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Short Communication

New records of avian and interspecific predation in lizards of the genus *Liolaemus* (Squamata: Liolaemidae)

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Liolaemus is a diverse lizard genus distributed in southern South America, mainly in Argentina and Chile, currently containing 257 species and two subgenera—*Liolaemus* (sensu stricto) and *Eulaemus* (Abdala and Quinteros 2014). Few records of interspecific saurophagy have been reported. Avila and Belver (2000) noted the predation by an adult male *L. koslowsky* Etheridge, 1993 on a hatchling *L. pseudoanomalus* (Cei, 1981). Avila and Morando (2002) documented an adult male *L. petrophilus* Donoso-Barros and Cei, 1971 preying on a hatchling *L. bibronii* (Bell, 1843). Pérez *et al.* (2009) reported the predation by an adult (sex not mentioned) *L. austromendocinus* Cei, 1974 on an adult female *L. bibronii.* Torres-Mura (2013) described the predation by an adult (sex not mentioned) *L. monticola* Müller and Hellmich, 1932 on a juvenile *L. lemniscatus* Gravenhorst, 1838 (incorrectly stated to be the first record of saurophagy on *Liolaemus*).

Likewise, few records of predation by passerine birds on species of *Liolaemus* have been reported. Pérez and Avila (2005) reported an adult Black-bellied Shrike-tyrant [*Agriornis montanus* (D'Orbigny and Lafresnaye, 1837)] capturing and killing a subadult *L. petrophilus.* Santoyo-Brito *et al.* (2014) stated that they "confirmed in the field" that *A. montanus* also preys on neonate *L. leopardinus* Müller and Hellmich, 1932, without more details. Santoyo-Brito *et al.* (2014) reported an adult Rufous-banded Miner [*Geositta rufipennis* (Burmeister, 1860)] capturing and killing a neonate *L. leopardinus.* Bianchini (2014) reported a predation event from a photograph of a Long-tailed Meadowlark [*Leistes loyca* (Molina, 1782)] holding a *L. multimaculatus* (Duméril

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and Bibron, 1837) in its beak. Until these records, *A. montanus* was reported to prey on several small vertebrates (Salvador and Bodrati 2013), and both *G. rufipennis* and *L. loyca* were thought to feed solely on arthropods and plants (Del Hoyo *et al.* 2003).

Herein, we report a new instance of interspecific saurophagy in *Liolaemus* and two new cases of saurophagy by passerine birds, the identities of which were confirmed with Couve *et al.* (2016). The reports are based mainly on anecdotal field observations, which were photographed. We only examined one dead *Liolaemus;* the sexes of the other individuals were determined based on the dorsal color pattern.

On 07 December 2015, we photographed an adult Austral Thrush (*Turdus falcklandii* Quoy and Gaimard, 1824) holding a dead adult female *Liolaemus tenuis* (Duméril and Bibron, 1837) in its beak and beating it several times against the ground (Figure 1A). The observation took place at 16:15 hr near the house of one of the authors (JTP) in Santiago City (33°31' S, 70°45' W, 480 m a.s.l.) in the Metropolitan Region of Chile. The observer (JTP), who was walking down the street, saw the bird with the lizard in its beak; he returned to his home to get a camera to photograph the bird's behavior and returned within 1 min. During the second observation, JTP was located about 5 m away from the bird for about 2 min, when the bird noticed his presence and escaped with its prey. *Turdus falcklandii* occurs in Chile and Argentina, where the birds are found as solitary or in pairs in both in urban and rural areas (Couve *et al.* 2016). The species feeds on annelids and fruits in some seasons (Orellana *et al.* 2014); this is the first record of its predation on a vertebrate. *Liolaemus tenuis* ranges across the Coquimbo and Los Ríos regions (Núñez and Gálvez 2015, Troncoso-Palacios 2019). The lizard was identified as a female based on its gray dorsum bearing short, transverse black stripes and the light green snout that is diagnostic of this species; also, it is the most common species of lizard found in central Chilean cities and has a maximum snout–vent length of 59.0 mm (Pincheira-Donoso and Núñez 2005).

On 30 January 2019, we photographed an adult male *Liolaemus tenuis* preying on a juvenile (unknown sex) *L. lemniscatus* (Figure 1B). The observation took place at 13:12 hr, in the Reserva Nacional Río Clarillo (33°43' S, 70°23' W, 1100 m a.s.l.) in the Metropolitan Region of Chile. The observer (IV) was 4 m away from the lizards for a period of 3 min. Although the predator was kept in sight until half of the prey was swallowed, we neither observed the capture nor the entire consumption of the prey. This is the first known report of saurophagy in *L. tenuis,* the species is thought to feed solely on arthropods (Donoso-Barros 1966, Pincheira-Donoso 2008). *Liolaemus lemniscatus* ranges across the Coquimbo and Los Ríos regions (Núñez and Gálvez 2015, Troncoso-Palacios 2019). Although the prey individual was examined at a distance, its identity was determined based on the absence of a vertebral line, and presence of a yellowish brown occipital band, dark-brown para-vertebral stripe and light yellow dorsolateral stripes (Pincheira-Donoso and Núñez 2005). The geographical ranges of both lizard species overlap; however, the taxa differ in microhabitat use. While *L. tenuis* is a saxicolous and tree-perching lizard, *L. lemniscatus* is a ground lizard (Troncoso-Palacios 2019).

On 02 December 2019, we photographed an adult Black-bellied Shrike-tyrant (*Agriornis montanus*) holding a dead adult male *Liolaemus atacamensis* Müller and Hellmich, 1933 in its beak and beating the lizard several times against the ground (Figure 1C, D). The observation took place at about 10:50–11:30 hr, while we carry out a field study for the mining project Delirio by Santiago Metals (26°45' S, 69°54' W, 1850 m a.s.l.), located 6 km NE of Inca de Oro, Atacama Region, Chile. The saurophagy event was observed (YMA and DH) for 10 min at a distance of 15 m. When the bird noticed our presence, it flew away abandoning its prey, thereby allowing

Figure 1. (**A**) An Austral Thrush, *Turdus falcklandii* preying on an adult female *Liolaemus tenuis*. (**B**) An adult male *Liolaemus tenuis* preying on a *Liolaemus lemniscatus*. (**C, D**) A Black-bellied Shrike-tyrant, *Agriornis montanus,* preying on an adult male *Liolaemus atacamensis*.

us to examine the prey; the lizard was a known, previously marked individual. *Agriornis montanus* is widely distributed in southern South America, and ranges from Colombia to Chile where it is found as solitary individuals or in pairs (Couve *et al.* 2016), and preys on vertebrates such as lizards, nestling birds, eggs, small rodents, and even fishes (Salvador and Bodrati 2013). *Liolaemus atacamensis* is endemic to Chile, inhabiting the regions of Coquimbo and Atacama (Troncoso-Palacios 2014). The maximum snout-vent length (SVL) of this lizard is 67.2 mm (Troncoso-Palacios and Garín 2013). The identity of the lizard described here is based on the presence of a rounded black spot on the shoulder, as well as the presence of a few light-blue dorsal scales (Troncoso-Palacios and Garín 2013).

Because we did not observe the birds capturing and killing the lizards, it is possible that the lizards were dead before the birds picked them up and consumed the dead bodies

(opportunistic feeding behavior). Nevertheless, we think that these observations are predation records for the following reasons. First, in both instances, the dead lizard had autotomized tail, which is a defense mechanism against capture (Jaksic and Fuentes 1980). Second, there is blood spot on the tail of the *Liolaemus atacamensis* and on the snout of the *L. tenuis,* which is indicative of a recent death by predation. Each record of saurophagy reported here, *Agriornis montanus* on *L. atacamensis, Turdus falcklandii* on *L. tenuis,* and *L. tenuis* on *L. lemniscatus,* occurred between species with widely overlapping distributional ranges in Chile; thus, saurophagy may not be uncommon. However, if this is true, it is remarkable that no previous records of saurophagy have been reported in the literature.

Cannibalism has been recorded frequently in *Liolaemus.* Two adult male *L. lutzae* Mertens, 1938 preyed on juveniles (Rocha 1992) and an adult male *L. darwini* (Bell, 1843) preyed on a hatchling (Ripoll and Acosta 2007), as did an adult male *L. rothi* Koslowsky, 1898 (Kozykariski *et al.* 2009) and an adult male *L. zapallarensis* Müller and Hellmich, 1933 (Pincheira-Donoso 2012). Villareal *et al.* (2012) recorded the only known record of cannibalism between captive individuals involving an adult male *L. forsteri* Laurent, 1982 preying on a neonate. Jiménez-Robles and De la Riva (2017) reported an adult female of *L. orientalis* Müller, 1924 preying on a juvenile. Congeneric predation has been hypothesized to explain patterns of special segregation in *L. huacahuasicus* Laurent, 1985 (Halloy and Halloy 1997). Additionally, Álvarez and Zelada (2014) reported an adult (sex unknown) of *L. pictus* (Duméril and Bibron, 1837) preying on a juvenile *Liolaemus* of undetermined species. Last, Pincheira-Donoso (2012) mentioned a case of cannibalism on *L. chiliensis* (Lesson, 1830) that was to be published in the first issue of the journal "Revista de Integración Biológica de Concepción"; however, we cannot confirm this record in publication.

Saurophagy is recorded in the subgenera of *Liolaemus* and occurs in diverse clades. In the *Liolaemus* (sensu stricto), saurophagy is known in (parenthetical subclades fide Morando *et al.* 2003, Troncoso-Palacios *et al.* 2015, Panzera *et al.* 2017) *L. austromendocinus, L. petrophilus* (*petrophilus* group), *L. monticola* (*monticola* group), *L. pictus* (*pictus* group), *L. zapallarensis* (*nigromaculatus* group), and *L. tenuis* (species without close relatives). In the subgenus *Eulaemus,* saurophagy is recorded in (parenthetical subclades fide Abdala and Quinteros 2014, Avila *et al.* 2013) *L. darwini, L. koslowsky* (*darwini* group), *L. fosteri, L. orientalis* (*montanus* group), *L. lutzae* (*wiegmannii* group), and *L. rothi* (*rothi* group). This strongly suggests that in *Liolaemus,* saurophagy may be ancestral behavioral feature.

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