

Do Fork-tailed Flycatchers (*Tyrannus s. savana*) stop to molt during fall migration?

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ABSTRACT: Fork-tailed Flycatchers (*Tyrannus s. savana*) breed from central to southern South America, then migrate to northern South America, where they undergo a winter molt. However, exactly when this winter molt begins is not known. Previous research showed that some Fork-tailed Flycatchers stopover for an extended period in Mato Grosso do Sul in late January/early February, during fall migration. We hypothesized that these flycatchers are suspending fall migration to initiate flight feather molt, as do congeners in North America. In February 2016, we located a roost of >100 migratory flycatchers in Mato Grosso do Sul state and captured two adults and two juveniles, one of which was an adult female that was symmetrically molting the first primary feather. This is the furthest south that this species has been found molting flight feathers and suggests that some Fork-tailed Flycatchers undertake fall molt-migration to Mato Grosso do Sul. Further research on the relationship between timing of molt and migration of this and other birds that migrate within South America will be essential to evaluate the evolution of their life history strategies, seasonal interactions, and limitations they face throughout the year.

KEY-WORDS: intra-tropical migration, Mato Grosso do Sul, post-reproductive, remiges.

The timing of feather molt in migratory birds is a topic of increasingly growing interest, given the recognition in recent years that molt is a key event in their annual cycle (e.g., Leu & Thompson 2002, Carlisle *et al.* 2005), which must be carefully timed so as to not conflict with other important but energetically costly activities such as breeding and migration (e.g., Echeverry-Galvis & Hau 2013).

Fork-tailed Flycatchers (*Tyrannus s. savana*) that migrate within South America (*i.e.*, the nominate subspecies) breed from central Brazil to south-temperate latitudes of South America (Fitzpatrick *et al.* 2004). They have one annual remex molt in the basic flight molt sequence (*i.e.* proceeding distally in the primaries, Jenni & Winkler 1994), which occurs from March to June on the wintering grounds in northern South America (Jahn *et al.* 2016a). Although the body molt of this migratory subspecies occurs throughout the year, including during winter and while breeding, the molt of the remiges is currently only known to occur on the wintering grounds (Jahn *et al.* 2016a). Previous research based on light-level geolocator data shows that Fork-tailed Flycatchers breeding at Estação Ecológica de Itirapina, São Paulo state, Brazil, have two fall migration strategies (Jahn *et al.* 2016b). Some migrate directly to the wintering grounds after breeding, whereas others first move west

after breeding to southwestern Brazil (Mato Grosso do Sul state), where they remain for several weeks in January and February (Jahn *et al.* 2016b). Nevertheless, why some flycatchers make this westward movement and prolonged stopover is still unknown and precludes understanding the relationship between timing of molt and migration in this widespread Neotropical species.

With the goal of identifying when migratory Fork-tailed Flycatchers (hereafter, “flycatchers”) initiate their winter molt, we measured feather molt of flycatchers during early fall migration in southwestern Brazil. We test the hypothesis that some flycatchers stopover in southwestern Brazil for several weeks after breeding to begin feather molt.

We banded migrating flycatchers at Fazenda Ribalta, Mato Grosso do Sul state, Brazil (22.5°S; 49.8°W). This property used to be a cattle ranch, but is now mostly used to grow Soybeans (*Glycine max*). We captured migratory flycatchers at this place on 10 February 2016. Flycatchers roosted in a bamboo grove (Poaceae) located behind the ranch buildings. We caught flycatchers with four 3 × 12 or 3 × 18 m polyester or nylon nets (38 mm mesh size), placed 2–6 m from the bamboo grove used by flycatchers to roost. Nets were raised up to 8 m high and stacked, using bamboo poles. Captured flycatchers were banded with an individually numbered metal band or Darvic

color bands and processed using techniques described in Ralph *et al.* (1993) before being released.

We aged and sexed flycatchers following Pyle (1997) and determined reproductive condition, subcutaneous fat content, primary feather wear, body molt intensity and body and flight feather molt following Ralph *et al.* (1993).

We captured and measured two adults (one male and one female) and two juveniles; none had a smooth or vascularized brood patch, nor exhibited a swollen cloacal protuberance. Of these, the two adults had no body molt, one juvenile had light preformative molt, and the other juvenile exhibited heavy preformative molt. None of the flycatchers captured were molting flight feathers, except for the adult female, which was symmetrically molting the first primary feather (*i.e.* molting the first primary feather on both wings, Fig. 1), representing the definitive prebasic molt. The two juveniles had light primary feather wear and the two adults exhibited moderate primary feather wear.

The two juvenile flycatchers had a subcutaneous fat score of 3 and 4. The adult male had a subcutaneous fat score of 5, as did the female that was symmetrically molting the first primary feather.

These results represent the furthest south that Fork-tailed Flycatchers have been found molting flight feathers, and provides preliminary evidence that some flycatchers move to southwestern Brazil to begin flight molt. The subcutaneous fat score (slightly bulging fat) of the female was much higher than that observed in breeding flycatchers (A.E.J., unpub. data), suggesting that it was stopping over or migrating through our study site in Mato Grosso do Sul. Notably, the two juveniles were molting body feathers, whereas the adults had no body molt. Although the sample size is low, these results suggest that age-dependent timing of feather molt exists in this species just after the breeding season, as has been



Figure 1. Picture of the right wing of a female Fork-tailed Flycatcher *Tyrannus s. savana*. Note primary 1, which is actively molting (arrow). Note that the tertials are less worn than the primary and secondary feathers, suggesting that the tertials represent an alternate molt.

found later in winter (Jahn *et al.* 2016a).

Future research on molt strategies of birds that migrate in the Neotropics promises not only a better understanding of their evolutionary history, it will also provide the necessary information to tailor specific conservation plans for migratory species with different life history and molt strategies.

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