

Short Communications

The Wilson Journal of Ornithology 131(3):625–628, 2019

Observations of certain breeding behaviors in a bilateral gynandromorph Eastern Towhee (*Pipilo erythrophthalmus*)

Stephen J. Brenner,^{1*} Olivia A. DaRugna,² and Scott R. McWilliams¹

ABSTRACT—We present observations of breeding behaviors exhibited by a bilateral gynandromorph Eastern Towhee (*Pipilo erythrophthalmus*) in Rhode Island during June and July 2017. The individual had the black plumage of a male towhee on the left side of its body and brownish plumage of a typical female towhee on the right side of its body. We observed this individual moving with, interacting with, and feeding fledged young. We also recorded the bird singing in similar locations over a 35 day observation period. This is one of the first observations of a free-living gynandromorph bird exhibiting certain breeding behaviors such as associating with another adult, singing, and feeding young. Received 13 December 2018. Accepted 9 February 2019.

Key words: bilateral gynandromorphy, breeding behavior, Eastern Towhee

Observaciones de ciertos comportamientos reproductivos en un ginandromorfo bilateral del rascador *Pipilo erythrophthalmus*

RESUMEN (Spanish)—Presentamos observaciones de comportamientos reproductivos mostrados por un ginandromorfo bilateral del rascador *Pipilo erythrophthalmus* en Rhode Island durante junio y julio 2017. El individuo tenía el plumaje de un rascador macho en el lado izquierdo de su cuerpo y plumaje pardo de una hembra típica en el lado derecho del cuerpo. Observamos a este individuo en movimientos, interactuando y alimentando polluelos emancipados. También registramos este pájaro cantando en localidades similares a lo largo de un periodo de 35 días. Este es una de las primeras observaciones de un ginandromorfo en libertad exhibiendo ciertos comportamientos reproductivos como su asociación con otro adulto, cantando y alimentando polluelos.

Palabras clave: comportamiento reproductivo, ginandromorfo bilateral

Bilateral gynandromorphy is a rare state in which a bird's plumage shows a demarcation along the midline with one lateral side exhibiting female characteristics and the other side male character-

istics (Crew and Monro 1938). It is most common for the female plumage to be on the left side and the male plumage on the right, corresponding to the location of ovaries on the female-sided plumage and testes on the male-sided plumage (Kumerloeve 1954, DaCosta et al. 2007). Yet recent work in chickens revealed that the gonads did not necessarily correspond to the external appearance of the individuals, and that the phenotypic expression of avian gynandromorphy was cell autonomous (Zhao et al. 2010).

Gynandromorphic individuals have been observed in free-living and captive-bred environments, although there is very limited information on whether gynandromorphs exhibit typical breeding behaviors such as singing, territory defense, or parental care. One study on a captive Zebra Finch (*Taeniopygia guttata*) gynandromorph found its breeding behavior similar to that of a normal male (e.g., singing) when a female was present (Agate et al. 2003). This individual even copulated with the female, which then laid and incubated infertile eggs. Gynandromorphy has been observed in multiple avian species in the wild, including Evening Grosbeak (*Coccothraustes vespertinus*; Laybourne 1967), a single Black-throated Blue Warbler (*Setophaga caerulescens*; Patten 1993), and extensive observations of a Northern Cardinal (*Cardinalis cardinalis*) in Illinois (Peer and Motz 2014). There is also a published record of a gynandromorphic Rufous-sided Towhee captured and banded in 1941 (Laskey 1969). Despite these various reports, there are few detailed observations of gynandromorphic bird behavior in the wild (Cadbury 1973, Peer and Motz 2014), and no detailed observations of any breeding behaviors in free-living gynandromorph birds.

We provide the first documented case of a free-living gynandromorph bird exhibiting certain breeding behaviors. We present our field observations, recordings, and photographs of a bilateral gynandromorph Eastern Towhee (hereafter, “to-

¹ Department of Natural Resource Science, University of Rhode Island, Kingston, RI, USA

² School of Natural Resources, University of Nebraska, Lincoln, NE, USA

* Corresponding author: sjbrenner@uri.edu

where”) in Rhode Island, USA, that was observed on multiple occasions caring for fledged young, vocalizing, and associating with a typical-plumaged adult male.

Observations

On 28 June 2017, a bilateral gynandromorph towhee was first observed in the Arcadia Wildlife Management Area (41°35′09″N, 71°43′25″W) in Exeter, Rhode Island. The bird had a clear demarcation along the midline with the brown female plumage on the right side and the black male plumage on the left side (Fig. 1). There were scattered flecks of brown plumage appearing on the left side in the head and wing, as well as black plumage flecks in the head on the right, female-plumaged side.

During this first day of observation, we initially watched the gynandromorph moving through the mid-story of vegetation alone. However, within 15 min of this first sighting, the bird associated with 3 fledglings. The fledglings were mobile and capable of flight, and had plumage and vocalizations consistent with young 14–18 d after fledging (Brenner and McWilliams forthcoming 2019). Additionally, a typical-plumaged adult male towhee was singing nearby and associating with the group. We attempted but failed to capture the gynandromorph using mist nets and conspecific audio playback in order to obtain blood and feather samples. Both the gynandromorph and adult male came close to our nets and responded with brief alarm calls once we began playback, but became disinterested in the playback once the fledglings moved away from the nets. Within a few minutes the gynandromorph, fledglings, and adult male moved away together from our playback and nets.

The next day (29 June 2017), we attempted to capture the gynandromorph between 0730 and 1000 h with mist nets and audio playback. We observed it again with 3 fledglings that had the same plumage and age as the 3 fledglings observed the day before. The gynandromorph was clearly moving and foraging with the 3 fledglings along a field edge of pitch pine (*Pinus rigida*) and white oak (*Quercus alba*). The gynandromorph would respond to the soft calls of the fledglings and did not venture more than 10 m from the group. We observed the gynandromorph catch an insect, take



Figure 1a–1c. Photographs of the bilateral gynandromorph Eastern Towhee in Exeter, Rhode Island, 2017. Photos taken by Olivia DaRugna on 29 June 2017.

it to one of the fledglings, and feed it. The individual later flew and perched directly next to a fledgling in a presumed second feeding, although this was not confirmed because the birds were obscured from view by vegetation. We were unsuccessful in our continued efforts to capture the gynandromorph as the bird was actively moving throughout the area with the fledglings. On 30 June between 0700 and 0900 h, we relocated the gynandromorph and the 3 fledglings in the same area as the previous 2 d. We observed

and recorded the gynandromorph singing an unusual variation of a towhee song (Supplemental Recording S1). There was again an adult male within 50 m of the bird and young.

From 1 July through 26 July, we observed the gynandromorph on 6 additional days and unsuccessfully attempted to capture it 3 more times, with and without the use of audio playback. During this time, we did not observe fledglings interacting directly with the gynandromorph. The gynandromorph moved around its presumed territory and was observed on 3 days switching singing locations every few minutes. The predominant vegetation types in this territory were pitch pine, white oak, and a mix of huckleberry (*Gaylussacia* sp.) and blueberry (*Vaccinium* sp.) in the understory. We mainly observed and recorded it singing the alternate song (Supplemental Recording S1), although on 25 July we observed and recorded the gynandromorph singing a more typical towhee song (Supplemental Recording S2). On 27 July, we observed the gynandromorph foraging on black huckleberries (*Gaylussacia baccata*) with at least one fledgling. We did not observe the bird after 2 August 2017.

Discussion

Our observations of the towhee gynandromorph indicate that this individual exhibited certain breeding behaviors including associating with and feeding fledglings. As these observations occurred during a concurrent study of the breeding behavior and post-fledging movements of towhees in Rhode Island, we were able to draw comparisons among the gynandromorph and other breeding adults in the system. The community of towhees in the surrounding area was well documented and most other nearby adult towhees and fledglings were banded and/or in known territories and family groups (Brenner and McWilliams forthcoming 2019). The behaviors of the gynandromorph (i.e., feeding fledglings, staying close to young while moving, calling/vocalizing with young, singing, and reacting to distress calls) were consistent with other known-breeding adults in our study system during this time of fledgling development.

Because we were unable to get genetic material from the individual in question or from the fledged

young, we cannot determine whether these young were the true genetic offspring of the gynandromorph. The observations of Agate et al. (2003) suggest that it is unlikely the gynandromorph was able to produce viable offspring. However, there are other possibilities that could explain the parental care and behaviors exhibited by the gynandromorph beyond direct parentage. The individual could have been subject to an extra-pair paternity event during the nesting stage and thus be caring for the genetic offspring of another individual (Griffith et al. 2002). The gynandromorph may have adopted the young of a nearby pair, which has been shown to occur during the nesting and post-fledging stage in other songbirds (Stutchbury and Ogden 1996, Wetzel and Chandler 2008). This adoption would likely be of low personal cost to the gynandromorph and could incur future mating opportunities with the remaining genetic parent(s) (Rohwer 1986, Stutchbury and Ogden 1996). It is also possible that this individual was demonstrating parental care not as a potential mating benefit but in response to other behavioral or physiological cues associated with its own reproductive failure (Wetzel and Chandler 2008). Although the genetic connection (or lack thereof) between the gynandromorph and the fledglings it was caring for will remain unknown, the bird was actively guarding and feeding 3 fledglings, and thus demonstrating parental behavior.

The vocalizations we observed and recorded from the gynandromorph serve to strengthen our observations of breeding behavior. On multiple occasions it would sing and call, and its song varied from the classic “*drink your tea*” (Supplemental Recording S2) to an alternate, abbreviated “*drink teeeaa*” (Supplemental Recordings S1 and S3). This singing behavior would suggest territory establishment or territory defense and implies the bird was functionally male, but singing alone does not exclude the possibility the bird was functionally female. Although rare, female towhees have also been documented singing (Nolan 1958, Greenlaw 2015). Female song in other passerines has been previously documented and related to territory defense, aggression toward other females, and family group maintenance when caring for fledglings (Richison 1983, Arcese et al. 1988). We observed 2 typical-plumaged adult males associating with the gynandromorph and the nearby

young on a few occasions, and we never observed any females interacting with the adults, young, or in the presumed territory of the gynandromorph. Thus, these observations suggest that the gynandromorph was either a singing male associating with other typical-plumaged adult males, or a female that regularly sang and associated with these males. These observations provide the first evidence that a free-living gynandromorph exhibits some typical breeding behaviors including caring for young, singing, maintenance of a territory, and pair-like associations with at least one other adult.

Acknowledgments

We would like to thank Ryan Healey, Kevin Tillinghast, and Luke Douglas for their assistance in locating and observing the bird. We would also like to thank Clara Cooper-Mullin for her help improving earlier versions of this manuscript. Our unsuccessful attempts to capture the gynandromorph were under master bander permit #22923 from the US Geological Survey Bird Banding Laboratory, and all research activities were approved by the University of Rhode Island Institutional Animal Care and Use Committee (#AN10-02-017).

Literature cited

- Agate RJ, Grisham W, Wade J, Mann S, Wingfield J, et al. 2003. Neural, not gonadal, origin of brain sex differences in a gynandromorphic finch. *Proceedings of the National Academy of Sciences USA* 100:4873–4878.
- Arcese P, Stoddard PK, Hiebert SM. 1988. The form and function of song in female Song Sparrows. *Condor* 90:44–50.
- Brenner SJ, McWilliams SR. Forthcoming 2019. Independence day: Post-fledging movements and behavior of adult Eastern Towhees (*Pipilo erythrophthalmus*) in landscapes managed for American Woodcock (*Scolopax minor*). *Wilson Journal of Ornithology*.
- Cadbury JW III. 1973. A gynandromorphic Evening Grosbeak in Burlington County, N.J. *Cassinia* 54:15–17.
- Crew FAE, Monro SS. 1938. Gynandromorphism and later asymmetry in birds. *Proceedings of the Royal Society of Edinburgh* 58:114–135.
- DaCosta JM, Spellman GM, Klicka J. 2007. Bilateral gynandromorphism in a White-ruffed Manakin (*Corapipo altera*). *Wilson Journal of Ornithology* 119:289–291.
- Greenlaw JS. 2015. Eastern Towhee (*Pipilo erythrophthalmus*). In Rodewald PG, editor. *Birds of North America*. Ithaca (NY): Cornell Lab of Ornithology. <https://doi.org/10.2173/bna.262>
- Griffith SC, Owens IPF, Thuman KA. 2002. Extra pair paternity in birds: A review of interspecific variation and adaptive function. *Molecular Ecology* 11:2195–2212.
- Kumerloeve H. 1954. On gynandromorphism in birds. *Emu* 54:71–72.
- Laskey AR. 1969. Bilateral gynandromorphism in a Cardinal and a Rufous-sided Towhee. *Auk* 86:760.
- Laybourne RC. 1967. Bilateral gynandromorphism in an Evening Grosbeak. *Auk* 84:267–272.
- Nolan V. 1958. Singing by a female Indigo Bunting and Rufous-sided Towhee. *Wilson Bulletin* 70:287–288
- Patten MA. 1993. A probable bilateral gynandromorphic Black-throated Blue Warbler. *Wilson Bulletin* 105:695–698.
- Peer BD, Motz RW. 2014. Observations of a bilateral gynandromorph Northern Cardinal (*Cardinalis cardinalis*). *Wilson Journal of Ornithology* 126:778–781.
- Richison G. 1983. The function of singing in female Black-headed Grosbeaks (*Pheucticus melanocephalus*): Family-group maintenance. *Auk* 100:105–116.
- Rohwer S. 1986. Selection for adoption versus infanticide by replacement “mates” in birds. *Current Ornithology* 3:353–395.
- Stutchbury BJ, Ogden LJE. 1996. Fledgling adoption in Hooded Warblers (*Wilsonia citrina*): Does extrapair paternity play a role? *Auk* 113:218–220.
- Wetzel DP, Chandler CR. 2008. Adoption: Adaptation or reproductive error in Eastern Bluebirds? *Wilson Journal of Ornithology* 120:419–422.
- Zhao D, McBride D, Nandi S, McQueen HA, McGrew MJ, et al. 2010. Somatic sex identity is cell-autonomous in the chicken. *Nature* 464:237–242.