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# Male-male pair bonding, nesting and egg incubation in a wild passerine

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## Abstract

Examples of nesting behavior between pair-bonded males are exceedingly rare among songbirds. We observed a male same-sex pair bond that resulted in the partial development of one egg while monitoring the breeding activity of a population of wild Crimson Finches (*Neochima phaeton*) over four breeding seasons. This male–male pair built four nests and incubated two clutches, each with a single egg of unknown origin, with at least one developing partially before failing. This same-sex behavior is unusual among passerines and its origin and evolutionary significance remain poorly understood.

## Introduction

Same-sex sexual behaviors have been observed in many species of wild birds, and include mounting, copulating, courtship display, and pair bonding (MacFarlane et al. [2010](#)). Pair-bonded individuals may engage in a variety of behaviors, from allopreening to courtship displays, nest building and sharing, and egg incubation (MacFarlane et al. [2010](#)).

Same-sex pair bonding generally involves females, and pair bonding among males is quite rare (MacFarlane et al. [2010](#)). Of 93 wild bird species where male–male same-sex sexual behavior has been documented, only about 19% ( $n = 18$ ) included pair bonding (MacFarlane et al. [2010](#)). Of those male–male pair bonds, the highest frequency of this behavior was found in the Anseriformes and Suliformes orders, and only a handful of these pairs were observed nest building and incubating eggs together (MacFarlane et al. [2010](#)). Over 50% of all bird species are passerines, but they account for only about 7.5% of the species in which male–male pair bonding behavior is known in the wild (MacFarlane et al. [2010](#)), and only the Hooded Warbler (*Setophaga citrina*) has been documented to show both nesting behavior and egg incubation between pair-bonded males (Niven [1993](#); Verner and Willson [1969](#)).

Here we report on the rare behavior of male–male pair bonding involving nest building and egg incubation in another passerine species, the Crimson Finch (*Neochmia phaeton*). Crimson Finches are sexually dimorphic, usually form long-term pair bonds across breeding seasons, and breed as socially monogamous pairs with unknown levels of extra-pair paternity or facultative intraspecific brood parasitism (Higgins et al. [2006](#); Milenkaya et al. [2011](#)). Crimson Finches in our study population do not hold territories and generally build nests in close proximity to other pairs (Milenkaya et al. [2011](#)). Typically male behavior includes gathering nesting material, building nests, and chasing other males that approach too closely to their active nest (personal observation). Other than laying eggs, there are no conspicuous female-specific behaviors. Females may be in attendance at the nest as the male builds and may contribute by arranging some of the nesting material (Milenkaya et al. [2011](#)). Both sexes line the completed nest with feathers, the female lays an average of five eggs, and both sexes incubate and feed young (Milenkaya et al. [2011](#)).

## Methods

As part of a broader study, we monitored the breeding activity of a wild population of Crimson Finches utilizing color bands during four consecutive breeding seasons (2006–2010) at the Australian Wildlife Conservancy's Mornington Wildlife Sanctuary in northwestern Australia.

Nests were conspicuous and located by observing behavioral cues such as nest building and carrying feathers for use as lining. We attempted to determine the status of each nest (active or not active) every 3 or 4 days. Nests were considered abandoned if the pair was seen building a new nest, or the nest was left unattended during three consecutive nest-monitoring visits. An incubation bout was defined by birds switching places at the nest, staying in the nest for more than 10 min, and/or leaving the nest with a bent tail. After a nest was complete, we attempted to check the nest once during the laying period, and once after the full clutch was laid, in order to determine the start date of laying and clutch size. Crimson Finches were sexed based on their unambiguous sexually dimorphic plumage (Higgins et al. [2006](#)), as no evidence of sexually ambiguous plumage has ever been reported in this species. We were unable to confirm the sex by genetic analyses or dissections. Videos were taken of the same-sex pair building two of their shared nests.

## Results

A total of 267 unique breeding pairs were found at our study site, one of which was a male–male pair. This pair was found during the 2010 breeding season when the males had four nests together and incubated two clutches, each with a single egg.

The same-sex Crimson Finch pair was first discovered (by J. K.) on 6 February 2010 when a banded male and an unbanded male were seen attending a nest together. The pair was observed together at this nest three times, but no eggs were found. The pair's second nest was found on 10 February 2010, and contained a single egg of unknown origin. The pair was observed together at this nest once before it disappeared. The pair's third nest was found on 26 February 2010 and the pair was observed together at the nest twice. No eggs were found in this nest, which was later abandoned. The fourth and final nest was found on 16 March 2010 when both males were carrying nesting material and together constructing the nest. One egg of unknown origin was found in this nest on 24 March 2010, and the pair was observed together at the nest five times. When this egg was 11–15 days past the date when it was expected to hatch, our colleague (Michelle Hall) dissected it, determined that it was fertilized, and estimated the embryo to be about 20–30% developed.

Over a period of almost 2 months, the two males were observed in a same-sex pair bond which included nest building, lining the nest with feathers, attending to their nests together, and incubating. While both exhibited the typically male behavior of carrying nesting material to their nests, the unbanded male was observed in this behavior more often (at least once at each nest, for a total of five occasions) than the banded male (once). As this pair was nesting at the edge of suitable habitat where conspecific density was low and neighbors were few, neither male was ever observed in the typically male behavior of chasing other males from their nest sites. The unbanded male was also observed rearranging nesting material in a nest on four occasions, lining a nest with feathers on two occasions, and incubating on two occasions. The banded male was observed rearranging nesting material in a nest on three occasions, lining a nest on one occasion, and incubating on two occasions.

The banded male was at least 3 years old and was atypical in having had paired with three different females over the three previous breeding seasons. During the 2010 breeding season, the banded male's female mate from the previous year was missing from the population. In the 2 years preceding the male–male pair bond, this male had had two successful nests and produced six total fledglings with two different females.

## Discussion

We observed a rare case of two males forming a pair bond that lasted for at least one breeding season during which they built four nests and incubated two clutches. The mechanisms that result in such behaviors in wild populations remain unclear. We contribute to an understanding of this phenomenon by sharing our observation and reflecting on how it compares to the only other example of such behavior in a passerine.

One unbanded Hooded Warbler male exhibiting typically female behavior paired and incubated eggs in nests of two different males that previously or subsequently nested with other females (Niven [1993](#)). Hooded Warblers vary in their plumage such that bright females may resemble dull males, and Niven ([1993](#)) suggested that this overlap in plumage may explain his observed same-sex pairings. However, it does not explain why the dull-plumaged male exhibited typically female behavior or chose to pair with two members of his own sex. Such an explanation is also not applicable to our same-sex pair because Crimson Finches have unambiguous sexually dimorphic plumage. That males may choose to pair with other males despite clear visual signals of one's sex, suggests that other mechanisms other than ambiguous signaling may be responsible for same-sex behavior.

MacFarlane et al. ([2010](#)) found that few socially monogamous bird species exhibit male–male sexual behavior compared to polygamous birds. They suggest that this pattern exists because same-sex behavior in monogamous males is maladaptive, while it may have little fitness cost in polygamous males if they also engage in sexual behaviors with females and, indeed, may incur fitness benefits [e.g., by allowing younger males to learn courtship behaviors (MacFarlane et al. [2010](#))]. Our finding of male–male sexual behavior in a socially monogamous passerine is therefore somewhat surprising. However, only one out of 267 Crimson Finch breeding pairs was same-sex during our 4 years of study, thereby supporting the idea that such behaviors are indeed rare. Our observation suggests that same-sex behavior among socially monogamous species occurs, but at low frequencies that only relatively large and detailed studies such as ours are likely to document. We encourage more reporting from other detailed and long-term studies of wild populations to determine whether this behavior occurs in only a few species, or in most species but at low frequencies. This distinction between rarity among or within species would help to inform the development of hypotheses about the evolution and maintenance of same-sex behavior.

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