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First predation record of the Galapagos Hawk *Buteo galapagoensis* (Accipitriformes: Accipitridae), on a feral cat *Felis catus* (Carnivora: Felidae)

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Primer registro de depredación del gavilán de Galápagos *Buteo galapagoensis* (Accipitriformes: Accipitridae), sobre un gato feral *Felis catus* (Carnivora: Felidae)

Abstract

The Galapagos Hawk *Buteo galapagoensis* is the top predator of the archipelago, feeding on a wide variety of species from different taxonomic groups, ranging from insects to carrion. We report the first recorded instance of predation by a Galapagos Hawk on a feral cat *Felis catus*, as camera trap bycatch, on Wolf Volcano, Isabela Island. This report adds to the extensive list of the hawk's dietary items and may have ecological implications, such as the role of introduced species in food webs, the role of native predators in controlling invasive species, and how these interactions play out on islands, leaving many open questions.

Keywords: Galapagos Islands, introduced species, food webs, top predator, camera traps, invasive species, Accipitridae, raptor, Isabela Island, Wolf Volcano

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Resumen

El gavilán de Galápagos *Buteo galapagoensis* es el depredador tope del archipiélago, alimentándose de una gran cantidad de especies de varios grupos taxonómicos, desde insectos hasta carroña. Reportamos el primer evento de depredación de un gavilán de Galápagos sobre un gato feral *Felis catus*, como captura incidental de un proyecto de cámaras trampa, en el Volcán Wolf, isla Isabela. El reporte contribuye a una gran lista de ítems de dieta del gavilán, y puede tener implicaciones ecológicas como el rol de especies introducidas en cadenas tróficas, el rol de depredadores nativos en el control de especies invasoras, y cómo estas interacciones se dan en islas, dejando muchas preguntas abiertas.

Palabras clave: Islas Galápagos, especies introducidas, cadenas tróficas, depredador tope, cámaras trampa, especies invasoras, Accipitridae, rapaz, isla Isabela, Volcán Wolf

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The Galapagos Hawk *Buteo galapagoensis* is the only native bird of prey of the Galapagos Islands. It is a diurnal, top predator with breeding populations currently found on eight islands, including Española, Santa Fe, Pinzon, Santiago, Isabela, Fernandina, Marchena, and Pinta; it was extirpated from the islands of Santa Cruz, San Cristobal, Floreana, and Baltra mainly because of hunting pressure, habitat changes, and food scarcity attributed to introduced species [1,2,3,4,5]. It is a social species, forming polyandric groups and actively defending territory, which is usually dry, open ecosystems close to shore, but also reaching Galapagos' highest points, such as Wolf Volcano [3,4,6,7].

This island endemic is a broad generalist, known to consume more than 30 different species from diverse groups. Its diet items include native and introduced rodents [1,8], reptiles, and a great array of bird prey. These range from marine birds such as boobies *Sula* spp., gulls *Creagrus furcatus*, petrels *Hydrobates* and *Pterodroma* spp., to the juveniles and chicks of pelicans *Pelecanus occidentalis*, penguins *Spheniscus mendiculus*, and flightless cormorants *Nannopterum harrisi*. Inland bird prey includes Galapagos finches *Geospiza* spp., mockingbirds *Mimus* spp., tyrant flycatchers (family Tyrannidae), and even the Galapagos Short-eared Owl *Asio flammeus galapagoensis* [1,2,9,10,11]. Reptile prey is common and includes marine iguanas *Amblyrhynchus cristatus*, land iguanas *Conolophus* spp., lava lizards *Microlophus* spp., Galapagos racer snakes *Pseudalsophis* spp., and even recently hatched turtles. Its diet also expands to fish, invertebrate prey, and carrion and placentas from many animals including sea lions *Zalophus wollebaeki*. As a very versatile predator, this hawk hunts, eats carrion, and even steals food from other birds [1,12], making it an adaptable opportunistic-generalist that has also found its way around introduced prey items. Its prey preferences change depending on group, habitat occupied, phenology, and seasonality [1].

Feral cats have been a growing problem on the Galapagos Islands, where they compete with native predators and prey upon and decimate populations of many native land species such as rodents, lizards, and birds, as well as marine bird nests and iguana nests [13,14,15]. They pose a significant threat to ecosystems on all islands where they are found. Although various control strategies have been implemented across the archipelago, eradication efforts remain a challenging and ongoing task on many islands, made more difficult given the fact that cats do not have any predators on the islands [16,17]. However, and despite the vast understanding of Galapagos Hawk diet items and predatory behavior, we present the first documented record of an individual hawk predating upon a feral cat *Felis catus*, on Wolf Volcano, Isabela Island, as camera trap bycatch data.

Isabela is the largest island in the Galapagos archipelago, as well as the most volcanically active, formed by six shield volcanoes—five of them active with eruptions recorded in the last 50 years: Wolf, Darwin, Alcedo, Sierra Negra, and Cerro Azul. Ecuador Volcano is the only one not currently active [18]. Its landscape is very diverse, with various ecosystems across its 4,670 km^2, including mangroves, dry shrub forests, humid forests, and barren lava flows [19]. Around 2,000 people inhabit Isabela Island permanently, and many introduced animals such as dogs, cats and rats threaten the local fauna and decimate populations [13,20]. Wolf Volcano in particular (Fig. 1) is located in the north of the island, on the equator. It is special because its northwestern slopes are home to the endemic Galapagos Pink Iguana *Conolophus marthae*, a recently described species considered critically endangered because of its restricted range and threats from invasive species, especially feral cats [21,22,23].

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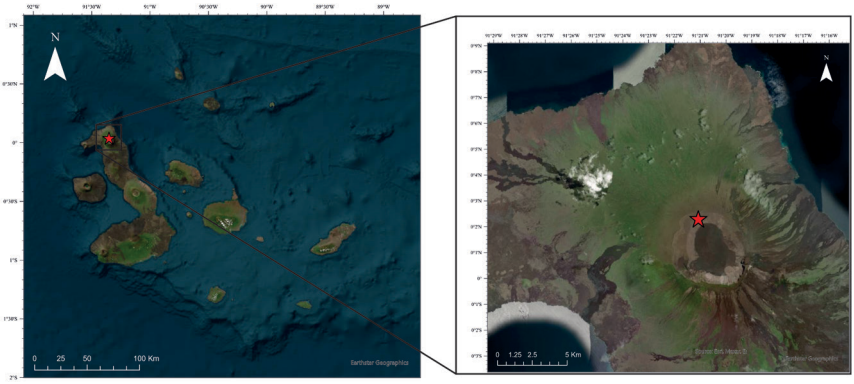

FIGURE 1. Map of the Galapagos Islands, Ecuador, with zoom in to Wolf Volcano, Isabela Island. Red star represents the location where first record of a Galapagos Hawk *Buteo galapagoensis* preying upon a feral cat *Felis catus* was taken by a camera trap.

For conservation purposes and monitoring Galapagos Pink Iguanas, a camera trap project was started in January 2022 with the primary objective of evaluating the actual demographics of the iguanas, identifying possible nesting areas, and determining the existence of active reproduction and recruitment within the population. This project was funded by the non-governmental organization Galápagos Conservancy and carried out in collaboration with the Galapagos National Park Directorate. During the monitoring phase, 53 Reconyx camera traps, model HyperFire 2, were set up in strategic places, covering the iguana's distribution area, on slopes, crests, and inside the volcano crater. Cameras were checked and pictures extracted every 20 days, one of which caught the predation event.

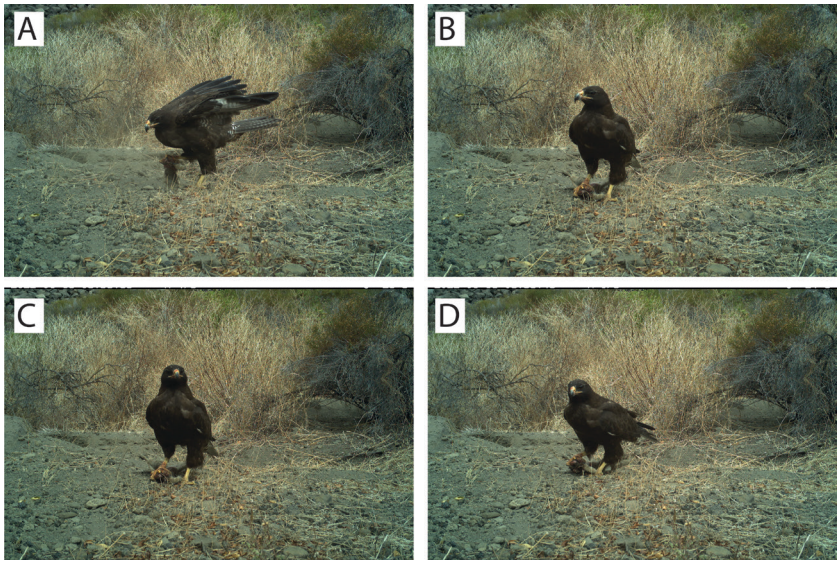

FIGURE 2. First record of a Galapagos Hawk *Buteo galapagoensis* preying upon a feral cat *Felis catus* on Wolf Volcano, Isabela Island, Galapagos, taken by a camera trap as bycatch data.

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On the 18th of January, 2022, a Galapagos Hawk *Buteo galapagoensis* was pictured with a feral cat *Felis catus* in its right claw (Fig. 2). The event occurred at the northern slopes of Wolf Volcano (0°02'18.2"N 91°21'04.3"W), at an altitude of 1,234 m above sea level, on inclined ground. The prey item was identified as a cat based on its size, fur coloration, and the absence of any other similarly sized mammal species on the island. Distinct features such as legs, paws, and thick fur further supported this identification. The cat appears to be a juvenile based on size and is missing its head. The hawk has apparent blood marks on its beak and right claws, suggesting hunting included attacking the head (which is missing from the images). Overall, 10 pictures of the event were taken, where the hawk stands grabbing the cat tightly in its claws. It was the only event of this nature registered.

This record presents the first documented case of *Buteo galapagoensis* preying on a feral cat *Felis catus,* further highlighting the hawk's opportunistic and generalist feeding behavior and adding a previously unrecorded prey item to its extensive dietary repertoire that includes more than six mammalian prey. The availability of introduced prey species can provide important insights into ecosystem dynamics on the Galapagos Islands. Predation on an introduced predator such as a feral cat may have broader implications, potentially indicating a shift in the hawk's diet towards non-native species. However, given the hawk's highly opportunistic and idiosyncratic prey selection [1], this single event does not necessarily indicate a population-wide trend. Regardless, it does contribute to discussions on the ecological impacts of introduced species and their integration into native food webs. On some islands, such as Santiago, black rats have become the primary food source for the hawk following goat eradication [8]. With the addition of feral cats, the number of known introduced prey species in the hawk's diet now increases to five: small goats and goat carrion *Capra capra*, black rats *Rattus rattus*, mice *Mus musculus*, domestic poultry *Gallus* spp. [1,4], and now feral cats *Felis catus*. This opens discussions about the role of introduced species in supporting native predator diets and may present initial insights into the hawk's potential role in the ecological control of invasive cats or others, since the event shows a positive interaction towards the ecosystem, where cats threaten endangered species such as the critically endangered pink iguanas. This event highlights the potential but probably limited role of native predators in mitigating the impacts of invasive species, something that could complement ongoing conservation efforts. However, further research is needed to understand ecosystem resilience and inform cautious, scientific-based conservation strategies, as well as the importance of considering native predator responses in conservation efforts.

The observation raises several important ecological questions: Is the hawk's consumption of introduced species indicative of a dietary shift, or is it driven by the decline of native prey? Does the increasing abundance of invasive species such as feral cats simply raise the chances of such predation events? Is it also possible that such interactions have gone unrecorded due to the lack of monitoring in places where both species coincide? On Santa Cruz, San Cristóbal, and Floreana, hawks were extirpated primarily due to hunting and the depletion of food resources [1,2,5]. Introduced species played a significant role in this decline, as they contributed to the depletion of native food sources [6]. Considering this, while introduced species may now provide an alternative food source for the hawk, suggesting that they benefit them must be approached with caution, given their historical role in ecosystem disruption. While all of these questions remain unresolved, the observation does contribute with valuable insights not only into

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the ecology of *B. galapagoensis*, but also into the broader dynamics of food webs in the Galapagos ecosystem. We highlight the need for further monitoring both cat and hawk populations on the islands. Further research is needed to determine whether events such as this one are isolated or part of a broader, emerging pattern that could influence invasive species management and predator-prey dynamics across the Galapagos.

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AUTHOR CONTRIBUTIONS

Conceptualization: Elias Viteri-Basso (EVB); Data curation: Johannes Ramirez Kastdalen (JRK) and EVB; Formal analysis: EVB and JRK; Funding acquisition: Jorge Carrión-Tacuri (JCT) and JRK; Investigation: EVB; Methodology: JRK and EVB; Resources: JRK and JCT; Visualization: EVB; Writing-original draft: EVB; Writing-review and editing: EVB, JRK, and JCT.

DECLARATION OF GENERATIVE AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

For this work, the author(s) did not use generative or AI-assisted tools in the preparation of the manuscript; therefore, no such use is declared.

DATA AVAILABILITY STATEMENT

No data were used in this study.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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