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INTERACTIONS BETWEEN BIRDS OF PREY AND THE CAPE PARROT IN THE EASTERN CAPE

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Abstract
Worldwide, parrots are most vulnerable to attack when congregating around feeding and drinking sites. Flocking is a way of minimising vulnerability to predation, but can increase predation risk when flocks are unusually large and conspicuous. The Cape Parrot *Poicephalus robustus* is endemic to South Africa and is listed as endangered, with an estimated 1250 mature individuals remaining in the wild. Predation attempts have been previously documented on individuals flying over natural forests. However, unusually large flocks gather during autumn and winter to feed on exotic Pecan *Carya illinoinensis* nuts growing in orchards in Eastern Cape, South Africa, and this may increase their risk to predation. Observations conducted on 13 mornings and seven afternoons during March-June 2017 revealed frequent flushing and chasing by raptors such as African Goshawk *Accipiter tachiro* and Black Sparrowhawk *Accipiter melanoleucus*. No predation events were witnessed, and carcasses found on the ground beneath pecan trees suggests either predation or individuals that succumbed to Psittaccine Beak and Feather Disease. Ongoing observations at pecan orchards during the pecan season would better evaluate predation levels, and other threats to this endangered species at these feeding sites away from Afromontane habitat.

Introduction
Parrots are most vulnerable to predation while in the nest, where snakes and mammals target eggs, chicks and incubating adults. Introduced mammals have been particularly devastating (Gnam & Burchsted 1991; Juniper & Parr 1998; Stojanovic et al. 2014). Away from the nest, parrots are attacked when they are congregating around feeding and drinking sites (Simmons & Selman 2005; Brightsmith & Villalobos 2011). For example, in southern Africa, Rüppell's Parrot *Poicephalus rueppellii* is attacked by a variety of raptors when flocks descend to drink (Simmons & Selman 2005), while other parrots are attacked while flying individually or in small groups (Skead 1964; Wirminghaus et al. 2000; Symes 2005). Brown Snake-Eagles *Circaetus cinereus* have been recorded to chase Grey-headed Parrots *Poicephalus fuscicollis* in flight (Symes 2005). Black Sparrowhawks *Accipiter melanoleucus*, Lanner Falcons *Falco biarmicus* and African Goshawks *Accipiter tachiro* have been recorded to chase individual flying Cape Parrots *Poicephalus robustus* in forests (Skead 1964; Wirminghaus et al. 2000).

The Cape Parrot is endemic to South Africa and is currently listed as endangered, with approximately 1250 mature individuals remaining in the wild (Downs 2015). The species is restricted to breeding in or very near natural forest patches and predominantly feeds on unripe Yellowwood fruit kernels (*Podocarpus* and *Afrocarpus*; Skead 1964, Wirminghaus et al. 2001a; Downs 2005), but occasionally feeds on other indigenous and exotic fruiting trees (Symes & Downs 2002). Cape Parrots travel and feed for most of the year in pairs or small flocks (an average of 22 individuals) in dense indigenous forest, with flocks up to 80 individuals observed in some months (Wirminghaus et al. 2001b). However, they are known to travel outside these forest patches into human modified habitat to feed in large flocks on exotic plant species such as Pecan *Carya illinoinensis* nuts (Symes & Downs 2002).

Flocking behaviour in birds has both risks and benefits to each individual. Flocking reduces an individual's risk of predation by the dilution effect, vigilance effect and confusion effect (Cresswell 1994). Flocks are also more easily able to chase off predators than a single individual (Ryan 2014). However, large flocks of birds are more conspicuous than single birds, whether in flight or nesting, and large flocks attract the attention of predators (Ryan 2014).

In the Amathole region of the Eastern Cape province, South Africa, which is the most southern part of the Cape Parrot's distribution, pecan orchards attract large flocks of Cape Parrots from their roosting areas in Afromontane forests during autumn and winter. Flocks at these orchards fly noisily over and among the pecan trees during their early-morning and late-afternoon feeding bouts. In this paper, we describe interactions between raptors and Cape Parrots at a site that attracts unusually large flocks.

Methods

Observations at one pecan orchard in the Eastern Cape were conducted over 13 mornings and seven afternoons during March-June 2017. Morning observations were conducted during 06:00-10:00 and afternoon observations during 16:00-18:30. We recorded any interactions between raptors and parrots during orchard visits, defined as any time a raptor would purposefully flush Cape Parrots from trees, or follow or chase flying flocks of Cape Parrots. We ignored false-alarm flushes which were typically initiated by those species that associate with parrots in the orchard such as Red-eyed Doves *Streptopelia semitorquata* and Crowned Hornbills *Lophoceros alboterminatus*. During each observation day, the ground of the orchard was scoured for parrot carcasses.

Results

Most of the parrots that were observed in the orchard did not roost there, but travelled from their overnight roosting areas in the Afromontane forests ≥ 30 km away (98% of the total number of individuals seen at the orchard travelled in). A few individuals roosted in a nearby town < 1 km from the orchard (2 % of individuals). Parrots arrived in the orchard in small flocks in the mornings (06:30-09:40). Arriving flocks comprised 7 ± 6 individuals (mean ± SD; range: 2-39, n = 355), with 34 individuals having travelled to the orchard singly. After a bout of foraging in the morning, individuals spent the midday period resting quietly in nearby large stands of exotic *Eucalyptus* trees. Parrots returned to the orchard in the late afternoon for a second daily bout of foraging, then left the orchard in the evening (16:45-18:00), returning to their roosting areas in the forest. Departing flocks (n = 72) contained 39 ± 50 individuals (range: 2-223 individuals). Eight individuals were observed departing the orchard alone to their evening roost. Each day, 248 ± 171 individuals visited the orchard (range: 1-589).

While the parrots were in the orchard, we recorded four raptor species flushing and/or chasing parrots but no predation events were witnessed. Up to two interactions per hour were recorded. African Goshawk, Black Sparrowhawk, Long-crested Eagle *Lophaetus occipitalis* and Wahlberg's Eagle *Aquila wahlbergii* flushed parrots from trees. African Goshawks and Black Sparrowhawks also chased individuals and flocks. Black Sparrowhawks were observed in May and June. Up to three individuals typically perched in tall trees and snags surrounding the orchard from which they flew into the orchard directly at trees where parrots were feeding, flushing and chasing flocks. African Goshawks were present through all observation months and were suspected to roost in tall *Eucalyptus* trees ± 1 km from the orchard. They flew in every morning and perched in the thick riparian vegetation near the orchard. This species made brief appearances in the orchard, flying swiftly toward flocks in pecan trees causing the parrot flocks to flush. They also chased flocks in the orchard. During one evening observation, an African Goshawk trailed a Cape Parrot flock as individuals were returning to their forest

roosting sites. Wahlberg's Eagles were present in March, and a pair had a nest in a tall pecan tree, 50 m from the orchard edge. Individuals perched in the nest tree in the mornings and flush flocks from pecan trees infrequently, and typically late in the morning when the Cape Parrot flocks were at their largest. A Long-crested Eagle was observed flushing parrots twice, once each month during May and June. Cape Crows *Corvus capensis* occasionally displaced Cape Parrots individuals and flocks at feeding trees. Parrots did not flush when Jackal Buzzards *Buteo rufofuscus* flew 20 m from the pecan tree where parrots were feeding. We found 15 Cape Parrot carcasses, of which five had plucked feathers around the belly, hole on the side of the body with innards removed. Small remains of a further 10 individuals were found.

Cape Parrots repeated a similar set of behaviours after detecting a raptor and before eventually settling to forage. Once a raptor was spotted, the flock flushed and flew noisily over the orchard. Often the flock followed the raptor away from the orchard for a short distance, giving alarms calls continuously before circling back. If the raptor landed nearby, the flock circled overhead, and individuals made "popping" calls, best described as a short 'peo', when the circling flock passed directly over the raptor. The flock eventually settled in an exposed tree near the orchard and gradually returned to the orchard in small flocks. Individuals did not immediately resume foraging, but only did so when large numbers of parrots, doves and hornbills were present in the immediate vicinity (the latter two species typically foraged on the ground).

Discussion

Large congregations of Cape Parrots have rendered them vulnerable to conflict with humans. Historically, Cape Parrots were persecuted for damage caused to crops when the parrots first discovered pecans as a feeding resource in the 1970s (Symes & Downs 2002; Boyes 2010). Parrots have also been captured illegally at a site in KwaZulu-Natal (Symes & Downs 2002). Large congregations of Cape Parrots are described here as also attracting unwanted attention in the form of birds of prey.

Frequent interactions (flushing and chasing) between Cape Parrot flocks and raptors indicate that large flocks are attracting the attention of predators. The unusually large numbers observed in this Eastern Cape pecan orchard are even more conspicuous to predators as these flocks occur in human-modified habitat which are generally more open than the natural forest (Wimberger et al. 2017). Long-crested Eagles only rarely hunt birds (Johnson 2005), and may just have been attracted to the orchard temporarily due to the conspicuousness of the large, highly vocal parrot flocks. Similarly, Wahlberg's Eagle may not have been targeting Cape Parrots as prey, but possibly exhibiting nest defense behaviour towards another largish bird (M. Brown 2017 pers. comm.). However Black Sparrowhawks, Lanner Falcons and African Goshawks have been documented in the literature as chasing Cape Parrots (Skead 1964; Wirminghaus et al. 2000), and it is these two species that could pose a threat to Cape Parrots when large flocks gather, in addition to other threats such as disease, particularly Pstittascene Beak and Feather Disease (PBFD, Boyes 2010).

Parrots frequent the pecan orchard during the austral autumn and winter when individual parrots suffer declining physical condition due to the symptoms of PBFD such as the loss of feathers (Boyes 2010; Regnard et al. 2015a, 2015b). It seems reasonable that sick birds, being compromised in their ability to fly well, would be easy prey for raptors. Furthermore, it is likely that some of the carcasses found in the orchard where from individuals who succumbed to this disease. Although clumps of exotic feeding trees such as pecan orchards offer attractive feeding sites for the Cape Parrot, the possible increased risk of predation at these sites is worth further investigation given the endangered status of the species (Downs 2015). We recommend further observations throughout South Africa at sites where concentrated numbers of Cape Parrots occur, to quantify threats

such as predation or illegal capture (Symes & Downs 2002, D de Swardt 2016 pers. comm.) at these sites away from indigenous forests. In addition, observations at these sites will contribute to our understanding on the costs (possible high predation levels, illegal capture) and benefits (reliable food source) of using exotic fruiting trees as a food source for the Cape Parrot.

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An adult Cape Parrot feeding on Pecan nuts (Photo: Johann Carstens).

A flock of Cape Parrots at a Pecan orchard in the Eastern Cape (Photo: Johann Carstens).