in southeastern Virginia, USA, in 2013. The home range was constructed with bird locations collected from 1 June to 18 July. Tracking on 1 and 2 September revealed the bird to be near the northeastern part (arrow) of its breeding home range. As demonstrated by LiDAR-derived vegetation density, the area coincided with a dense patch of vegetation, mainly composed of introduced bamboo (*Phyllostachys aurea*). A visual observation of COLW4 while roosting on 6 September revealed synchronous tail growth near the end of the prebasic molt.

the male identified as CNPS41 on 29 May and tracked him for 24 d before locating his nest on 22 June. Positioned 4 m high in a small American beech (*Fagus grandifolia*), the nest was in the incubation stage and contained a female (CNPS41F), which we captured that day. At 2200 h EST on 24 June, the

female roosted on the nest; however, at 0800 h on the following day (25 Jun) we found CNPS41F across the road with severe injuries possibly caused by a vehicle collision (Fig. 2). The bird had a broken wing, leg, and rib, along with substantial bruising on the abdomen, and died within 2 d. We checked the



Figure 2. A Wood Thrush (*Hylocichla mustelina*) nest monitored in southeastern Virginia, USA, in 2014. As evidenced by bruising and other injuries, the disabled female (a) was found on 25 June shortly after her nest hatched (b). Following the female's death soon thereafter, the 3 nestlings continued to be singly provisioned by the male at least through 3 July. We found the nest empty on 5 July after it was likely depredated (d). Notice the presence of an infertile egg in photos on 25 and 27 June (c), but not on 5 July.

pair's nest on the day of the female's injury and found 3 young nestlings (~day 3–4; Jomsomjit 2013) and one infertile egg (Fig. 2).

We were convinced this event would lead to nest abandonment by the male, but this was not the case. Surprisingly, nest checks on 27 and 29 June, and 2 and 3 July, revealed progressively older nestlings. Throughout these dates, radio telemetry indicated CNPS41 in the nest vicinity: 20 locations collected 25 June–3 July were an average of 45 m away from the nest (SD 36, range 9–178 m). However, on 5 July, around the estimated fledge period, we discovered the nest to be empty. Because the infertile egg was also missing and we found no evidence of fledglings during subsequent tracking of CNPS41, we concluded that the nest was most likely depredated. Conservatively, CNPS41 therefore appeared to be the sole provisioner of his

nestlings for 9–11 d (~75% of nestling period). Assuming nestling stage lasts 12–14 d (Evans et al. 2011), CNPS41 therefore nearly succeeded in fledging his 3 offspring singly. However, we cannot completely rule out successful fledging. We continued tracking CNPS41 until 16 July, during which the bird remained in his original home range with an exception of a single 735 m foray.

Interestingly, all 15 of the male's post-breeding locations were accompanied by song, whereas the bird sang at only 32% (12 of 37) of nesting and pre-nesting locations. We presume CNPS41 was searching for a new mate.

We never witnessed brooding by CNPS41. As previously mentioned, the female had roosted on the nest prior to death, while the male roosted some distance away, as is typical of Wood Thrush pairs tending to active nests (Jirinec et al. 2015).

At 2215 h on 27 June (at which point the female was already deceased), we tracked CNPS41 to his roost, finding him 63 m away from the nest. No adult was present at the nest that night.

Local weather was generally hot and humid during the nestling stage when CNPS41 was providing parental care alone. For 25 June–5 July, weather data from the nearby Newport News International Airport compiled by Weather Underground showed a mean maximum temperature of 32.5 °C (range 29–37 °C) and mean minimum temperature of 22.3 °C (range 16–28 °C). Humidity ranged from 32% to 89% but was generally high overall, as is the standard for the region in the summer. The only inclement weather occurred on 4 July when it rained 22.4 mm and temperatures the following morning fell to 17 °C.

Discussion

Our observation of synchronous tail molt in the Wood Thrush is not the first. This phenomenon was documented at least twice before (Weaver 1949, Vega Rivera et al. 1998). In the latter study, 70% (21/30) of radio-tagged individuals observed during prebasic molt lost their tails at once. We contribute to the above research with a long tracking interval for the individual in the current study (COLW4) that spans most of the breeding season, showing both the breeding territory and the molting area. Furthermore, we use the observation to bring more attention to this molt strategy in the Wood Thrush and other species and discuss its implications for bird vulnerability and habitat requirements.

Flight-feather molt reduces the flight ability of birds (Stresemann and Stresemann 1966, Haukioja 1971, Rimmer 1988, Swaddle and Witter 1997), leading to increased vulnerability to predators and change in habitat use. For example, many members of the Anseriformes simultaneously replace remiges and spend the molting period in the relative safety of larger water bodies where they can retreat from terrestrial predators (Yarris et al. 1994, Pyle 2008). Sleeping birds, which are considered to have an impaired ability to actively flee, often select roosts in dense foliage (Jirinec et al. 2011, Jirinec et al. 2015). Therefore, synchronous tail molt in the Wood Thrush might call for an analogous switch in habitat use. In the Vega

Rivera et al. (1998) study, 15 birds (50%) moved outside breeding territories into areas with dense vegetation where they were difficult to observe and capture. A similar pattern was documented by Gow and Stutchbury (2013) and our own observations showed COLW4 located in a dense patch of bamboo during the tailless period (Fig. 1). We suggest that molting grounds should be considered a distinct component of Wood Thrush habitat requirements, separate from breeding, stopover, and wintering grounds.

Synchronous or nearly synchronous tail molt during the prebasic molt may be more common than we realize. Molting Hermit Thrushes (*Catharus guttatus*) on mountaintops in eastern Oregon were nearly flightless and moved into thickets (S.G. Herman, Evergreen State College, 2019, pers. comm.). Outside Turdidae, synchronous tail molt appears to be prevalent in North American migratory warblers (see Mumme 2018 for review), including the Hooded Warbler (*Setophaga citrina*). Hooded Warblers in this condition appeared to seek dense thickets and become more cautious (Evans Ogden and Stutchbury 1996). Perhaps it is unsurprising that a recent study found widespread movements to disjunct molting grounds (“molt-migrations”; Leu and Thompson 2002) for many species of North American landbirds, including the Wood Thrush (Pyle et al. 2018). Quantification of museum specimens or captures at bird monitoring stations of birds that have passed their second prebasic molt and display alignment of growth bars (or fault lines) would lead to a better understanding of how common synchronous tail molt is.

Observations of Wood Thrush males singly provisioning nests are rare. Evans et al. (2011) mentioned 2 cases that involve female widows: a female with 5- to 6-day-old nestlings managed to fledge all 3, whereas all 4 nestlings of another female widowed during incubation starved in the nest. In Delaware, males fed nestlings more than females (1.2 vs. 0.7 trips/nestling/h), although females' share increased with brood size (Evans et al. 2011). Assuming similar feeding rates here, CNPS41 was expected to make 5.7 feeding trips per hour (or ~84 trips per day) to provision his nest. The paucity of observations of successful raising of chicks in this species where both parents normally provision is predictable as food demands of nestlings are high.

In other species that typically have biparental care, effects of single-individual provisioning of young vary. In the Common Redstart (*Phoenicurus phoenicurus*; Porkert and Špinká 2004) and Northern Flicker (*Colaptes auratus*; Wiebe 2005), feeding rates were close to those observed in biparental nests. However, in the few cases known, singled mates or polygamous species with single-parent raising of chicks have generally been successful (Gowaty 1996), but brood-rearing success is often lower, and sometimes yields fewer or lower-quality fledglings (Wiebe 2005).

As in other tracking studies, we cannot rule out the possibility that tags have had an adverse impact on our study birds. A review by Barron et al. (2010) found a general negative effect of tags on birds, including higher energy expenditure, which could have implications for the rate of molt (Done et al. 2011). However, a study by Gow et al. (2011) conducted specifically on the Wood Thrush found no negative effects of tags on bird behavior and physiology and our devices were a bit lighter than in this and the Vega Rivera (1998) study (15% and 62% lighter, respectively).

In summary, we present 2 observations relevant to Wood Thrush ecology on the breeding grounds. First, limited mobility and a shift in habitat use imply higher susceptibility to predation during the prebasic molt, and secondly, that despite high demands of nest provisioning, a widowed male may be capable of fledging his offspring alone. These notes underscore the vulnerability of the Wood Thrush outside breeding and migration, but also its reproductive resilience in the case of mate loss.

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