~ Notes from the Field ~

Cats at the end of the world: improving our understanding of the kodkod in Argentina

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"We do not inherit the earth from our ancestors; we borrow it from our children"

~Wendel Berry (The Unforeseen Wilderness)

The kodkod (*Leopardus guigna*) is the smallest felid in the Americas (Molina 1782). Little is known of this elusive species, which ranges over 300,000 km² from Chile to Argentina (Napolitano et al. 2015). Kodkods are mostly found in forest and shrubland habitat in the Valdivian Temperate Forest and the Chilean Matorral ecoregions (Nowell and Jackson 1996; Sunquist and Sunquist 2002, 2009; Fig. 1).

Across its already restricted distribution, the kodkod faces major threats like habitat loss and fragmentation (e.g., deforestation, land transformation for cattle or real estate), and human persecution, killing by dogs, and vehicle collisions (Napolitano et al. 2015, Monteverde et al. 2019). Thus, the species is categorized as "Vulnerable" at a global scale (Napolitano et al. 2015 Monteverde et al. 2019). In Argentina, the kodkod can only be found in the Andean Mountains of Neuquén, Rio Negro, and Chubut provinces covering a total area of ~20,000 km² (Monteverde et al. 2019). Kodkods are only present in a few National Parks (i.e., Lanín, Nahuel Huapi, Lago Puelo and Los Alerces), where they have been declared a "species with special value", a protection category that includes all species that: i) are highly threatened, ii) are distributed in at least 10% of the Argentinian national parks, and iii) represent societal and spiritual value for local people (Monteverde et al. 2019). Until recently, there were only two records of the kodkod in Los Alerces National Park (LANP; Fig. 1). However, kodkod ecology and habitat use are unknown in this area (Guerisoli et al. 2020).

In 2021, we began an interdisciplinary project studying kodkods in LANP, Argentina. The main objectives were to: 1) describe kodkod habitat use and activity patterns; 2) collect information on how local communities perceive this species; 3) design and write a graphic novel integrating local information about kodkods (generated from products 1 & 2), with scientific knowledge already published, for a non-scientific audience.

To address our first objective, we installed camera traps across different zones of the study area. The sites ran for a minimum of six months and were baited with commercial tuna. During the survey, we recorded over 40 independent "capture" events of kodkods, including a melanistic individual (Fig. 2), mostly at night (Guerisoli et al. 2022). We also recorded the vulnerable pudu (*Pudu puda* - one of the smallest deer species in the world), the puma (*Puma concolor*), the



Andean fox (*Lycalopex culpaeus*), and the introduced American mink (*Neogale vison*), among other species. Although we already presented partial findings at scientific meetings (Guerisoli et al. 2022, Bonaglia et al. 2023, Buffa et al. 2022), we are still running camera trapping surveys and conducting data entry for data collected during the last sampling period completed in November 2023. We aim to increase the geographic coverage of the project in the near future.

Figure 1. Location of Los Alerces National Park in the Argentinean Patagonia. In dark grey: National Park *sensu scricto*; in light grey: National Reserve; in white: main water bodies.



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Figure 2. Melanic individual (A) and non-melanic (B) individual of *Leopardus guignas* in Los Alerces National Park.

For our second objective, we completed virtual structured interviews within local communities. We also released an online interview to collect information on local knowledge of fauna from northwestern Chubut province. We asked people to answer questions about multiple species present in the area, and particularly if they were familiar with the kodkod. We retrieved 212 responses, of which 40% identified the kodkod as a member of the local fauna. In contrast, almost 90% identified the introduced wild boar (*Sus scrofa*) as part of the local fauna. Interestingly, when asked if they were familiar with the kodkod, 50% answered "yes". Yet, when asked what kind of animal a kodkod is, 66% answered "cat", whereas 29% answered "bird", and nearly 2% said "lizard". Of the 50% of people that claimed to know the kodkod, only 52% correctly identified it from pictures, whereas ~30% confused it with the Geoffroy's cat (*Leopardus geoffroyi*) (Guerisoli et al. 2022).

For the third objective, we published a graphic novel, "*Piedra libre huiñita*" (Bulzomi and Negri, 2022). This book tells the story of a young girl and boy who are camping in Los Alerces National Park. One morning, they play hide and seek with several species that inhabit this protected area. They found a kodkod and describe the difference between this species, the domestic cat, and another small felid species that also occurs in the area: the Geoffroy's cat. As they continued talking, they discuss the main threats to kodkod across its distribution. The online version can be found at: *https://www.researchgate.net/ publication/363184969_Piedra_libre_huinita*. We have also created an online (PDF format) version and printed 50 copies that we distributed to the main educational centers of the study area (Fig. 3). Our next step is to translate the graphic novel into English and print more copies.

Our project experiences challenges given the elusive nature of the kodkod, the remoteness and relative lack of accessibility into the study area (*i.e.*, it cannot be performed without Administración de Parques Nacionales [APN]), and the calamitous economic situation unfolding in Argentina as science (e.g., CONICET, APN) is being "defunded" by the present government administration (Lambertucci et al. 2023). Nonetheless, we are satisfied with results we have obtained thus far and our ongoing sampling and analyses. We are also thrilled to have obtained not only hard scientific data about an enigmatic species in Argentina, but to have worked together with school institutions to increase knowledge of the local people about the native fauna. We embrace our profession remembering the Argentinean Nobel Prize winner Bernardo Houssay, "*Science is not expensive, ignorance is*".



Figure 3. Presentation of the book "Piedra libre huiñita" with the education institutions in Esquel, Chubut Province.

Use of a highway underpass by cougars in the urban landscape

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Connectivity between habitat patches is important for wildlife, particularly large carnivores that have expansive home ranges. The City of Calgary in Alberta, Canada has been working to manage urban growth while also considering wild-life movement. Therefore, the Municipal Development Plan included an ecological network by identifying core and stepping stone habitat vital for connectivity between the city and neighbouring natural jurisdictions, which is a big, actionable step for urban biodiversity. Bridges were constructed on highways to provide safer movement for wildlife and allow for connectivity between city parks and neighbouring jurisdictions. Furthermore, in 2022 construction including fencing was used to direct wildlife to the underpasses since vegetation growth is still minimal and cannot be used as a natural funnel.

Calgary Connect, managed by the Miistakis Institute, is a long-term wildlife monitoring project working to identify and secure corridors in and beyond the borders of the city, to better understand movement of mammals underneath high volume roads. To assess if species are using wildlife underpasses and to monitor changes over time, cameras have been set up since 2020 in three locations. Two of these locations are under a new 8-10 lane highway (Fig. 1). The third location is under a 6 lane, long established highway.

Monitoring of the corridor during and immediately after construction from 2018-2021, showed a variety of species using the corridor including whitetailed deer (*Odocoileus virginanus*), coyotes (*Canis latrans*), and moose (*Alces alces*). Cougars (*Puma concolor*) were present in the buffer zone around the underpass (Fig. 2) but did not cross until 2023, where we were thrilled to photo-capture two cougars using the underpass to cross (Fig 3)! Since then, cougars have been documented through image or tracks on multiple occasions between December 2023 and February 2024 in three parks that are still connected to more natural landscapes outside of the City.

The current road mitigation allows access to previously used habitat in these city parks that otherwise would have been cut off by the large roadway. With increasing development and fragmentation on the fringes of the city, the use of the underpass to move between natural areas by cougars is a positive sign for the cat's ability to adapt to an ever-changing landscape. Calgary Connect will continue to monitor for at least another year.

To learn more, visit www.rockies.ca.



Figure 1. Green lines show the Stoney Trail underpass location under a 8-10 lane highway connecting Weaselhead Natural Environment Park with Tsuut'ina First Nation land.



Figure 2. Cougar tracks seen January 2024 under highway underpass in Calgary, Alberta, Canada.



Figure 3. Remote camera photo-captures a single cougar caught in Weaselhead Natural Environment Park after using underpass (left) and pair of cougars (right) along the Elbow River in 2023, three years after remote cameras were initially installed at underpasses in 2020.