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New records of jaguar (*Panthera onca*) in Península Papagayo, Guanacaste Conservation Area, Costa Rica

Nuevos registros de jaguar (*Panthera onca*) en Península Papagayo, Área de Conservación Guanacaste, Costa Rica

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While jaguars (*Panthera onca*) are known to inhabit Guanacaste Conservation Area, Costa Rica, there are sectors within the conservation area where the species has not been confirmed. Therefore, herein we document the first jaguar records in Península Papagayo, Guanacaste Conservation Area, Costa Rica. Data was collected from February to August 2022 using non-invasive methods, including camera traps and fecal DNA sampling across the study area. After 6,093 camera trap nights, we identified 2 adult jaguar individuals (male and female). Furthermore, out of 30 fecal samples collected, 4 were identified as jaguar scats. Our findings constitute the first evidence of jaguar presence in Península Papagayo, and to our knowledge, are the southernmost records along the Pacific coast of Guanacaste Conservation Area, Costa Rica.

Key words: Camera-trap; fecal sample; Felidae; mammals; scat detection dog.

Aunque se sabe que los jaguares (*Panthera onca*) habitan en el Área de Conservación Guanacaste, Costa Rica, existen sectores dentro del área donde no se ha confirmado la presencia de la especie. Por lo tanto, en la presente nota documentamos los primeros registros de jaguar en Península Papagayo, Área de Conservación Guanacaste. Entre el periodo comprendido entre febrero y agosto de 2022 se emplearon métodos no invasivos, incluyendo cámaras trampa y extracción de ADN de muestras fecales, para determinar la presencia de la especie en el área de estudio. Después de 6,093 noches de muestreo, se identificaron 2 individuos adultos de jaguar (macho y hembra). Asimismo, de 30 muestras fecales colectadas, 4 fueron identificadas como heces de jaguar. Nuestros hallazgos constituyen la primera evidencia de la presencia del jaguar en Península Papagayo, y a nuestro conocer, constituyen los registros más al sur a lo largo de la costa Pacífica del Área de Conservación Guanacaste, Costa Rica.

Palabras clave: Cámaras trampa; Felidae; mamíferos; muestras fecales; perro detector de heces.

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Photographic evidence has confirmed the presence of jaguars (*Panthera onca*) in Guanacaste Conservation Area, Costa Rica. For example, Artavia (2015) and SINAC (2018) compiled data from existing camera traps studies conducted in Costa Rica, some of which confirm the presence of the species across the conservation area, including protected areas and private land. Further, several authors (Carrillo *et al.* 1994; Alfaro *et al.* 2016; Fonseca et al. 2017, 2020) have described the predator-prey interaction between the jaguar and the sea turtles that nest in the coastal habitat of Santa Rosa National Park, Guanacaste Conservation Area, Costa Rica. Additionally, Yaney-Keller *et al.* (2022) recorded jaguar photographic evidence in Cabuyal, located south of Santa Rosa National Park. Although monitoring efforts have been made, there are sectors within the conservation area where jaguar presence has not been confirmed. Herein, we present the first confirmed records of jaguars in Península Papagayo, Guanacaste Conservation Area, Costa Rica.

Península Papagayo is located on the Northern Pacific coast of Costa Rica (Figure 1a; 10° 37 ' 44.5" N, 85° 40 ' 49.2" W). It encompasses an area of approximately 860 ha and is characterized by an urban development that includes private houses, resorts, golf courses and a marina. The site is surrounded by pristine beaches and remnants of natural forest, including tropical dry forest, riparian forest, and mangroves (Arévalo-Huezo *et al.* 2020).

From February to August 2022, a total of 53 camera traps were set up within the study site according to a 1 x 1 km grid system (Figure 1b). Out of these, 24 were placed randomly (called random camera traps), while the remaining 29 were placed at sites where wild cat tracks or sight-

ings had previously been reported by locals (called selective camera traps). To identify individual jaguars, the images were cross-referenced with a photographic database previously established by researchers working in the Guanacaste Conservation Area. The date, time and geographic coordinates were recorded for each image.

Scats were collected across the entire grid system using a trained scat-detecting dog, skilled in detecting the 6 species of wild cats that inhabit Costa Rica (Figure 1c). For each fecal sample detected, a 2-inch segment was placed in a container with desiccant to dry the sample for storage and transported to the laboratory. The date of collection and geographic coordinates were recorded for each sample. Genetic analysis was conducted in the USDA National Genomics Center for Wildlife and Fish Conservation in Missoula, Montana, United States. DNA was extracted using the QIAGEN Qiamp DNA Stool Mini Kit (Qiagen, Valencia, California) according to the manufacturer's instructions. A region of the mitochondrial genome was amplified using carnivore-specific primers. The resulting sequence was compared against reference sequences in GenBank to confirm the species to which the scats belonged.

After a sampling effort of 6,093 camera trap nights, 3 occurrences of jaguars were recorded at 3 separate locations (Figure 1c). The occurrences correspond to an adult male (May 31, 2022 at 3:30 hr; Figure 2a) and an adult female (July 1, 2022 at 18:04 hr and July 3, 2022 at 22:02 hr; Figure 2b; 2c). It is important to highlight that both individuals have been previously recorded to the north of our study area (Figure 1d), with the first records dating back to December 26, 2011 (male; L. Fonseca pers. comm.) and June 8, 2015 (female; L. Fonseca pers. comm.). Regarding movement patterns, the linear distance between photographic records (including current and historical detections) ranged from approximately 14.95 km (in Naranjo Beach; L. Fonseca pers. comm.) to 32.92 km (Coloradas Beach; L. Fonseca pers. comm.) for the male individual. As for the female, the distance ranged from 2.62 km (in Cabuyal Beach; Yaney-Keller *et al.* 2022) to 18.16 km (in Nancite Beach; L. Fonseca pers. comm.).

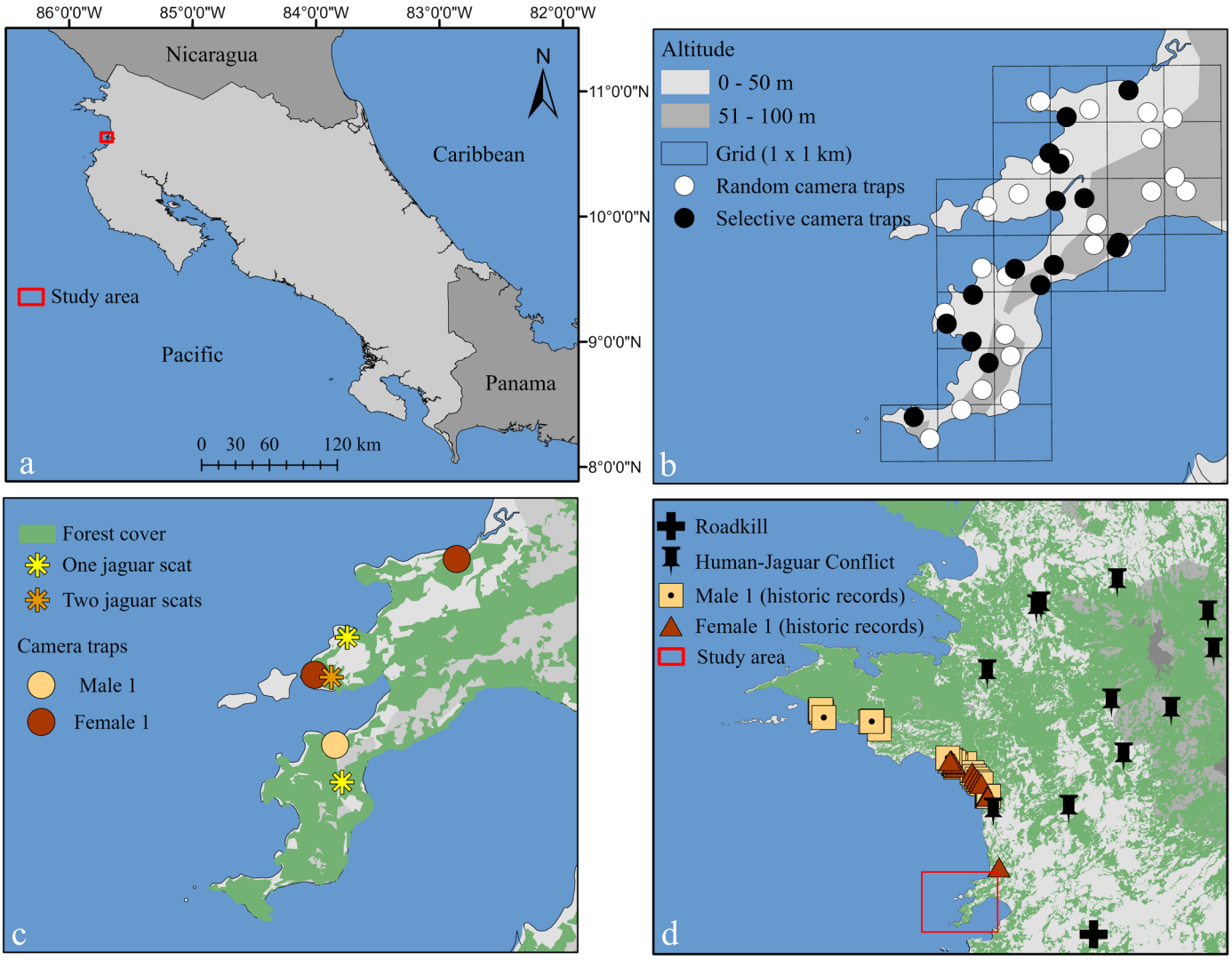

Figure 1. Maps showing a) the study site location of Península Papagayo, Guanacaste Conservation Area, Costa Rica; b) the location of camera traps grid; c) current jaguar records; d) historic jaguar records obtained in the surroundings of the study area.

A total of 93 km of trails were walked across the study site by the scat-detecting dog and 30 samples were collected (detection rate of 0.24 samples/km). Four of the samples were identified as jaguar scats (which were collected at 3 different locations; Figure 1c), while 6 were identified as puma (*Puma concolor*). However, the molecular identification of the remaining samples failed due to DNA degradation, possibly caused by environmental conditions such as high temperature and humidity.

The scarcity of historical evidence of jaguars in Península Papagayo can be attributed to several factors, one of which is the inherent characteristics of the species. Jaguars tend to be solitary and have large home ranges as well as low population densities (Sanderson *et al.* 2002; Silver *et al.* 2004), making them difficult to study. In addition to this, the few studies conducted in Península Papagayo (Artavia 2015; SINAC 2018; Arévalo-Huezo *et al.* 2020) could also contribute to the lack of jaguar records, rather than the species being absent.

The presence of jaguars in Península Papagayo could be attributed to the availability of prey species. Our study recorded 47 species of vertebrates, including the white-tailed deer (*Odocoileus virginianus*) and the collared peccary (*Pecari tajacu*), which are part of the jaguar's diet (Rabinowitz and Nottingham 1986). Further, the landscape characteristics of the area may have allowed both recorded jaguar individuals to travel to and from the study area, along the coastline of Santa Rosa National Park and nearby beaches, where jaguars are known to prey on sea turtles (Fonseca *et al.* 2020). There is additional evidence that the jaguar is using the landscape around the study site. For example, there have been reports of human-jaguar conflicts, including jaguars preying on livestock in nearby communities (Figure 1d; D. Corrales-Gutiérrez pers. comm.). Additionally, an adult female jaguar was reported as roadkill on Route 21 on December 24, 2018 (Figure 1d; Figure 2d).

In summary, our findings indicate the presence of jaguars in Península Papagayo. However, these findings have raised important questions, such as: 1) Is the presence of jaguars in this area seasonal (*e.g.*, related to the sea turtle nesting season up north) or permanent throughout the year? 2) Does Península Papagayo serve as a habitat patch that facilitates jaguar dispersal throughout the coastal habitat of Guanacaste Conservation Area? Further research into these questions is necessary for the effective management of the species and its habitat in Península Papagayo and Guanacaste Conservation Area.

Figure 2. Photographic records of jaguars recorded in Guanacaste Conservation Area, Costa Rica: a) an adult male (Male 1) and b, c) an adult female (Female 1) recorded with camera traps in Península Papagayo; d) photographic record of an adult female roadkill, photo by L. C. Hernández Júnez.

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Literature cited

Alfaro, L. D., *et al*. 2016. Characterization of attack events on sea turtles (*Chelonia mydas* and *Lepidochelys olivacea*) by jaguar (*Panthera onca*) in Naranjo sector, Santa Rosa National Park, Costa Rica. International Journal of Conservation Science 7:101–108.

Arévalo-Huezo, E., *et al*. 2020. Ruta Nacional 253, Carrillo, Guanacaste, Costa Rica. Informe Sin Publicar. Grupo Vías Amigables con la Vida Silvestre, Panthera-Costa Rica y Península Papagayo. San José, Costa Rica. Available at daraya@panthera.org.

Artavia, A. 2015. Diagnóstico de estudios con cámaras trampa en Costa Rica (1998-mayo 2015). Project MAPCOBIO (SINAC, MINAE and JICA). Heredia, Costa Rica.

Carrillo, E., *et al*. 1994. Depredación de tortuga lora (*Lepidochelys olivacea*) y de tortuga verde (*Chelonia mydas*) por el jaguar (*Panthera onca*). Vida Silvestre Neotropical 3:48–49.

Fonseca, L. G., *et al*. 2017. New records of jaguar predation on sea turtles, Pacific coast, Costa Rica. Cat News 66:36–37.

Fonseca, L. G., *et al*. 2020. Impacts of jaguar predation on nesting sea turtles at Nancite Beach, Santa Rosa National Park, Costa Rica. Herpetological Conservation and Biology 15:547–557.

Rabinowitz, A. R., and B. G. Nottingham. 1986. Ecology and behavior of the jaguar (*Panthera onca*) in Belize, Central America. Journal of Zoology 210:149–159.

Sanderson, E. W., *et al*. 2002. Planning to save a species: The jaguar as a model. Conservation Biology 16:58–72.

Silver, S. C., *et al*. 2004. The use of camera traps for estimating jaguar *Panthera onca* abundance and density using capture/recapture analysis. Oryx 38:148–154.

Sistema Nacional de Áreas de Conservación (SINAC). 2018. Estado de conservación del jaguar (*Panthera onca*) en Costa Rica a través de la integración de datos de registros de la especie y modelaje del hábitat idóneo. Proyecto MAPCOBIO-SINAC-JICA. Santo Domingo de Heredia, Costa Rica.

Yaney-Keller, A., *et al*. 2022. Pattern of vertebrate biodiversity in a tropical dry and mangrove forest matrix. Revista de Biología Tropical 70:668–687.

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