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Observations of a Bilateral Gynandromorph Northern Cardinal (*Cardinalis cardinalis*)

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ABSTRACT.—We describe behavioral observations of a bilateral gynandromorph Northern Cardinal (*Cardinalis cardinalis*) in northwestern Illinois from December 2008 through March 2010. The bird exhibited the typical bright red color of a male cardinal on the left half of its body, and the dull brownish-gray appearance of a female cardinal on the right half. We observed the bird more than 40 days, mostly in the vicinity of bird feeders. It was never paired with another cardinal, was never heard vocalizing, and was not subjected to any unusual agonistic behaviors from other cardinals. These observations are among the most extensive of any bilateral gynandromorph bird in the wild. *Received 14 February 2014. Accepted 5 July 2014.*

Key words: bilateral gynandromorphy, *Cardinalis cardinalis*, Northern Cardinal.

Bilateral gynandromorphy is a condition in which one half of a bird's body appears as a female and the opposite half appears as a male. Often, the left side is female and the right side is male (Crew and Munroe 1938, Kumerloeve 1954). Gynandromorphy occurs in a variety of avian taxa (Kumerloeve 1987, Patten 1993), with the most frequently reported species being the Evening Grosbeak (*Coccothraustes vespertinus*) (Patten 1993). It undoubtedly occurs more frequently, but it is obviously difficult to observe in sexually monomorphic species.

The mechanism by which bilateral gynandromorphy arises has been unclear until a recent study by Zhao et al. (2010) which found that, at least in chickens, these individuals are male:female chimeras. In the three chickens studied, tissues on the male side of the body were predominantly ZZ, but ZW cells were also present, and the opposite was true for the female side with both cell types present, and the majority

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being ZW (Zhao et al. 2010). Interestingly, two of the birds were male on the left side, but one possessed a testis and the other an ovary on this side, whereas the third individual was female on the left side and possessed a combination ovary-testis-like structure (Zhao et al. 2010).

While we now have a better understanding of bilateral gynandromorphy, there is scant information on the reproductive behavior and behavior in general, of these unusual birds in the wild (Gill 2007). To date, almost all observations of wild gynandromorphs have been brief, single observations (Shaub 1960, Alström and Olsson 1988, Patten 1993), or descriptions of collected birds (Townsend 1882, Brodkorb 1935, Laybourne 1967, Laskey 1969, Lowther 1977, Tordoff 1983, Parrish et al. 1987, DaCosta et al. 2007) without detailed or prolonged observations of their behaviors. Only a single study has documented behavior in any detail and this was of an Evening Grosbeak (Cadbury 1973). Cadbury (1973) observed this individual ~10 times throughout the winter of 1973 and noted no unusual behaviors when the bird fed in the presence of conspecifics. Here, we provide among the most extensive observations of a gynandromorph bird in the wild, a Northern Cardinal (*Cardinalis cardinalis*) that was observed from December 2008 to March 2010.

OBSERVATIONS

The bilateral gynandromorph was first observed in Rock Island, IL (41° 27' 54" N, 90° 33' 50" W) on 16 December 2008 in a yard adjacent to the 84-ha Black Hawk Forest Nature Preserve along the Rock River in northwestern Illinois. The initial sighting was made by J. Frink, R. Motz, and B. Frink while the bird was perched in a cockspur hawthorn tree. The bird was strongly demarcated down the midline of the body, with the left side appearing as a male cardinal, and the right side a female (Fig. 1). When viewed from the left it appeared like a typical male cardinal, and from the right a typical female cardinal (Fig. 1). Only when both halves of the bird were observed simultaneously was it evident that the bird was a bilateral gynandromorph. B. Peer first observed the bird on 13 January 2009. The majority of the observations were made when the bird was on the driveway of the home feeding on seed, or at or near a window feeder. All observations of the bird occurred at the home, except one which took place at a feeder <0.5 km to the north. The bird was observed on at least 48 days and occasionally

multiple times per day, although we were not as diligent in our record keeping in 2010.

The bird was observed primarily during the nonbreeding season from December 2008–April 2009 and November 2009–March 2010; cardinals begin singing more frequently in late January and early February in this area, and begin nesting in late April (B. Peer, unpubl. data). We observed the bird closely to determine whether it was paired with another individual, whether there were any overt aggressive interactions between it and normal cardinals, and also whether it vocalized (online supplemental material). As is typical in the winter, there were many cardinals at the feed at any one time (online supplemental material). As the season progressed, male and female cardinals were observed paired, and eventually a resident male and female began defending the feeding area around the house and the gynandromorph was rarely observed.

There were no unusual agonistic interactions between the gynandromorph and the other cardinals, although at times it appeared less likely to approach the seed when other cardinals were in the vicinity feeding (online supplemental material). The gynandromorph was observed alone in the trees or feeding 34 times and with other cardinals 22 times; on four occasions it was flushed by other cardinals and it flushed a male once. The gynandromorph was never clearly paired with another cardinal, whereas it was obvious when other birds were paired especially as the breeding season approached in March and April, because single male and single female cardinals were observed together. In March of 2009, the gynandromorph was observed less frequently until it was last spotted on approximately 2 April. The bird reappeared, again with no obvious mate, on 15 November 2009 and was last observed approximately 4 March 2010. In both years, cardinal numbers were high at the feeders from December–February and then decreased as birds established territories.

In January and February of 2009, we used playbacks of Northern Cardinals' songs on at least three occasions to determine whether the gynandromorph would respond. Other males had begun calling at this time; however, the only time the bird made an obvious response was when it looked around while hearing the song (online supplemental material). We never heard the bird give any type of vocalization but did hear other



FIG. 1a, 1b. Photographs of the bilateral gynandromorph Northern Cardinal in Rock Island, IL, USA.

individuals in the area routinely vocalizing, especially as the breeding season approached. We attempted to capture the bird to collect blood and tissue samples using mist nets from March–April of 2009 and from November 2009–March 2010 but were unsuccessful.

DISCUSSION

Our observations are among the most extensive of a bilateral gynandromorph bird in the wild. At least one previous observation of bilateral gynandromorphy has been made of a Northern Cardinal

by Laskey (1969). This bird was banded and released, and was a male on the right side and female on the left side, the opposite of the bird we observed. Laskey (1969) also described the gynandromorph as being strongly demarcated down the center, but the crest was all female-like and the entire area around the mandible was black, similar to a male. The individual we observed had a female like crest on the right side, and a male crest on the left, and had a reduced black area surrounding the bill on the female side (Fig. 1).

We never knowingly heard the gynandromorph cardinal vocalize nor was it obviously paired with another individual, whereas other cardinals in the area vocalized and were paired, especially as the breeding season approached. Agate et al. (2003) observed a gynandromorph Zebra Finch (*Taeniopygia guttata*) in the laboratory singing the typical male song, and it paired with a female who laid infertile eggs. This individual was also attacked when caged with another male (Agate et al. 2003). Based on our observations, it was unclear whether our bird was ever mated or whether it was capable of vocalizing.

The gynandromorph cardinal was never subjected to unusual aggressive attacks from other cardinals, which is similar to the observations by Cadbury (1973) of a bilateral gynandromorph Evening Grosbeak feeding with conspecifics. The gynandromorph we observed fed amongst conspecifics in addition to other species such as Black-capped Chickadees (*Poecile atricapillus*), Dark-eyed Juncos (*Junco hyemalis*), Song Sparrows (*Melospiza melodia*), and Mourning Doves (*Zenaidura macroura*). At times the bird appeared somewhat less likely to feed when others were present; however, on one occasion it drove a conspecific from the feed as is typical of normal cardinals. These observations increase our limited knowledge of the behavior of wild bilateral gynandromorph birds that are rare and difficult to observe.

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LITERATURE CITED

- AGATE, R. J., W. GRISHAM, J. WADE, S. MANN, J. WINGFIELD, C. SCHANEN, A. PALOTIE, AND A. P. ARNOLD. 2003. Neural, not gonadal, origin of brain sex differences in a gynandromorphic finch. *Proceedings of the National Academy of Sciences USA* 100: 4873–4878.
- ALSTRÖM, P. AND U. OLSSON. 1988. Gynandromorphism in the Pink-browed Rosefinch *Carpodacus rhodochrous*. *Bulletin of the British Ornithologists' Club* 108:12.
- BRODKORB, P. 1935. A sparrow hawk gynandromorph. *Auk* 52:183–184.
- CADBURY III, J. W. 1973. A gynandromorphic Evening Grosbeak in Burlington County, N.J. *Cassinia* 54:15–17.
- CREW, F. A. E. AND S. S. MUNRO. 1938. Gynandromorphism and lateral asymmetry in birds. *Proceedings of the Royal Society of Edinburgh* 58:114–135.
- DACOSTA, J. M., G. M. SPELLMAN, AND J. KLICKA. 2007. Bilateral gynandromorphism in a White-ruffed Manakin (*Corapipo altera*). *Wilson Journal of Ornithology* 119:289–291.
- GILL, F. B. 2007. *Ornithology*. Third Edition. W. H. Freeman and Co., New York, New York, USA.
- KUMERLOEVE, H. 1954. On gynandromorphism in birds. *Emu* 54:71–72.
- KUMERLOEVE, H. 1987. Le gynandromorphisme chez les oiseaux—recapitulation des données connues. *Alauda* 55:1–9.
- LASKEY, A. R. 1969. Bilateral gynandromorphism in a cardinal and a Rufous-sided Towhee. *Auk* 86:760.
- LAYBOURNE, R. C. 1967. Bilateral gynandromorphism in an Evening Grosbeak. *Auk* 84:267.
- LOWTHER, P. E. 1977. Bilateral size dimorphism in House Sparrow gynandromorphs. *Auk* 94:377–380.
- PARRISH, J. R., J. STODDARD, AND C. M. WHITE. 1987. Sexually mosaic plumage in a female American Kestrel. *Condor* 89:911–913.
- PATTEN, M. A. 1993. A probable bilateral gynandromorphic Black-throated Blue Warbler. *Wilson Bulletin* 105: 695–698.
- SHAUB, M. S. 1960. Unusual plumage variations of the eastern Evening Grosbeak. *Passenger Pigeon* 22:18–21.
- TORDOFF, H. B. 1983. An Evening Grosbeak gynandromorph. *Loon* 55:22–24.
- TOWNSEND, C. H. 1882. Remarkable plumage of the Orchard Oriole. *Bulletin of the Nuttall Ornithological Club* 7:181.
- ZHAO, D., D. MCBRIDE, S. NANDI, H. A. MCQUEEN, M. J. MCGREW, P. M. HOCKING, P. D. LEWIS, H. M. SANG, AND M. CLINTON. 2010. Somatic sex identity is cell autonomous in the chicken. *Nature* 464:237–243.

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