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Lerp-feeding behaviour of the flower-visiting Musk Lorikeet *Glossopsitta concinna*

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Abstract. Besides the primary diet of nectar, pollen, and fruits, the flower-visiting Musk Lorikeet *Glossopsitta concinna* feeds on lerps. However, a description of its behaviour while foraging on this latter source seems to be lacking. We describe and illustrate the feeding behaviour of the Musk Lorikeet on Spondylaspidinae psylloid lerps. The lerps were within young deformed eucalypt leaves, and the Lorikeet had to open a deformed leaf and remove the starchy lerps to feed on them. The Lorikeet took *c.* 1 minute to process each leaf, which suggests that these lerps are an important or satisfying food.

Introduction

Most, if not all, lorikeets and various rosellas pick lerps from eucalypt tree leaves as a food source (Higgins 1999; Rose 1999; Hasebe & Franklin 2004; Endersby 2005; Adams 2018). Lerps are structures produced by the nymphs of hemipteran insects of the superfamily Psylloidea, usually referred to as lerp bugs (Endersby 2005; Burckhardt & Ouvrard 2012). They are rich in starch and sugars and low in proteins and fats (Gilby *et al.* 1976; Endersby 2005; Faast *et al.* 2020), which would render lerps an important addition to the diet of nectar-feeding birds.

The diet of the flower-visiting Musk Lorikeet *Glossopsitta concinna* consists mostly of nectar, pollen, fruits and lerps (Higgins 1999; Hasebe & Franklin 2004; Fitzsimons *et al.* 2003; Courtney & Debus 2006; Adams 2018). Although there are a few reports of this species' foraging behaviour on flowers and fruits (Higgins 1999; Smith & Lill 2008; Stanford & Lill 2008; Courtney & Debus 2016), we did not find a description of its foraging behaviour on lerps. Herein we describe and illustrate the feeding behaviour of the Musk Lorikeet on psylloid lerps *Lasiopsylla* sp. (Aphalaridae, Spondylaspidinae) in suburban Sydney, New South Wales.

Methods

We observed the foraging Musk Lorikeets on a eucalypt *Eucalyptus* sp. growing at the margin of Louise Sauvage Pathway (33°50'S, 151°04'E, 4 m above sea level), Richmond, New South Wales, on 10 May 2021. Throughout the observational session we used ad libitum and sequence samplings (Altmann 1974), which are preferred methods to record temporary or unpredictable events. The observational session lasted 22 minutes (1027–1049 h), during which we documented the Lorikeets' behaviour with a 70–300-mm-lens digital camera. Posture categories while the Lorikeets foraged on lerps follow Stanford & Lill (2008). Two individuals were timed to measure the effort employed to remove the lerps from a deformed leaf.

Results

A flock of ~20 Musk Lorikeets foraged on a eucalypt ~20 m tall, which was not in bloom and had most of its young leaves deformed by psylloid lerps *Lasiopsylla* sp. (Figures 1–2). Most of the Lorikeets were feeding at ~10–12 m above ground, but a few foraged on branches at 3–4 m. The Lorikeets foraged on lerps in a characteristic sequence and we observed three of the five posture

Figure 1. A Musk Lorikeet perches upright and uses both mandibles to open a eucalypt leaf deformed by Spondylaspidinae psylloid lerps *Lasiopsylla* sp. Photo: Ivan and Marlies Sazima

Figure 2. (a) A Musk Lorikeet hangs inverted and scrapes the deformed eucalypt leaf to reach the lerps inside. (b) The same individual exposes a psylloid nymph and begins to collect the starchy lerps. Photos: Ivan and Marlies Sazima

Figure 3. (a) A Musk Lorikeet perches upright and feeds on the collected lerps. (b) Two deformed leaves opened to expose the starchy lerps and the psylloid nymphs *Lasiopsylla* sp. in different instars, i.e. different developmental stages. Photos: Ivan and Marlies Sazima

categories described by Stanford & Lill (2008): (a) perching upright-reaching, (b) perching upright-twisting, and (d) hanging inverted (Figures 1–3). The Lorikeets habitually grasped a deformed leaf with the bill, and began to work on it using both mandibles (Figure 1). They scraped the internal portion of the deformed leaf using the lower mandible and the tongue to reach the lerps (Figure 2a). With the deformed leaf partly broken, they exposed the starchy lerps (Figure 2b), and consumed the collected food (Figure 3a). In the lerp-eating process, some broken leaf pieces were discarded and accumulated on the ground below the tree, but we found no nymphs on these discarded leaf pieces. The two timed individuals processed each leaf in *c*. 1 minute to extract, collect, and consume the lerps. We collected three deformed leaves and found two lerps within each leaf. Nymphs in different instars (i.e. different developmental stages) produced the lerps on which the Lorikeets foraged (Figure 3b). After the lerp-feeding bout, the Lorikeets flew to a nearby blooming eucalypt to forage on flowers. We found no Musk Lorikeets on the following weekly visits to the study site until 9 October 2021, when we resighted the nomadic Lorikeets foraging on a blooming eucalypt but there were no perceptible lerps on the studied tree.

Discussion

This seems to be the first illustrated description of the Musk Lorikeet foraging on Spondylaspidinae psylloid lerps. What drew our attention was the effort that a Lorikeet had to employ to open a deformed leaf and remove the starchy lerps. The two timed Lorikeets took *c*. 1 minute to process each leaf, which suggests that these 'hidden' lerps are an important or satisfying food source. We believe that handling time is shorter while foraging on more accessible lerps such as those exposed on straight, undeformed leaves (see for example: twitter.com/parrotoftheday/status/1265501828407590920). Although we timed only two Musk Lorikeets, Endersby (2005) found that Rainbow Lorikeets *Trichoglossus moluccanus* processed 12–27 lerps per minute in 18 events while feeding on the exposed structures of the Spondylaspidinae psylloid *Lasiopsylla rotundipennis*. The Rainbow Lorikeet used its tongue to extract the honeydew produced by the nymphs and discarded the lerps (Endersby 2005), whereas we observed the Musk Lorikeet to swallow the collected lerps. As we found no psylloid nymphs on the leaf pieces discarded by the Musk Lorikeets, it is possible that they were intentionally or accidentally consumed along with the lerps. The Rainbow Lorikeet possibly removes the nymphs as well, during the process of extracting the honeydew

(Endersby 2005). The Eastern Rosella *Platycercus eximius* collects and eats minute lerps exposed on eucalypt leaves very quickly, ~10 leaves handled per minute (Biby TV 2015). It would be instructive to observe and document lerp-foraging parrots and compare their behaviour while feeding on this source, as lerp-collecting behaviour varies according to the bird and lerp species (Endersby 2005; this study).

As lerps contain starch and sugars and are energy-rich (Gilby *et al*. 1976; Endersby 2005; Faast *et al.* 2020), they are an important addition to the diet of nectar-feeding birds including Musk Lorikeets (Nichols 1978; Paton 1980; Rose 1999; Franklin & Noske 2000; Endersby 2005; Courtney & Debus 2006; Stanford & Lill 2008). Further observations on lerp-feeding parrots are needed to better understand the relationship of these birds with lerps, including the seasonality and importance of this energy source. The nomadic habits of the Musk Lorikeet and a few other flower- and lerp-feeding parrot species (Higgins 1999; Fitzsimons *et al.* 2003; Courtney & Debus 2006; Adams 2018) would add to the complexity of such studies.

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