

Capture events of Forster's Tree Iguana, *Liolaemus forsteri* Laurent, 1982, by Aplomado Falcon, *Falco femoralis* Temminck, 1822, in the high Andes of Bolivia

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Liolaemus forsteri Laurent, 1982 is an endemic and endangered lizard from the high Andes of La Paz, Bolivia, that occurs at elevations between 4100–4950 m (Aguilar and Domic, 2009; Aparicio et al., 2015; Aparicio, 2017). It typically inhabits open grasslands with low vegetation and rocky areas, often in association with rodent burrows (Aparicio et al., 2015; Morillas et al., 2023). It is a relatively large and robust diurnal species (snout-vent length: 79–96 mm) (Ocampo, 2010; Aguilar-Kirigin, 2021) that actively thermoregulates to maintain body temperatures around 32 °C (Villarreal, 2017). It is viviparous and omnivorous, with a diet that includes a considerable proportion of plant material (Pacheco, 1988; Baudoin and Pacheco, 1991; Ocampo, 2010). Reported home range size averages 31.2 m² (Morillas et al., 2023), and population densities range from 375 to 400 individuals per hectare (Pacheco, 1988). Although predation by local carnivores has long been presumed, we here report on capture events that represent the first direct evidence of such interactions.

On 24 December 2022, during a monthly population monitoring conducted by Bruno Miranda at La Cumbre, La Paz, Bolivia (16.3423°S, 68.0335°W; elevation 4738 m), a capture event was recorded. Between 09:00 and 10:00 h, an Aplomado Falcon (*Falco femoralis*) was noted perching and flying over the study area. At 10:47 h., the falcon appeared carrying an adult lizard in its talons; the event was photographed with a Nikon D5100

camera equipped with a AF-S DX NIKKOR 55–300 mm f/4.5–5.6G ED VR lens (Fig. 1).

On 19 May 2023, during the filming of a tourism promotion video by Diego Del Carpio in the community of Siete Lagunas, La Paz, Bolivia (16.4327°S, 68.1515°W; elevation 4209 m), another *F. femoralis* was seen perching on a utility pole at 10:33 h while holding an injured adult *L. forsteri*. The event was documented through four video recordings and photos taken with a Nikon COOLPIX P950 digital camera, totalling approximately 10 minutes (Fig. 2; https://www.youtube.com/playlist?list=PL1xMwZmx0Q27vEbGN5daOd2yzXcJz_bSA). Notably, the falcon was observed regurgitating a pellet before flying off with the lizard.

The diet of *F. femoralis* includes birds, mammals, and insects (Héctor, 1985; Jiménez, 1993; Bó, 1999; Macías-Duarte et al., 2004; Di Giacomo, 2005; Figueroa and Corales, 2005; Granzinolli and Motta-Junior,



Figure 1. *Liolaemus forsteri* individual carried by *Falco femoralis*, in La Cumbre, La Paz – Bolivia. Photo by Alejandro Bruno Miranda-Calle.

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Figure 2. *Liolaemus forsteri* individual involved in a capture event by *Falco femoralis* in Siete Lagunas, La Paz, Bolivia. Photo by Diego Del Carpio Martínez.

2006; Motta-Junior et al., 2010; Baladrón et al., 2012; Salvador, 2012). However, occasional consumption of reptiles, including lizards and snakes, has also been recorded (Keddy-Hector, 2000; Liébana, 2015), demonstrating the species' dietary plasticity. Reports of predation on species of Liolaemidae include *L. nitidus* in Chile (Jiménez, 1993), and *L. lineomaculatus* as well as other unidentified *Liolaemus* species in Argentina (Trejo et al., 2003; Liébana et al., 2015).

These documented records represent rare and valuable observations of capture events involving *L. forsteri* in the high Andes which most likely resulted in its predation. They enhance our understanding of its ecological interactions, providing evidence of the species' role within local food webs. Furthermore, contribute to a more comprehensive picture of its natural history, which is important for informed monitoring efforts and habitat management in High-Andean ecosystems.

Acknowledgments. We thank Daniela Moreno and Isabel Gómez for their assistance in confirming the identification of the avian species, and Alvaro Aguilar for confirming the lizard species. Anahí Paca and Cristian Abdala also made valuable suggestions to improve the manuscript. DDCM thanks Marcos Rossel and the team of Turismo El Alto Tour Operador for their support during the filming, conducted as part of the Sustainable Tourism Solutions Contest funded by SDSN.

References

Aguilar Kirigin, A., Domic, E. (2009): *Liolaemus forsteri* (Laurent, 1982). In: Libro Rojo de la Fauna Silvestre de Vertebrados de Bolivia, p. 272. Ministerio de Medio Ambiente y Agua Ed., La Paz, Bolivia, Ministerio de Medio Ambiente y Agua.

- Aguilar-Kirigin, A.J. (2021): *Liolaemus forsteri*. In: Las lagartijas de la familia Liolaemidae. Sistemática, Distribución e Historia Natural de una de las Familias de Vertebrados más Diversas del Cono Sur de Sudamérica Vol. 2, p. 126–127. Abdala, C.S., Laspiur, A., Scrocchi, G., Semhan, R.V., Lobo, F., Valladares, P., Eds., Valparaíso, Chile, RIL Editores, Universidad de Tarapacá.
- Aparicio, J., Ocampo, M., Aguilar-Kirigin, Á., Pacheco, L., Miranda-Calle, A.B., Villarreal, S. (2015): Reptiles del valle de La Paz. In: Historia Natural de un Valle en los Andes: La Paz. Second Edition, p. 522–538. Moya, E., Meneses, R. I., Sarmiento, J., Eds., La Paz, Bolivia, Museo Nacional de Historia Natural.
- Aparicio, J. (2017): *Liolaemus forsteri*. The IUCN Red List of Threatened Species **2017**: e.T50956565A50956570.
- Baladrón, A.V., Bó, M.S., Cavalli, M., Martínez, G. (2012): Comparison of the diet of two bird-eating raptors, the Aplomado Falcon (*Falco femoralis*) and the Cinereous Harrier (*Circus cinereus*), in the Pampean Region of Argentina. Boletín Chileno de Ornitología **18**(1–2): 62–67.
- Baudoin, M., Pacheco, L. F. (1991): Reptiles. In: Historia Natural de un Valle en los Andes: La Paz, p. 421–452. Forno, E., Baudoin, M., Eds., La Paz, Bolivia, Instituto de Ecología - LIDEMA.
- Bó, M.S. (1999): Dieta del Halcón Plomizo (*Falco femoralis*) en el sudeste de la provincia de Buenos Aires, Argentina. Ornitología Neotropical **10**: 95–99.
- Di Giacomo, A.G. (2005): Aves de la Reserva El Bagual. In: Historia Natural y Paisaje de la Reserva El Bagual, Provincia de Formosa, Argentina. Aves Argentinas, p. 256–257. Di Giacomo, A.G., Krapovickas, S.F., Eds., Buenos Aires, Argentina, Aves Argentinas, Asociación Ornitológica del Plata.
- Figuerola, R.A., Corales, E.S. (2005): Seasonal diet of the Aplomado Falcon (*Falco femoralis*) in an agricultural area of Araucanía. Journal of Raptor Research **39**(1): 55–60.
- Granzinolli, M.A.M., Motta-Junior, J.C. (2006): Predation on the Cattle Egret (*Bubulcus ibis*) and consumption of the Campo Flicker (*Colaptes campestris*) by Aplomado Falcon (*Falco femoralis*) in Brazil. Revista Brasileira de Ornitologia **14**(4): 453–454.
- Héctor, D.P. (1985): The diet of the Aplomado Falcon (*Falco femoralis*) in Eastern Mexico. Condor **87**(3): 336–342.
- Jiménez, J.E. (1993): Notes on the diet of the Aplomado Falcon (*Falco femoralis*) in North-Central Chile. Journal of Raptor Research **27**(3): 161–163.
- Keddy-Hector, D.P. (2000): Aplomado Falcon (*Falco femoralis*). In: The Birds of North America (No. 549), p. 1–20. Poole, A., Gill, F., Eds., Philadelphia, PA, United States, The Birds of North America.
- Liébana, M.S., Santillán, M.Á., Mallet, J., Sarasola, J.H. (2015): Predation on *Philodryas patagoniensis* (Squamata: Colubridae) by an Aplomado Falcon (*Falco femoralis*) in Central Argentina. Herpetology Notes **8**: 411–412.
- Liébana, M.S. (2015): Ecología del Halcón Plomizo (*Falco femoralis*) en agroecosistemas pampeanos. Unpublished Ph.D. thesis, Universidad Nacional de Mar del Plata, Mar del Plata, Argentina.
- Macías-Duarte, A., Montoya, A.B., Hunt, W.G., Lafón-Terrazas, A., Tavanelli, R. (2004): Reproduction, prey, and habitat of the Aplomado Falcon (*Falco femoralis*) in desert grasslands of

- Chihuahua, Mexico. *The Auk*, **121**(4): 1081–1093.
- Motta Junior, J.C., Granzinoli, M.A.M., Monteiro, A.R. 2010: Miscellaneous ecological notes on Brazilian birds of prey and owl. *Biota Neotrópica* **10**: 355–359.
- Morillas, E., Torrico-Paz, S., Romero, L., Zurita, L., Antezana, N., Carvajal, G., Miranda-Calle, A.B., Pacheco, L.F. (2023): Ámbito de hogar y uso de microhábitat de *Liolaemus forsteri* (Iguania: Liolaemidae) en una región Altoandina de La Paz, Bolivia. *Acta Zoologica Lilloana* **67**(1): 121–135.
- Ocampo, M. (2010): Estadios gonadales y parámetros fenotípicos en la biología reproductiva de tres especies de lagartijas del género *Liolaemus* (Squamata: Liolaemidae). Unpublished B.Sc. thesis, Universidad Mayor de San Andrés, La Paz, Bolivia.
- Pacheco, L. (1988): Actividad, densidad y hábitos alimenticios de dos especies de *Liolaemus* (Iguanidae) en el valle de La Paz. Unpublished B.Sc. thesis, Universidad Mayor de San Andrés, La Paz, Bolivia.
- Salvador, S.A. (2012): Historia natural, dieta y reproducción del Halcón Aplomado (*Falco femoralis femoralis*) en Villa María, Córdoba, Argentina. *Tercera Serie* **2**(2): 111–118.
- Trejo, A., Seijas, S., Sahores, M. (2003): Predation on *Liolaemus lineomaculatus*. *Herpetological Review* **34**(2): 145.
- Villarreal, S.V. (2017): Oportunidades de termorregulación de dos poblaciones de lagartijas (*Liolaemus forsteri*) a diferente elevación. Unpublished B.Sc. thesis, Universidad Mayor de San Andrés, La Paz, Bolivia.