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SHORT COMMUNICATION

Synchronous breeding by the Star Finch (*Neochmia ruficauda*) in the east Kimberley, Western Australia

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Abstract. The timing of Star Finch (*Neochmia ruficauda*) breeding was investigated as part of an ongoing banding study into the movement and survival of Star Finches in the Wyndham area of the east Kimberley. The brood patches of 86 captured females were examined, with the results suggesting that Star Finches breed synchronously. No female had an active brood patch in the first week of March, while more than 75% of females had active brood patches two weeks later. These data are supported by field observations identifying when juvenile birds were sighted with adults. The onset of breeding coincided with the ripening of a favoured seed, *Sorghum stipoideum*.

Keywords. Estrildidae, granivore, banding study, breeding biology

Introduction

Star Finches (*Neochmia ruficauda*) are relatively common in the damp grasslands that border the swamps, creeks and rivers of the north-east Kimberley (pers. obs.), but only one detailed study has been published on their breeding. This found that, around Kununurra, Star Finches nest in shrubs (63%, mostly *Vachellia* [*Acacia*] *farnesiana*), grasses (34%) or vines (3%), generally where live grasses grow through shrubs (M.K. Todd, cited in Higgins *et al.* 2006). The study also reported that breeding was "probably not fully underway until late March to early April, at the end of the wet season", two of 20 birds captured in March having brood patches and 21 of 59 in April (M.K. Todd, cited in Higgins *et al.* 2006). Breeding has been recorded in April, May, June and October in the Ord and Fitzroy areas (Barrett *et al.* 2003), while Johnstone and Storr (2004) state that eggs are laid from February to October.

The present study monitored the onset of breeding in 2010, in a population of Star Finches on the margins of the King River (15°33'12"S, 128°08'44"E) and Parry Creek (15°35'37"S, 128°16'9"E) floodplains near Wyndham, east Kimberley, Western Australia, as part of an ongoing investigation into movement and survival of Star Finches in the area.

In February 2010 extensive field observations revealed that Star Finches had dispersed from the locations where they had been observed in large flocks in September 2009. The 243.6 mm of rain that had fallen in January and 175.4 mm in February (Bureau of Meteorology 2010) had resulted in flowing creeks, rapid plant growth and flooded ephemeral wetlands, creating extensive habitat suitable for Star Finches. The shrub favoured by nesting Star Finches in Kununurra, *Vachellia* [*Acacia*] *farnesiana*, is not found in the Wyndham area. As locating nests near Wyndham could not be guaranteed in these circumstances, timing of breeding was investigated by examining brood patch development in female Star Finches.

Methods

Star Finches were caught in mist-nets erected at locations where birds were observed to congregate, along water courses and at banding sites used successfully in 2009. As the species has been reported to breed towards the end of the wet season (Higgins *et al.* 2006), mist-netting was conducted from 4-25 March, ceasing when the majority of females were observed to have active brood patches. Females were distinguished from males on the basis of head and chest plumage (Higgins *et al.* 2006).

Each individual captured was banded on the right tarsus with a numbered metal band from the Australian

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Bird and Bat Banding Scheme (ABBBS) and examined for brood patch development.

Brood patches were scored on a scale of 0 to 3 (Lowe 1989) where:

0. No active brood patch;
1. Loss of feathers from thorax to cloaca; inflamed and shiny skin;
2. Well developed brood patch with heavy vascularisation and inflamed skin;
3. Fully developed brood patch with heavy blister-like swelling and a whitish 'waterbed' appearance

To substantiate brood patch data, observations were made to identify when free-flying juvenile Star Finches appeared with adult birds. Searches focused on sites where adults had previously been banded or at known water points. Observations were made from a distance of less than 20 m, using 10 x 42 binoculars. Juvenile Star Finches are distinguishable from adults by their plumage (Higgins *et al.* 2006) and observations in 2009 confirmed that they can be identified readily in the field. Adults have red heads and bills, green backs and yellow bellies, whereas juvenile birds are predominantly brown, with a dark brown bill and, when very young, an obvious white gape. Juvenile Star Finches can be distinguished from other brownish juvenile finches found at the study site by their red tails.

As previous studies have documented that incubation takes 12-13 days and fledging 17-21 days (Johnstone and Storr 2004; Higgins *et al.* 2006), it was anticipated that a marked increase in the number of adults with juveniles would be apparent approximately 34 days after the peak in active brood patches had been noted, around 19 April. A more accurate date could not be predicted as clutch size varies from 3 to 7 eggs (Higgins *et al.* 2006) and ascertaining whether a female with an active brood patch was laying the first or last egg in a clutch or already brooding eggs was not possible. Daily observations therefore began on 13 April, and ceased on April 27 when the first large mixed-age flock of 50+ birds was sighted and it was impossible to tell how many individual families it contained.

As it could also not be predicted where or when Star Finches would be sighted, a means of obtaining comparable daily data was required. The method chosen was to continue daily observations until at least 20 adult birds had been sighted, also recording the number of adults with juveniles observed in the same period. It was possible to sight 20 adult birds on all but four days, when rain fell and birds were not forced to visit watercourses to drink.

Mist-netting of Star Finches recommenced on 22 April. Female Star Finches were again examined for brood patch development, this time as a means of investigating how long the breeding season lasted.

Results

No nests were located, despite intensive searches along numerous water courses and wetland margins where it was considered Star Finches would be likely to breed.

Eighty six female Star Finches were examined for brood patch development from 4-25 March 2010. In

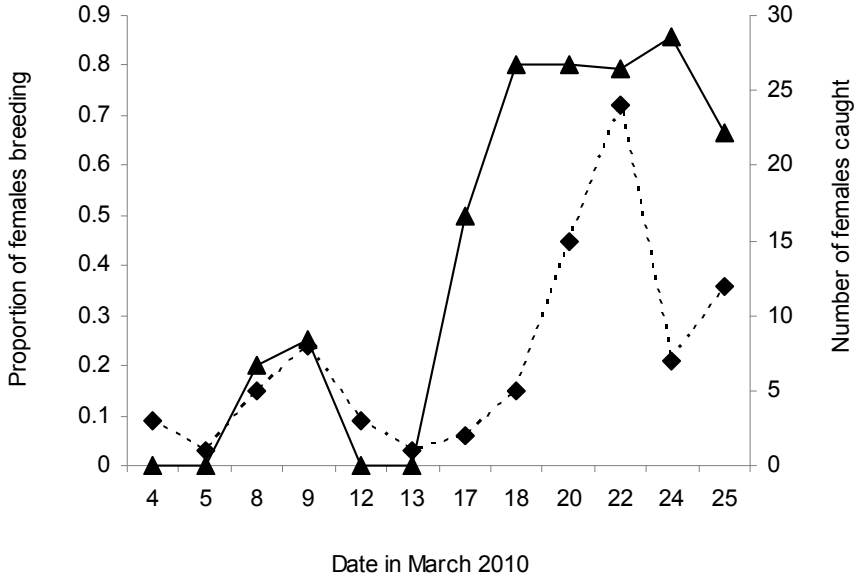

Figure 1. The number of female Star Finch (dotted line) and the proportion with an active brood patch (solid line) captured near Wyndham from 4-25 March 2010.

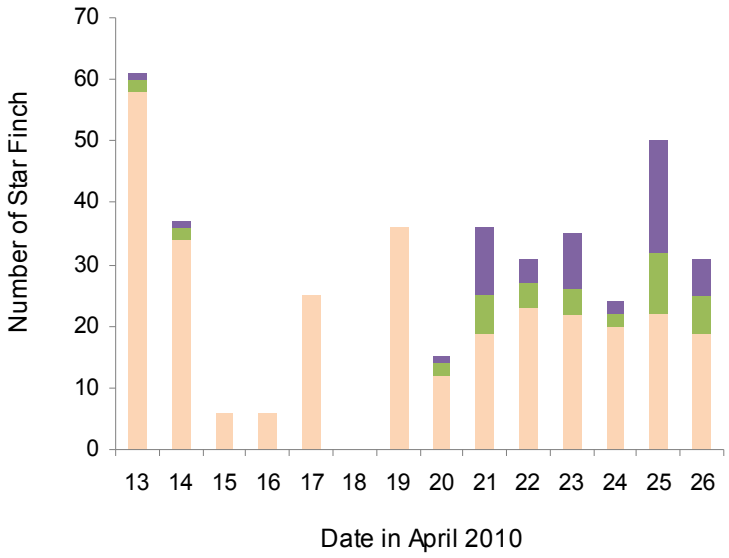

Figure 2. Numbers of adult Star Finch (pink bars), adults with juveniles (green bars), and number of juveniles (purple bars) observed near Wyndham from 13-26 April 2010.

the first two weeks of March, 14.3% (*n*=21) of females captured had an active brood patch. In the third week of March, 77.3% (*n*=20) of females had an active brood patch. By 24 March this had risen to 86% (*n*=7) of females having active brood patches (Figure 1).

Daily observations of the number of adult Star Finches with juveniles are detailed in Figure 2. A single pair, each with one juvenile, was observed on 13 and 14 April amongst sightings of 58 and 34 adults without juveniles. No adults with juveniles were subsequently sighted until 20 April when one pair with a single juvenile was observed. On the following three days, 21-23 April, 7 adult pairs with 24 juveniles were sighted.

Of the five adult females captured between 22 and 26 April 2010, four individuals showed evidence that they had recently had a brood patch, with bare wrinkled skin and/or pin feathers being evident from the thorax to cloaca, but none had active swollen brood patches. On 29 April only one of the 25 adult females captured showed any evidence of having had a brood patch, indicating that the breeding season was over. No active breeding was observed in any of the 141 adult females captured in subsequent banding sessions between 1 May and 28 July.

Discussion

Data on females with active brood patches and the presence of juvenile birds with adults in flocks strongly indicates that, in 2010, the start of the Star Finch breeding season was synchronised, occurring in the third week in March. While there is a large body of literature discussing both synchronous and asynchronous breeding and the impact that day length, temperature and food availability have on timing of breeding in a range of passerine species (Robin *et al.* 2009), there is, however, no published literature on the triggers that stimulate breeding in the estrildid finches inhabiting northern Australia (E.P. van Rooij, personal communication).

The question that remains unanswered in this study is what triggered female Star Finches to develop active brood patches in the third week of March 2010. Examination of weather data for March (Bureau of Meteorology 2010) reveals no obvious, sustained drop in temperature or relative humidity, or change of wind direction. The rainy season had not ended; 35.6mm of rain fell between 14 and 18 March. While it was not formally measured, field observations indicated a general availability of ground water, with 33% of creeks in the project area still flowing slightly on 23 March.

Star Finches are primarily granivorous (Todd *et al.* 2003), mainly feeding on seeds of native grasses, especially *Sorghum*. They usually pluck seeds from standing seed heads, less often foraging on the ground (Higgins *et al.* 2006). At the study site, creek-bank and floodplain habitat favoured by the Star Finch is heavily infested with cane grass *Sorghum stipoideum*. The ripe seeds of this plant are sharply pointed, forming miniature arrows designed to aid dispersal by animals. Anyone walking through cane grass immediately becomes aware of when the seed has ripened, because released seeds stick through clothing, causing immense irritation to the skin beneath. One factor that did change in the third week of March when Star Finch breeding be-

gan was that, on the 20 March, cane grass irritation began. The possibility of the onset of breeding being synchronised with the ripening of a favoured food source is obviously a topic that would bear further investigation.

In 2009, examination of Star Finch brood patches did not commence early enough to investigate the onset of the breeding season. However, it was observed that while four of the 19 females caught on 6 May 2009 had an active brood patch, none of the 168 females subsequently caught in the 34 banding sessions that occurred between 9 May and 11 September 2009 were actively breeding. This, and data on the duration of the breeding season in 2010 reported in this study, strongly suggests that, in comparison with other finches found at the project site, such as the Long-tailed Finch (*Poephila acuticauda*), which breeds from early March to the end of September in years when conditions are favourable (van Rooij and Griffiths 2009), Star Finch breeding is concentrated into a much shorter period.

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