Jaguar Conservation

M.Sc. Guido Saborío-R
guido.saborio@sinac.go.cr
guido.saborio.r@mail.com

https://blog.nationalgeographic.org/2018/03/15/coastal-jaguars/

In this presentation

- Introduction
- Conservation Status
- Interesting facts about jaguar
- Conservation efforts
  - Jaguar Corridor Initiative
  - Conservation Status in Costa Rica
  - UACFel

https://blog.nationalgeographic.org/2018/03/15/coastal-jaguars/

Panthera genus

Panthera onca

Mammalia-Carnivora-Felidae

http://edition.cnn.com/2011/TRAVEL/05/17/jaguar.spotting.belize.matador/index.html

- Origen

It is the only representative of the *Panthera* genus in the American hemisphere

Appears to have entered from Asia through the Beringia strait in the early Pleistocene, after it diverged from its common ancestor at least 1.5 million years ago (*Panthera onca augusta*, which was 15–20% larger)

Fossil jaguars in North America date to the middle Pleistocene

Ruiz-Garcia *et al* 2006

Geographical range

- Historical range: United States to Argentina
- Current range: Mexico to Paraguay-Brazil
  - 9.02 million km²
  - Amazon basin comprises 57% of its total extent occurrence

Conservation Status

- Classify as Near Threatened, due to a suspected 20-25% decline over the past three generations (21 years) in area of occupancy, extent of occurrence, and habitat quality, along with actual or potential levels of exploitation

Conservation Status

- Geographic range
  - **Extant**
  - Argentina; Belize; Bolivia, Plurinational States of; Brazil; Colombia; Costa Rica; Ecuador; French Guiana; Guatemala; Guyana; Honduras; Mexico; Nicaragua; Panama; Paraguay; Peru; Suriname; United States; Venezuela, Bolivarian Republic of
  - **Extinct: El Salvador; Uruguay**
- Population
  - **Low chance of survival:** 12% of its range have low probability of survival.
  - Atlantic Tropical Forest and Cerrado of Brazil; parts of the Chaco in northern Argentina; the Gran Sabana of northern Brazil, Venezuela and Guyana; parts of the coastal dry forest in Venezuela; and the remaining range in **Central America and Mexico**.

Threats

Residential & commercial development

- Housing & urban areas
- Commercial & industrial areas
- Tourism & recreation areas

Agriculture & aquaculture

- Annual & perennial non-timber crops
- Wood & pulp plantations
- Livestock farming & ranching

Energy production & mining

- Oil & gas drilling
- Mining & quarrying

Transportation & service corridors

- Roads & railroads
- Utility & service lines

Biological resource use

- Hunting & trapping terrestrial animals
- Gathering terrestrial plants
- Logging & wood harvesting

Human intrusions & disturbance

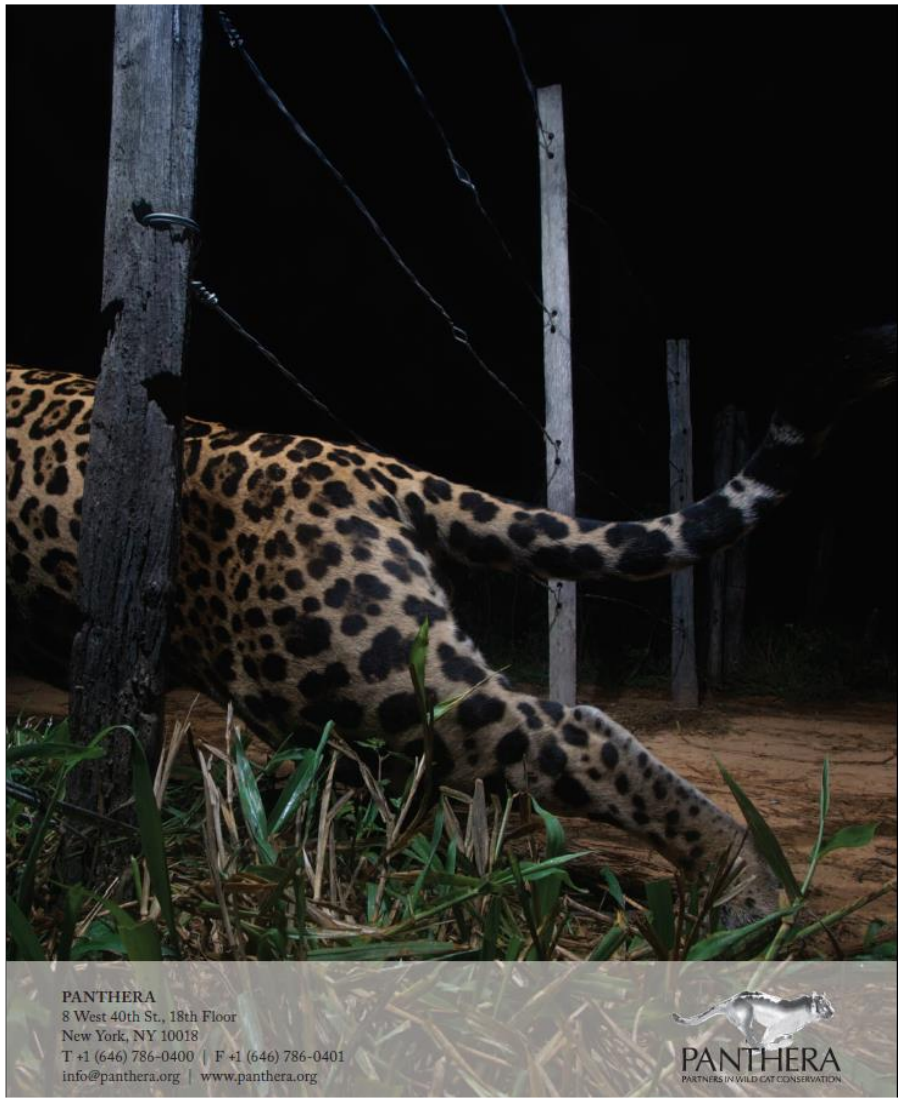
- Recreational activities
- Work & other activities

Natural system modifications

- Fire & fire suppression
- Dams & water management/use
- Other ecosystem modifications

Pollution

- Domestic & urban waste water
- Industrial & military effluents
- Agricultural & forestry effluents



Interesting facts about jaguars

Jaguar *Panthera onca* predation of marine turtles: conflict between flagship species in Tortuguero, Costa Rica

D. Veríssimo, D. A. Jones, R. Chaverri and S. R. Meyer

Abstract Predation can be an important driver of population dynamics but can also pose a dilemma to conservation managers if the species interacting are of conservation concern or have a high public profile. For 5 years we conducted regular transect surveys to monitor the spatial and temporal patterns of predation of adult marine turtles by jaguars *Panthera onca* in Tortuguero National Park, Costa Rica. Predation occurs throughout the study site on Tortuguero Beach although at lower rates at the northern and southern ends, probably because of increased human presence in these areas. There was a marked increase in predation, from an average of <2 turtles predated per survey in the first season to >5 predated per survey in the last, with 676 jaguar-predated marine turtles recorded during the study period. With a minimum of 189 individuals predated in the last season, predation of adult turtles has now reached a magnitude never before recorded in a marine turtle rookery. Although the nesting population of marine turtles in Tortuguero is one of the largest in the world and suffers from both direct and indirect anthropogenic pressures, the increase in predation by jaguars makes this ecological interaction relevant to the management of both the jaguar and marine turtle populations. The situation could lead to a potential conflict in conservation strategies that, given the flagship role of the species involved, will need to be addressed both in the context of species management and conservation marketing.

Keywords Caribbean, *Chelonia mydas*, *Dermochelys coriacea*, diet, green turtle, jaguar, leatherback turtle, marine turtle, *Panthera onca*

Introduction

As biodiversity faces growing anthropogenic pressures conservationists increasingly face conflicts between the management of different species. The resolution of such conflicts often requires making difficult decisions, particularly when the species are of conservation concern and/or have a high media profile (Simberloff, 1998). This is especially true when it comes to predatory interactions (Coonan et al., 2005; Gibson, 2006; Pudyatmoko et al., 2007) that, while involving the death of individuals, are critical in the dynamics of ecosystems (Heithaus et al., 2008).

Marine turtles and jaguars *Panthera onca* are widely recognized as conservation flagship species (Caro et al., 2004; Eckert & Hemphill, 2005) and large-scale projects such as Operation Green Turtle (Bjorndal et al., 1999) and Paseo Pantera (Ceballos et al., 2002) have been developed to conserve them. All marine turtle species occurring around the American continent are threatened with extinction, with the green turtle *Chelonia mydas* categorized as Endangered and leatherback *Dermochelys coriacea* and hawksbill *Eretmochelys imbricata* turtles categorized as Critically Endangered (IUCN, 2011; but see Broderick et al., 2006; Godfrey & Godley, 2008; Seminoff & Shanker, 2008). Although heavily affected by a range of natural predators during their early life stages (Fowler, 1979; Opay, 1998; Engeman et al., 2005) adult marine turtles have only a small number of documented regular predators (see Heithaus et al., 2008, for a review). Together with a lack of available data this has contributed to the assumption that predation has little impact on adult turtles (Heithaus et al., 2008).

Tortuguero National Park in Costa Rica is a globally important area, hosting one of the largest green turtle rookeries (Bjorndal et al., 1999), together with nesting populations of leatherback and hawksbill turtles (Troëng et al., 2004, 2005). The Park also contains an unknown number of jaguars. Although categorized globally as Near Threatened (Caso et al., 2008) jaguar populations in Costa Rica are considered to be highly threatened (Sanderson et al., 2002; Salom-Pérez et al., 2007). Despite the absence of a current estimate of the population Tortuguero National Park and the adjoining Barra del Colorado Wildlife Refuge were identified in an expert consultation as a priority Jaguar Conservation Unit, considered critical for the long-term survival of the species (Zeller, 2007).

Information on jaguar predation of marine turtles is sparse and anecdotal, with published records from Suriname (Autar, 1994) and Costa Rica (Carrillo et al., 1994; Chinchilla, 1997; Troëng, 2000; Salom-Pérez, 2005). Nevertheless, this ecological interaction is also reported to occur in French Guiana (J. Chevalier, pers. comm., in Troëng, 2000) and Guyana (R. de Freitas, pers. comm.). In

D. Veríssimo* (Corresponding author), D.A. Jones, R. Chaverri and S.R. Meyer
Global Vision International Costa Rica, 3rd floor, The Senate, Exeter, EX1 1UG, UK. E-mail dv38@kent.ac.uk

*Also at: Durrell Institute of Conservation and Ecology, University of Kent, Canterbury, UK

Received 23 April 2011. Revision requested 8 June 2011.
Accepted 24 August 2011.

G Model
MAMBIO-40399; No. of Pages 5
ARTICLE IN PRESS

Mammalian Biology xxx (2010) xxx–xxx

Contents lists available at ScienceDirect

Mammalian Biology

journal homepage: www.elsevier.de/mambio

Original Investigation

Jaguar and puma activity patterns in relation to their main prey

Bart J. Harmsen[a,b,c,*,1], Rebecca J. Foster[a,c], Scott C. Silver[d], Linde E.T. Ostro[d], C.P. Doncaster[c]

[a] Panthera, 8 W 40th Street, 18th Fl., New York, NY 10018, USA
[b] Environmental Research Institute, Natural Resource Management, University of Belize, University Drive, P.O. Box 340, Belmopan, Belize
[c] School of Biological Sciences, University of Southampton, Bassett Crescent East, Southampton SO16 7PX, United Kingdom
[d] Wildlife Conservation Society, 2300 Southern Boulevard, Bronx, NY 10460, USA

ARTICLE INFO

Article history:
Received 22 February 2010
Accepted 29 August 2010

Keywords:
Armadillos
Camera trapping
Moon phase
Pacas
Predator
Panthera onca
Prey
Puma concolor

ABSTRACT

Activity patterns of top predators are adapted for efficient predation, whereas their prey must contend with the conflicting demands of acquiring resources and avoiding predators. Here we analyse the activity of jaguars (*Panthera onca*) and pumas (*Puma concolor*) in relation to their most important prey species, armadillos (*Dasypus novemcinctus*) and pacas (*Agouti paca*) respectively, in the Cockscomb Basin Wildlife Sanctuary, Belize using large-scale camera-trap data. Jaguars and pumas have similar 24 h activity patterns as armadillos and pacas, both burrow-dwelling species, and negligible overlap with less frequently consumed prey species such as red brocket deer (*Mazama americana*) and peccaries. Activity of armadillos and pacas varied with moon phase, with reduced activity during periods of brighter illumination, perhaps as a predator-avoidance strategy. Across the study area, moon phase had no overall influence on jaguar and puma activity; however at locations associated with armadillos, jaguar activity declined with brighter illumination, perhaps indicating a shift to alternative prey during full moon when armadillos avoided foraging above ground. No such relationship was found for pumas and moon phase at locations associated with pacas.

Introduction

Predator-prey dynamics are regulated by predator hunting ability, and the predator-avoidance strategies of their prey. Predators can maximise the pay-off for hunting by doing so when prey are most vulnerable to attack. For example, non-burrowing carnivores hunt burrowing species when they feed above ground, whereas burrowing carnivores specialise in hunting burrowing species when they are below ground (Fedriana et al., 1999). The activity patterns of the predators coincide with periods when the prey are most vulnerable. Conversely, prey species may change their daily activity patterns to avoid predation (e.g. Eccard et al., 2008; Gliwicz and Dabrowski, 2008). Opportunistic wide-ranging predators, whose geographic ranges encompass multiple prey species, locally adapt their activity patterns to those of the prey. For example, the leopard (*Panthera pardus*) is nocturnal across most of its African savannah range but is mainly diurnal in West African rainforest areas in accordance with the activity patterns of prey (Jenny and Zuberbuhler, 2005).

Cats hunt primarily by auditory and visual cues (Kitchener, 1991; Sunquist and Sunquist, 2002) therefore they are more likely to detect and hunt actively foraging animals than inactive animals. Night-time illumination varies through the cycle of moon phases, with a fuller moon increasing visibility for cats and the vulnerability of their prey. Some rodent species are known to alter their activity patterns in relation to moon phase, trading foraging efficiency for lowered susceptibility to predation on bright nights (Lockard and Owings, 1974; Emmons et al., 1989; Wolfe and Summerlin, 1989; Daly et al., 1992; Kotler et al., 2004). Our study compares the activity patterns of jaguars (*Panthera onca*) and pumas (*Puma concolor*), two similar-sized sympatric cats, with their mammalian prey, in Belize, Central America by analysing data derived from one of the largest camera-trap studies conducted in the Neotropics.

Jaguars and pumas have low dietary overlap in Belize. Foster et al. (2010) found that they both mainly eat medium-sized (5–10 kg) burrow-dwelling mammals: jaguars favouring armadillos (*Dasypus novemcinctus*, 50% relative occurrence, 50% biomass), and pumas favouring pacas (*Agouti paca*, 60% relative occurrence, 50% biomass). Although jaguars also ate pacas and pumas ate armadillos, they were taken at low levels (5% and 7% respectively). In other areas of Mesoamerica wild ungulates are often major prey species of jaguars and pumas (Aranda and Sanchez-Cordero, 1996; Núñez et al., 2000; Scognamillo et al., 2003). Large ungulate species occur in Belize (tapir; *Tapirus bairdii*, white-lipped peccary; *Tayassu*

* Corresponding author at: School of Biological Sciences, University of Southampton, Bassett Crescent East, Southampton SO16 7PX, United Kingdom.
Tel.: +44 501 663 1505; fax: +44 501 822 1523.
E-mail addresses: bharmsen@panthera.org, bartjh@soton.ac.uk (B.J. Harmsen).
[1] Field address: PO Box 77, Dangriga, Belize.

1616-5047/$ – see front matter © 2010 Published by Elsevier GmbH on behalf of Deutsche Gesellschaft für Säugetierkunde.
doi:10.1016/j.mambio.2010.08.007

Please cite this article in press as: Harmsen, B.J., et al., Jaguar and puma activity patterns in relation to their main prey. Mammal. Biol. (2010), doi:10.1016/j.mambio.2010.08.007

Tortuguero National Park

Jaguar *Panthera onca* predation of marine turtles: conflict between flagship species in Tortuguero, Costa Rica

D . VE R Í S S I M O, D. A. JO N E S, R. CH AV E R R I and S . R . ME Y E R. 2012 Fauna & Flora International, Oryx, Page 1 of 8

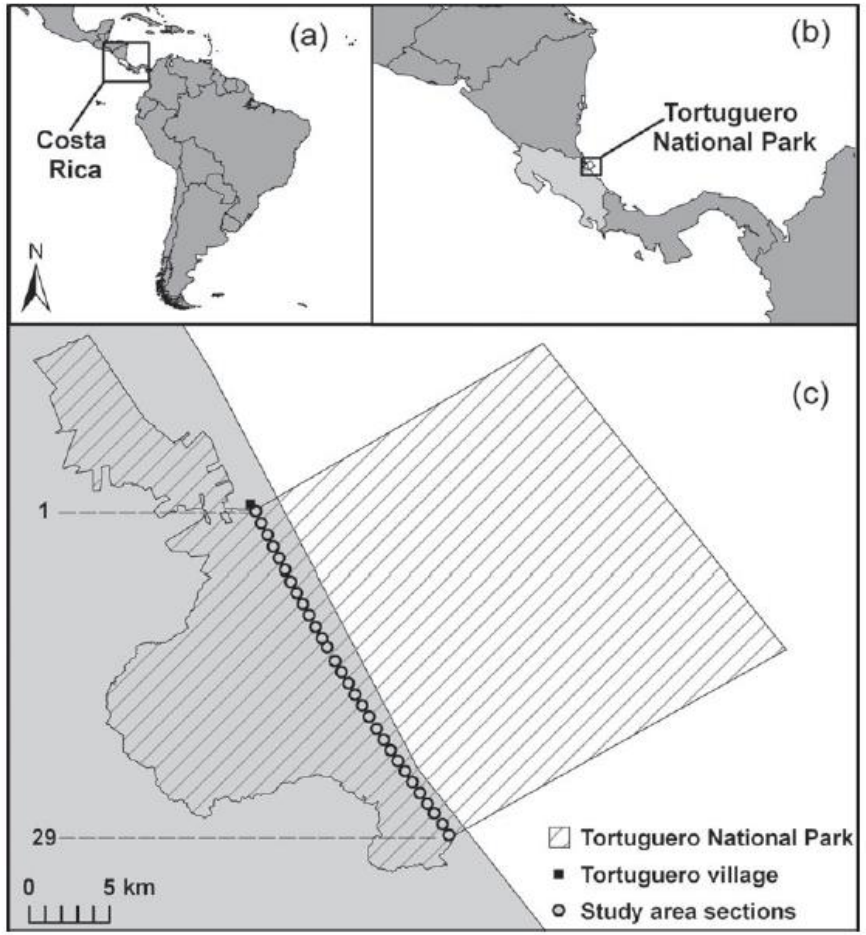


FIG. 1 (a) Costa Rica, (b) the location of Tortuguero National Park on the north Caribbean coast, and (c) the 30 numbered study sections (see text for details) on Tortuguero Beach.

- **Data collection took place over 176 surveys from July 2005 to June 2010**.
- Surveys were conducted on foot at c. 3–4 km h−1 along the length of the study area, once per week during each of the quarterly 9-week research periods per year.
- Field teams of 4–6 researchers started at dawn, covering the width of the beach from the tide line to the vegetation to maximize detection.
- The teams recorded presence/absence of jaguars (i.e. tracks or scats) and marine turtle tracks for each 805-m section of the study area. In both cases only fresh tracks that retained sufficient definition to be measured, and therefore could be identified accurately, were counted.

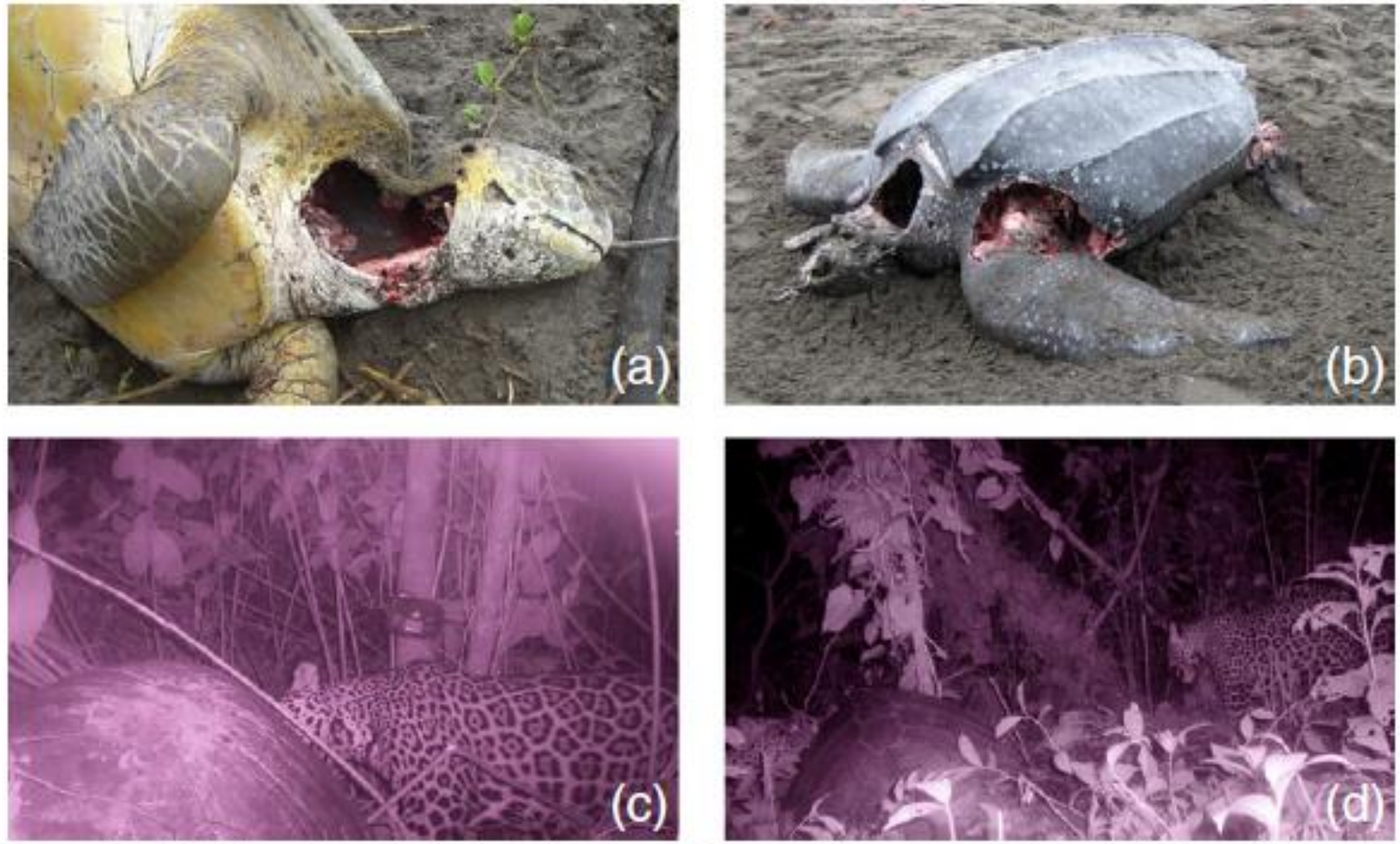


PLATE 1 (a) Green turtle *Chelonia mydas* and (b) leatherback turtle *Dermochelys coriacea*, with typical signs of jaguar *Panthera onca* predation, and (c, d) camera-trap photographs of jaguars feeding off green turtles. (All photographs GVI Costa Rica).

Results

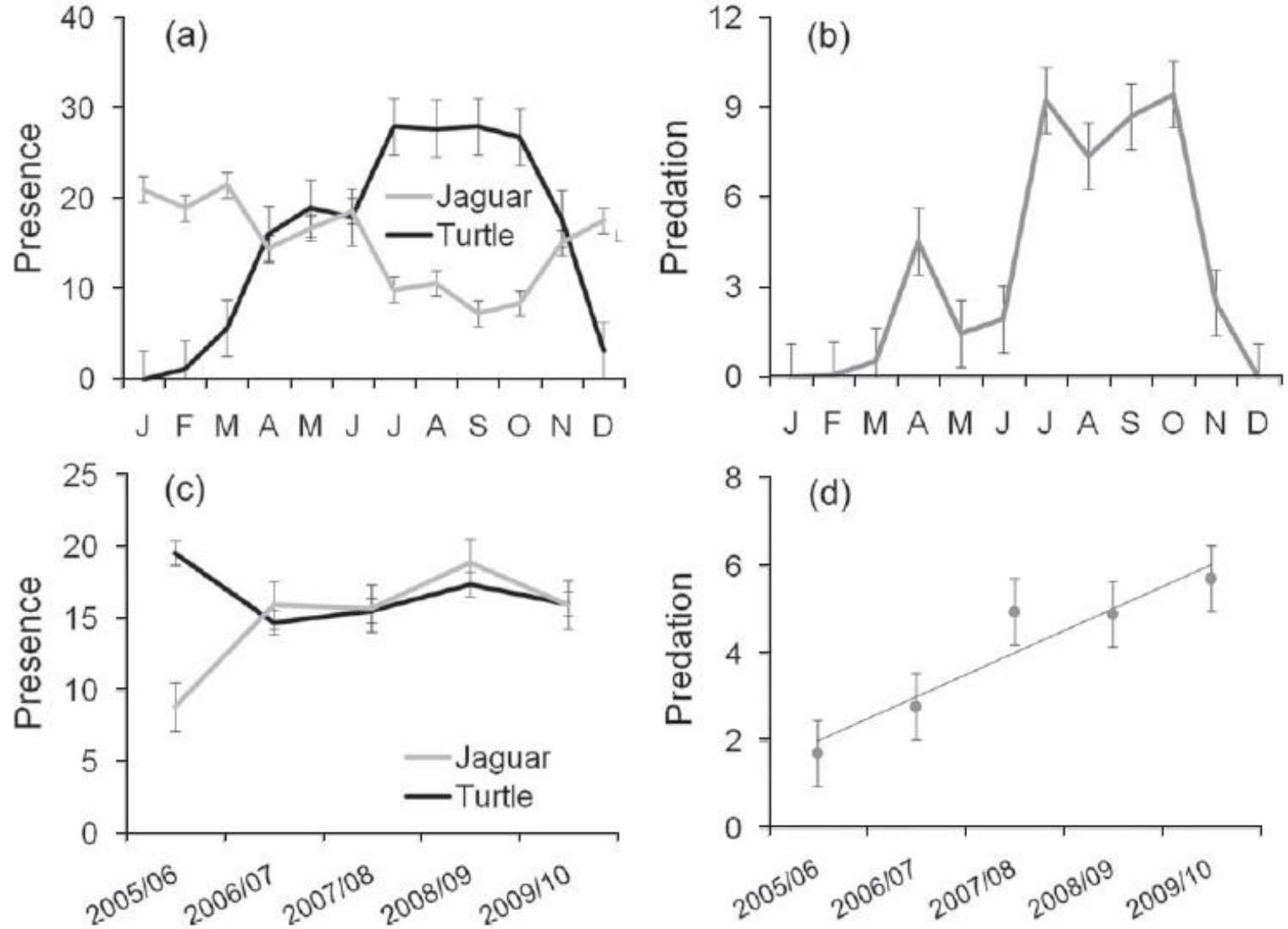


FIG. 2 (a) Mean number ± SE of 805-m (half-mile) sections of Tortuguero Beach (Fig. 1) with signs of jaguar *Panthera onca* and marine turtle presence per month, (b) mean number ± SE of turtles found killed by jaguars per month, from 1 July 2005 to 30 June 2010, (c) mean number ± SE of 805-m sections with signs of jaguar and turtle presence per year, and (d) mean number ± SE of turtles killed by jaguars per year. In (c) and (d) the 12 months are from 1 July to 30 June.

Conclusions

- The responsible authorities in Costa Rica may soon be faced with a management dilemma. On the one hand the predation of Endangered and Critically Endangered species of marine turtles by jaguars is increasing and it is unclear as to the level at which it will stabilize. On the other hand the degree to which marine turtles are of importance in the diet of the Near Threatened jaguar in and around Tortuguero National Park is unknown.
- Improved understanding of these issues will be required for appropriate management of the marine turtles and the jaguar. It has been hypothesized that the increase in turtle predation is driven by destruction and fragmentation of the jaguar's habitat (Troëng, 2000) as a result of human activities around the National Park and in its buffer zone.
- Management of this predator–prey relationship may therefore need to take into consideration not only the terrestrial and marine components of the Park but also areas beyond its borders.

https://blog.nationalgeographic.org/2018/03/15/coastal-jaguars/

Jaguar and puma activity patterns in relation to their main prey

Harmsen, B.J., et al., Jaguar and puma activity patterns in relation to their main prey. Mammal. Biol. (2010), doi:10.1016/j.mambio.2010.08.007

Cockscomb Basin Wildlife Sanctuary (CBWS) in Belize,

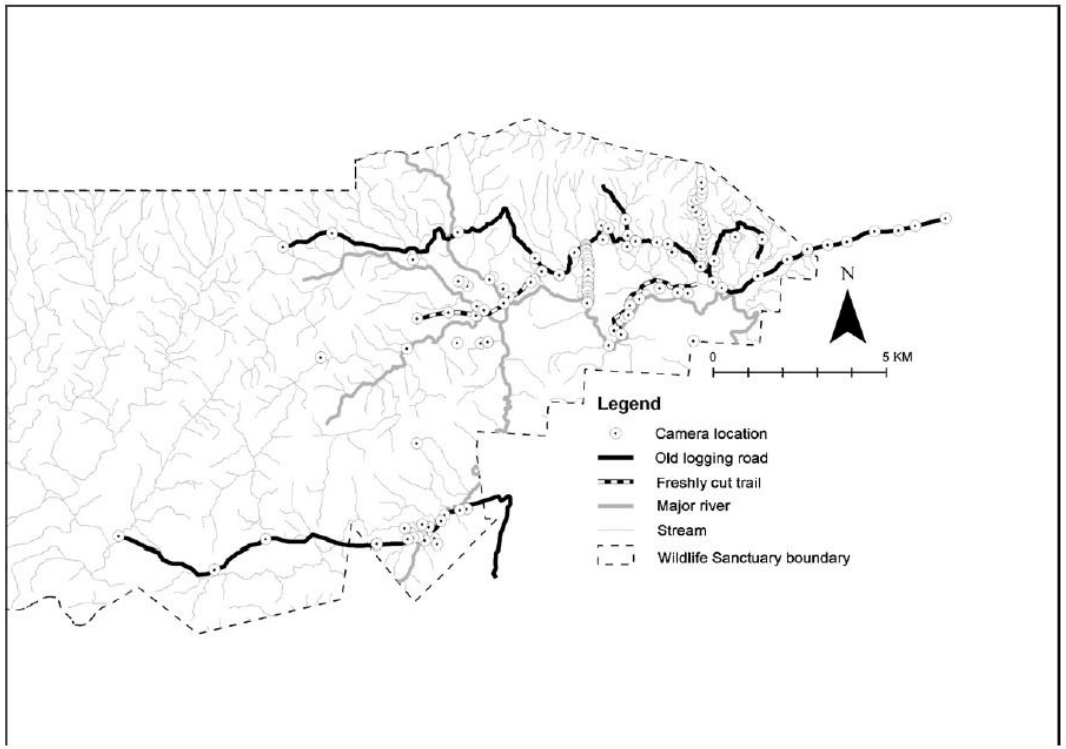


Fig. 1. Location of camera stations in the study area. Trails and waterways are shown.

- A total of 110 camera locations functioned for periods of 2–20 months over 2.5 years. (2003-2005)
- The cameras covered an effective sampling area of 198km2
- Analyses were based on 32 jaguars and at least 9 pumas.

Results

Table 1
Pearson correlations between 24-h activity patterns of jaguars or pumas and prey and control species. Significant correlations ($p < 0.05$) are shown in bold.

Species	Jaguar	Puma
Armadillo (main prey of jaguar)	0.33	0.36
Paca (main prey of puma)	**0.43**	**0.51**
Ocelot (control)	**0.76**	**0.75**
Tapir (control)	**0.64**	**0.65**
Opossum (control)	0.29	**0.52**
Brocket deer (prey)	−0.30	−0.32
Collared peccary (prey)	**−0.69**	**−0.61**
White-lipped peccary (prey)	−0.36	**−0.50**

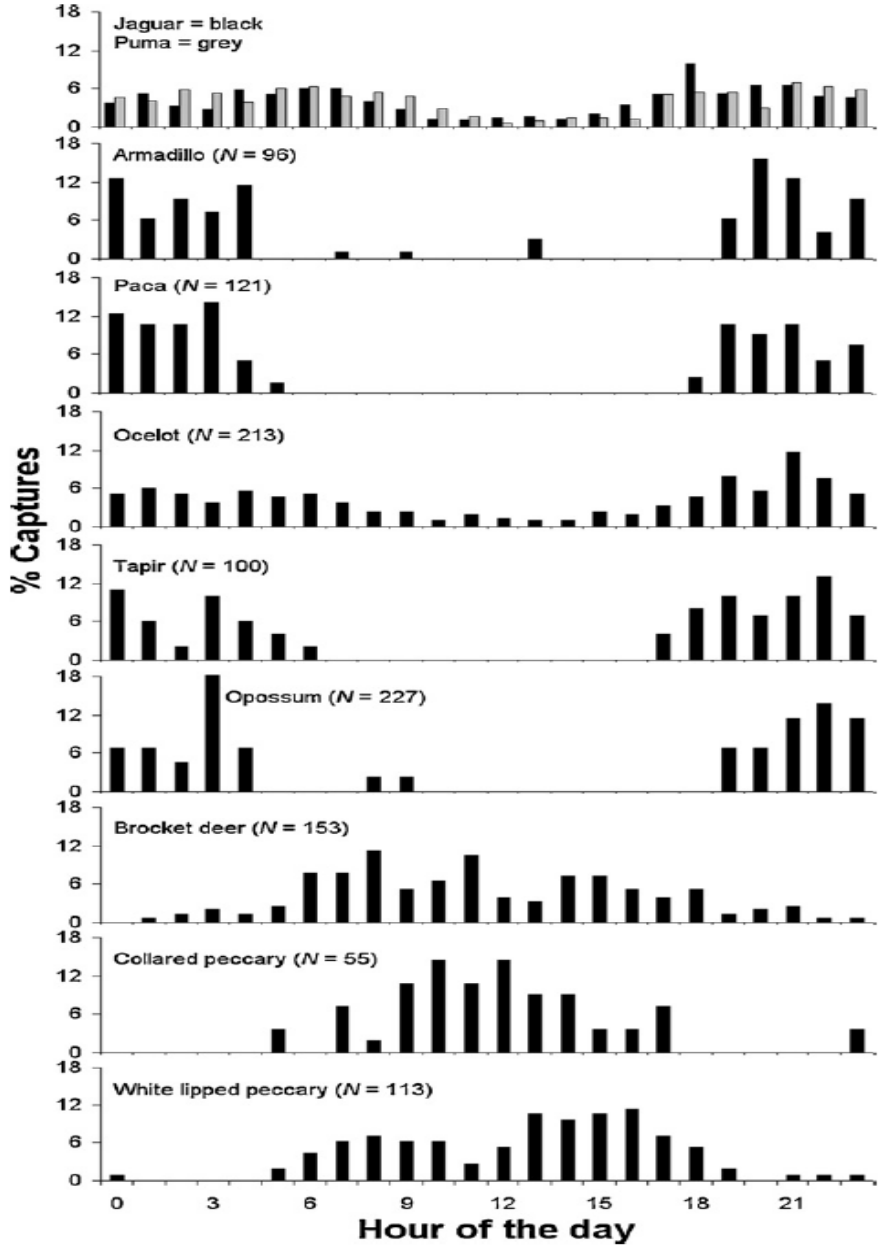


Fig. 2. Activity patterns of jaguar, puma, prey species and control species (*N* = number of captures).

Jaguar (*Panthera onca*) feeding ecology: distribution of predator and prey through time and space

M. Weckel1, W. Giuliano2 & S. Silver3

Journal of Zoology **270** (2006) 25–30 c 2006

Table 1 Jaguar *Panthera onca* prey use, availability and selection, Cockscomb Basin Wildlife Sanctuary, Belize, 1 June–24 November 2002

Species	Prey use[a]	Prey available[b]	EI[c]
Nine-banded armadillo *Dasypus novemcinctus*	33.3	27.2	0.10
Collared peccary *Tayassu tajacu*	23.3	9.5	0.42
Paca *Agouti paca*	23.3	20.3	0.07
Red brocket deer *Mazama americana*	6.7	9.9	−0.19
White-lipped peccary *Tayassu pecari*	3.3	7.3	−0.38
Coatimundi *Nasua narica*	3.3	3.4	−0.01
Kinkajou *Potos flavus*	3.3	NA	NA
Baird's tapir *Tapirus bairdi*	0	9.9	−1.00
Common opossum *Didelphis marsupialis*	0	5.6	−1.00
Agouti *Dasyprocta punctata*	0	2.6	−1.00
Striped hog-nosed skunk *Conepatus semistriatus*	0	0.4	−1.00
Bird spp.[d]	0	3.4	−1.00
Raccoon *Procyon* sp.	0	0.4	−1.00
Reptile sp.	0	NA	NA
Unidentified mammal	3.3	NA	NA

[a]Diet constructed from 23 scats collected from Guam Bank simultaneously to the camera survey expressed as frequency of occurrence (Weckel, 2005).

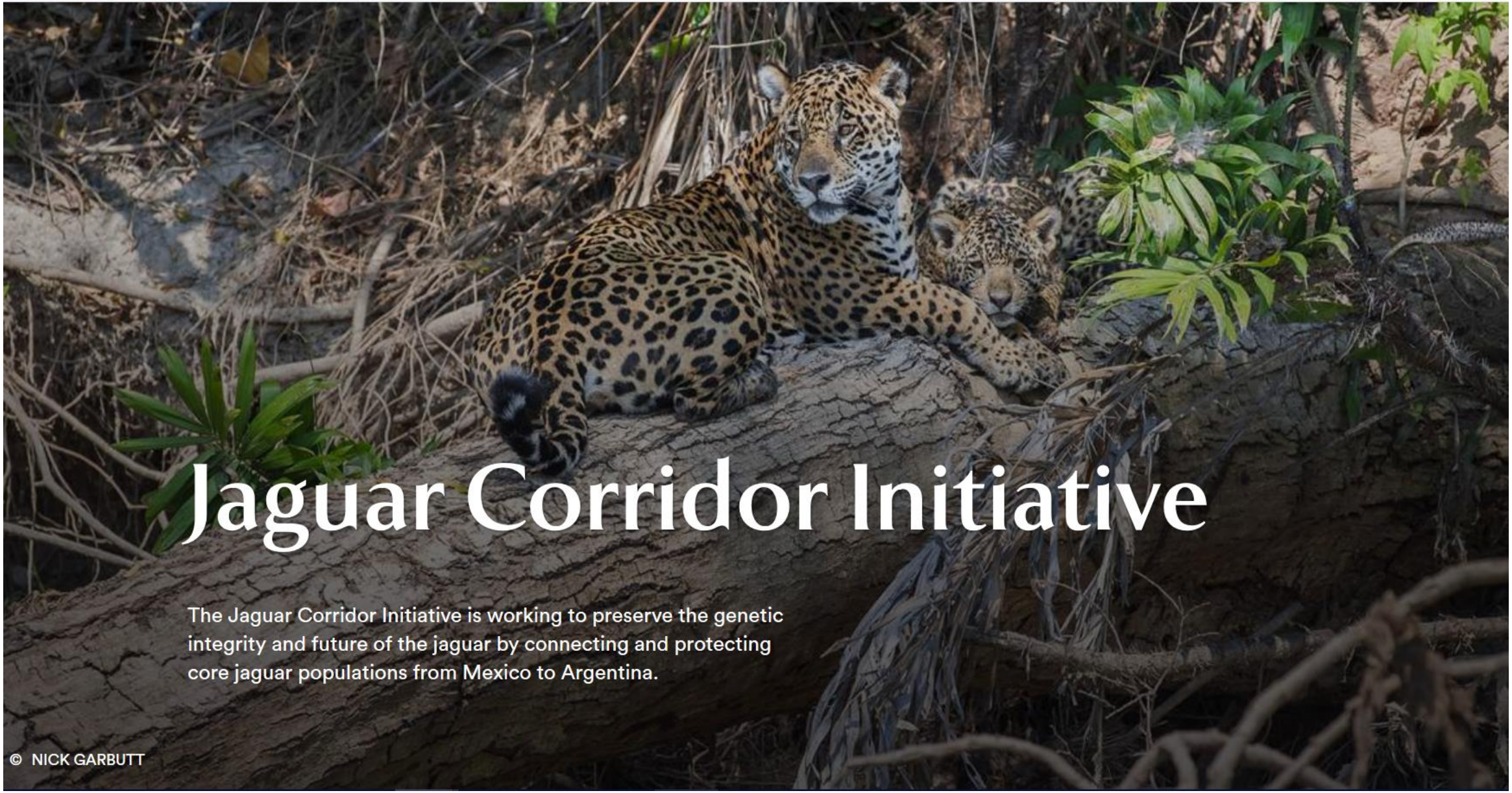
[b]Species-specific photographic capture rates are expressed as the number of captures per 100 trap nights.

[c]EI, Ivlev's electivity index (Ivlev, 1961) where values range from −1 (complete avoidance) to +1 (complete preference) and was used to examine prey selection.

[d]Birds include *Crypturellus boucardi*, *Crypturellus souri*, *Tinamus major* and *Crax rubra*.

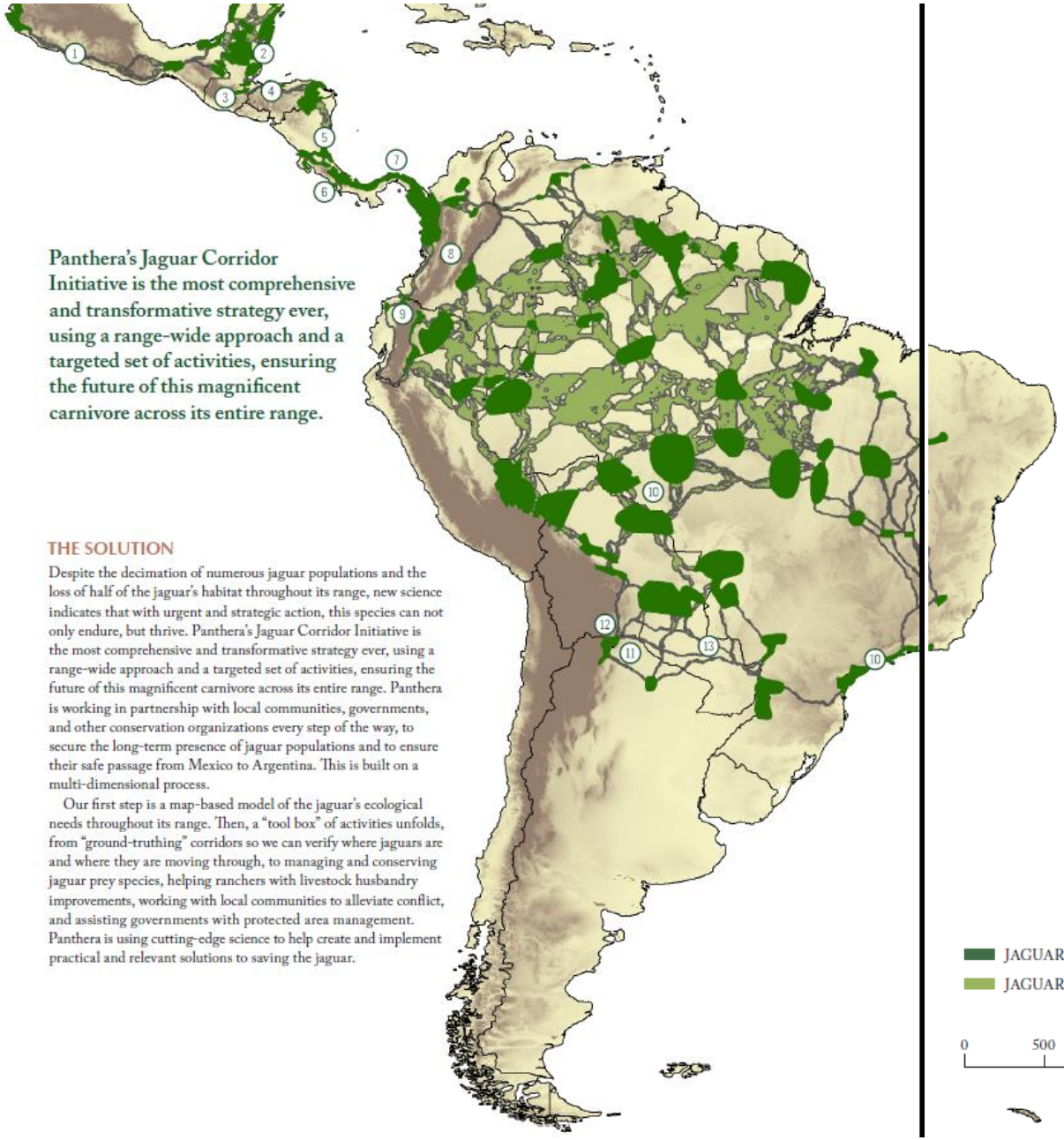
Conservation efforts!

https://www.ticoharoutiounian.com/index/G0000iaPeA9FSHeo



https://www.panthera.org/initiative/jaguar-corridor-initiative


© ANDY ROUSE
PANTHERA.ORG
Meet the Cats
Get to know the tiger →
Menu
Donate
Tiger
Endangered
Lion
Vulnerable
Jaguar
Near Threatened
Snow Leopard
Vulnerable
Leopard
Vulnerable
Puma
Least Concern
Cheetah
Vulnerable



Panthera's Jaguar Corridor Initiative is the most comprehensive and transformative strategy ever, using a range-wide approach and a targeted set of activities, ensuring the future of this magnificent carnivore across its entire range.

THE SOLUTION

Despite the decimation of numerous jaguar populations and the loss of half of the jaguar's habitat throughout its range, new science indicates that with urgent and strategic action, this species can not only endure, but thrive. Panthera's Jaguar Corridor Initiative is the most comprehensive and transformative strategy ever, using a range-wide approach and a targeted set of activities, ensuring the future of this magnificent carnivore across its entire range. Panthera is working in partnership with local communities, governments, and other conservation organizations every step of the way, to secure the long-term presence of jaguar populations and to ensure their safe passage from Mexico to Argentina. This is built on a multi-dimensional process.

Our first step is a map-based model of the jaguar's ecological needs throughout its range. Then, a "tool box" of activities unfolds, from "ground-truthing" corridors so we can verify where jaguars are and where they are moving through, to managing and conserving jaguar prey species, helping ranchers with livestock husbandry improvements, working with local communities to alleviate conflict, and assisting governments with protected area management. Panthera is using cutting-edge science to help create and implement practical and relevant solutions to saving the jaguar.

PANTHERA S JAGUAR FOOTPRINT

Jaguars exist today in 18 countries; Panthera currently works, through partnerships and grantees, in 13 countries, with plans to move into an additional two countries in the next year.

Some highlights include:

1. **MEXICO** Conducting surveys of jaguars that show they are living outside of protected areas in good numbers. The results have also helped identify some important and understudied areas for jaguars in western Mexico.
2. **BELIZE** With field surveys, landowner assistance, and training, we are identifying and securing the Central Belize Corridor, the critical and only link between the jaguar population in Mexico and Guatemala, and all other jaguar populations south of Belize.
3. **GUATEMALA** "Ground truthing" the Guatemala border with Belize to understand and alleviate impacts of illegal settlements on jaguars and their habitat; and seeking solutions for sustainable resource management, such as controlled xate palm extraction for the international floral industry.
4. **HONDURAS** Hosting meetings with ranchers to help mitigate jaguar conflict. We are also "ground truthing" the western corridor to understand and alleviate impacts of heavy truck traffic from the ports, that could sever a key jaguar corridor link.
5. **NICARAGUA** Completing interviews with local people throughout the remote and unexplored northern corridor to verify jaguar presence; Nicaragua contains expansive tracts of core jaguar habitat, but keeping connections intact will be key to jaguar survival.
6. **COSTA RICA** Providing biodigesters, which convert organic waste into liquid fertilizer and gas, to help mitigate jaguar conflicts with indigenous communities. Maintaining pigs in enclosures protects them from jaguars and provides communities with alternative energy and fertilizer.
7. **PANAMA** Finalizing an agreement with the Panamanian government to work on a national strategy for jaguar conservation and rancher conflict mitigation; we are participating in the development of a country-wide jaguar conservation strategy, and moving toward recognition of the jaguar corridor in 2010.
8. **COLOMBIA** Collaborating with the Ministry of the Environment in re-delineating forest reserves and helping define conservation objectives in key national parks. Our involvement has brought new knowledge about conservation threats and produced fine-scale maps of uncharted areas in the northern part of the country.
9. **ECUADOR** Exploring the potential for jaguar passage from the Pacific coast populations through the Andes and into the Amazon basin; as well as measuring and monitoring the bushmeat market and mitigating road impacts.
10. **BRAZIL** Creating a living model of a productive and economically viable cattle ranch that is compatible with jaguar conservation; and delivering basic health care to the underserved communities living in these areas. We are also surveying the Atlantic coast to determine the boundaries and densities of core jaguar populations.
11. **ARGENTINA** Helping ranchers better manage their livestock to protect them from jaguars.
12. **BOLIVIA** Developing a distribution map for jaguars, and identifying important corridors for them between existing protected areas.
13. **PARAGUAY** Collecting valuable data on livestock depredations to understand the scope of the problem and determine conservation actions; and analyzing genetic data of jaguars from an understudied area.

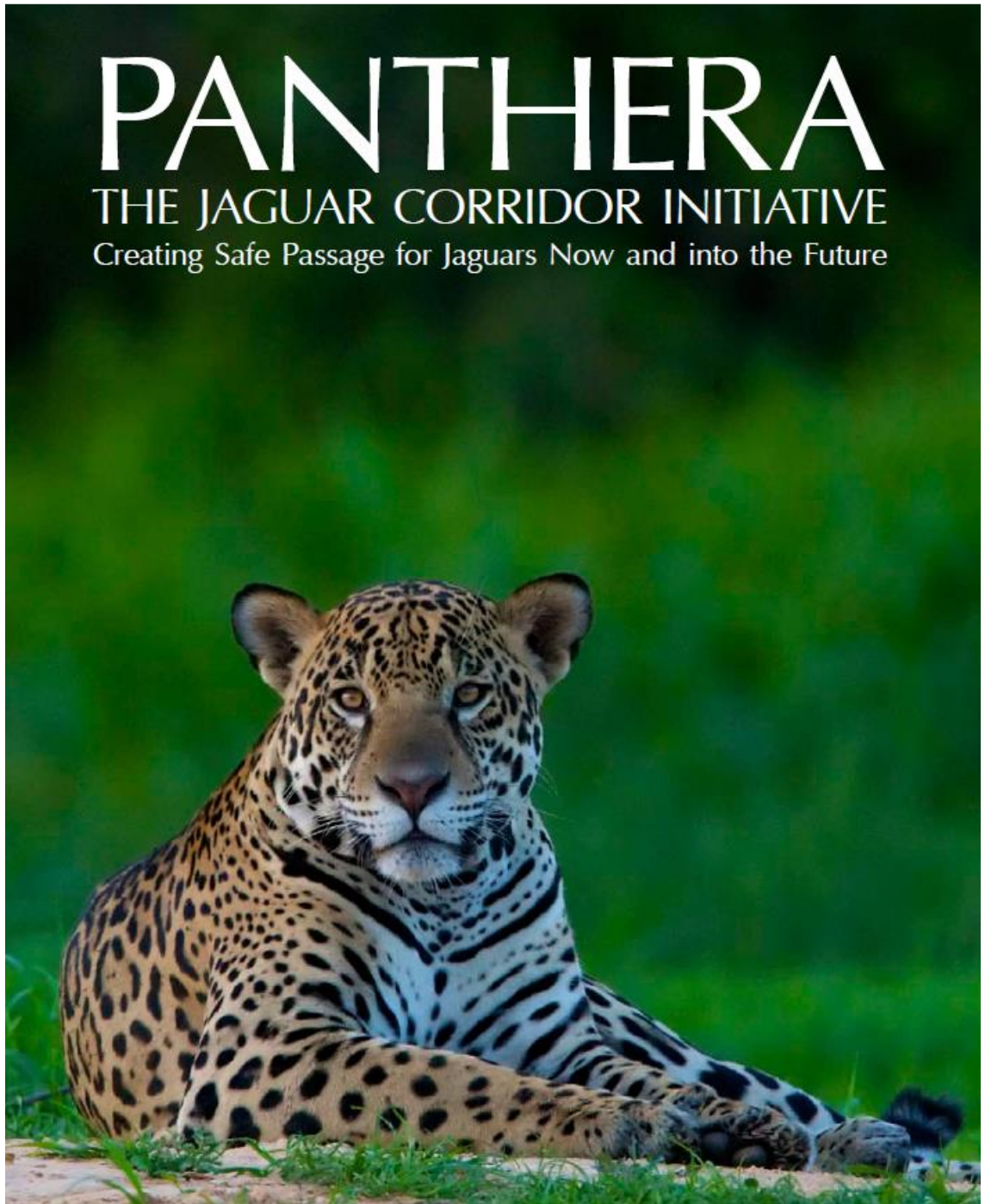
JAGUAR POPULATIONS

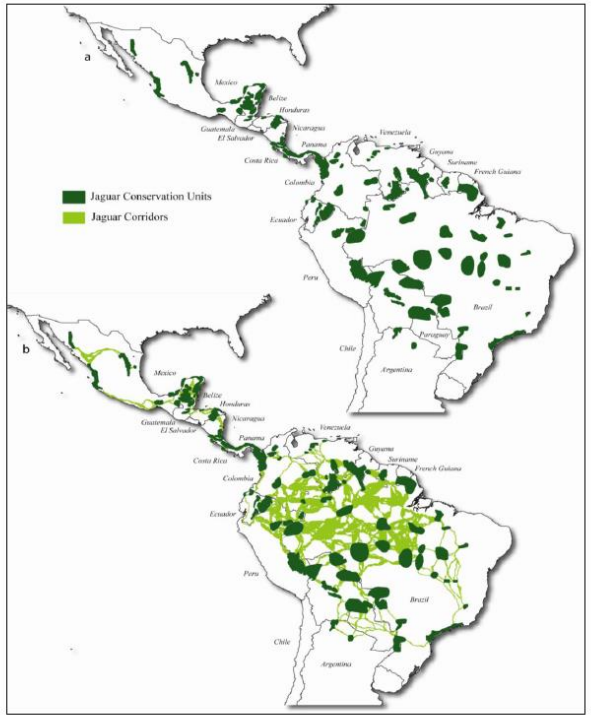
JAGUAR CORRIDORS

0 500 1,000 Kilometers

Five stage process

1. Identify the conservation áreas
2. Prioritize those áreas
3. Verify and refine the áreas
4. Implement conservation effots
5. Monitor our conservation efforts





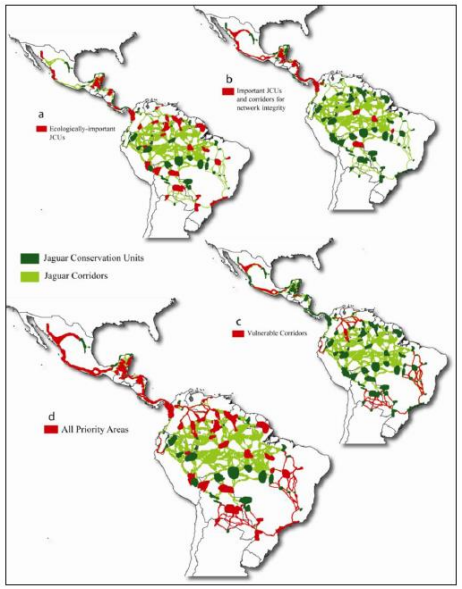
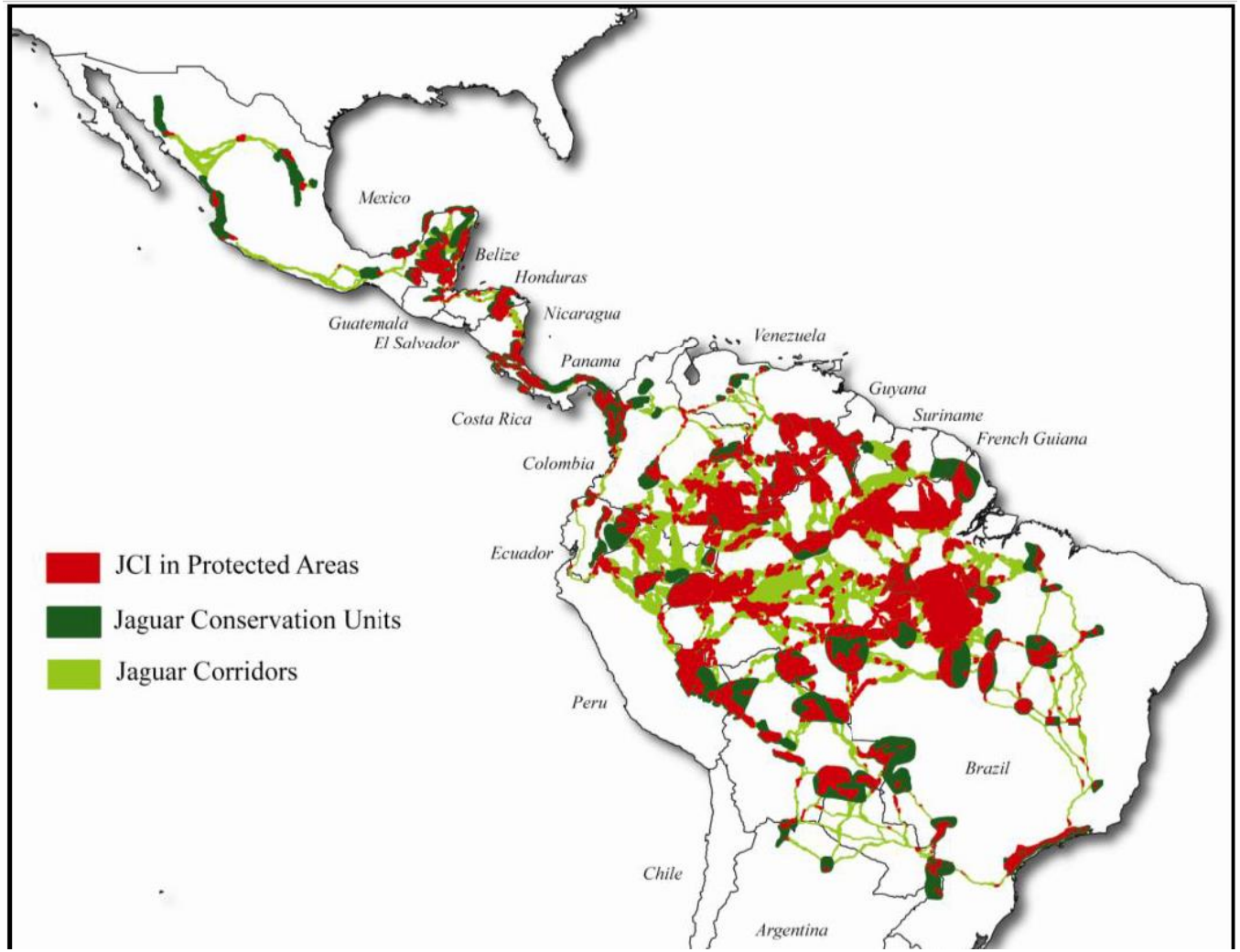


Figure 2. Results of prioritization analyses. Figure *a* shows the ecologically important JCUs. Figure *b* represents JCUs and corridors that are important for maintaining the overall conservation network. Figure *c* shows the vulnerable corridors. Figure *d* displays all the priority areas across jaguar range.



Jaguar conservation status-Costa Rica

The main purpose of the study was to evaluate the current conservation status of the jaguar (*Panthera onca*) through the integration of data from records of the species that were shared by jaguar researchers and experts in the country

More than 20 collaborators

Jaguar Agreement

Data

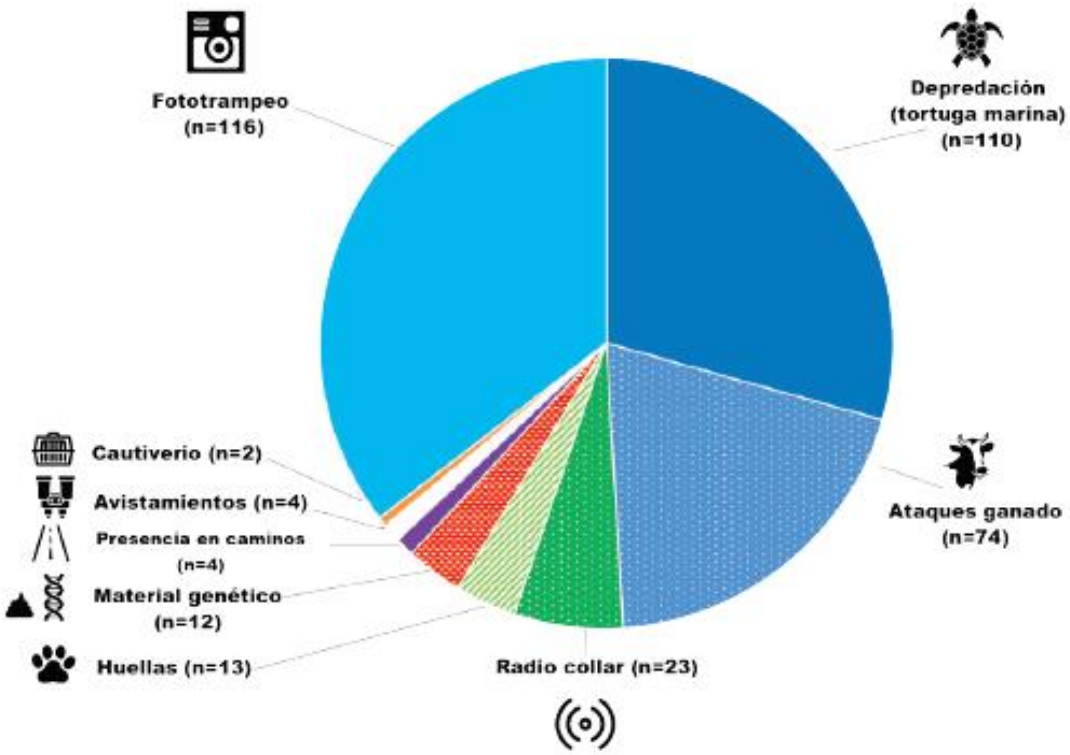


Figura 13. Registros de presencia de jaguar recopilados y provenientes de diversas fuentes durante el periodo 2012 -2017.

- 2012-2017
- 636 records
- 82% with designed methodologies
- 90% within Forest (Protected Areas/Private Reserves)
- Sea Turtles predations-Playa Nancite-Guanacaste

Locations

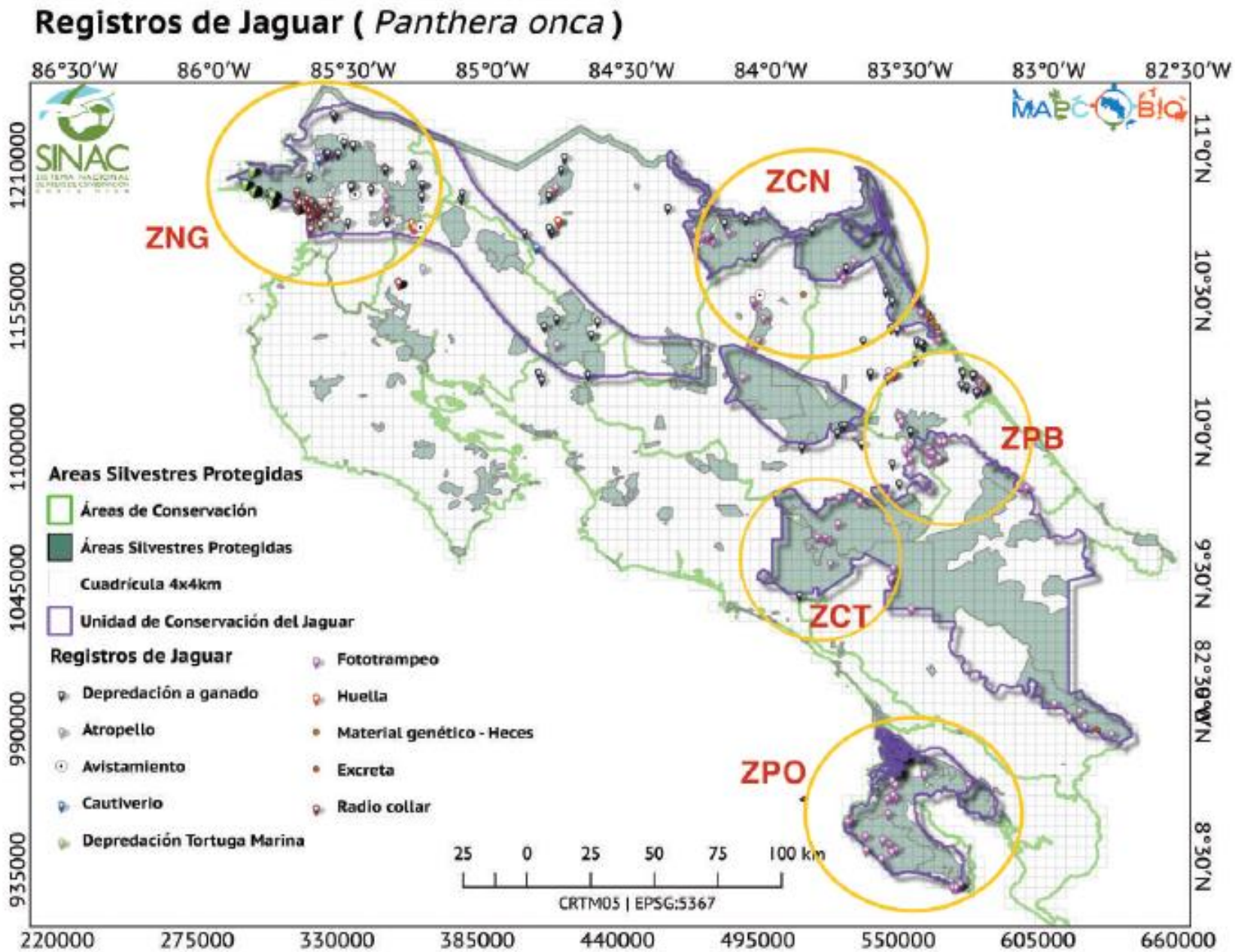


Figura 15. Mapa con la ubicación espacial de los registros de presencia de la especie en la grilla cuadriculada superpuesta de 4x4. km.

Research Projects

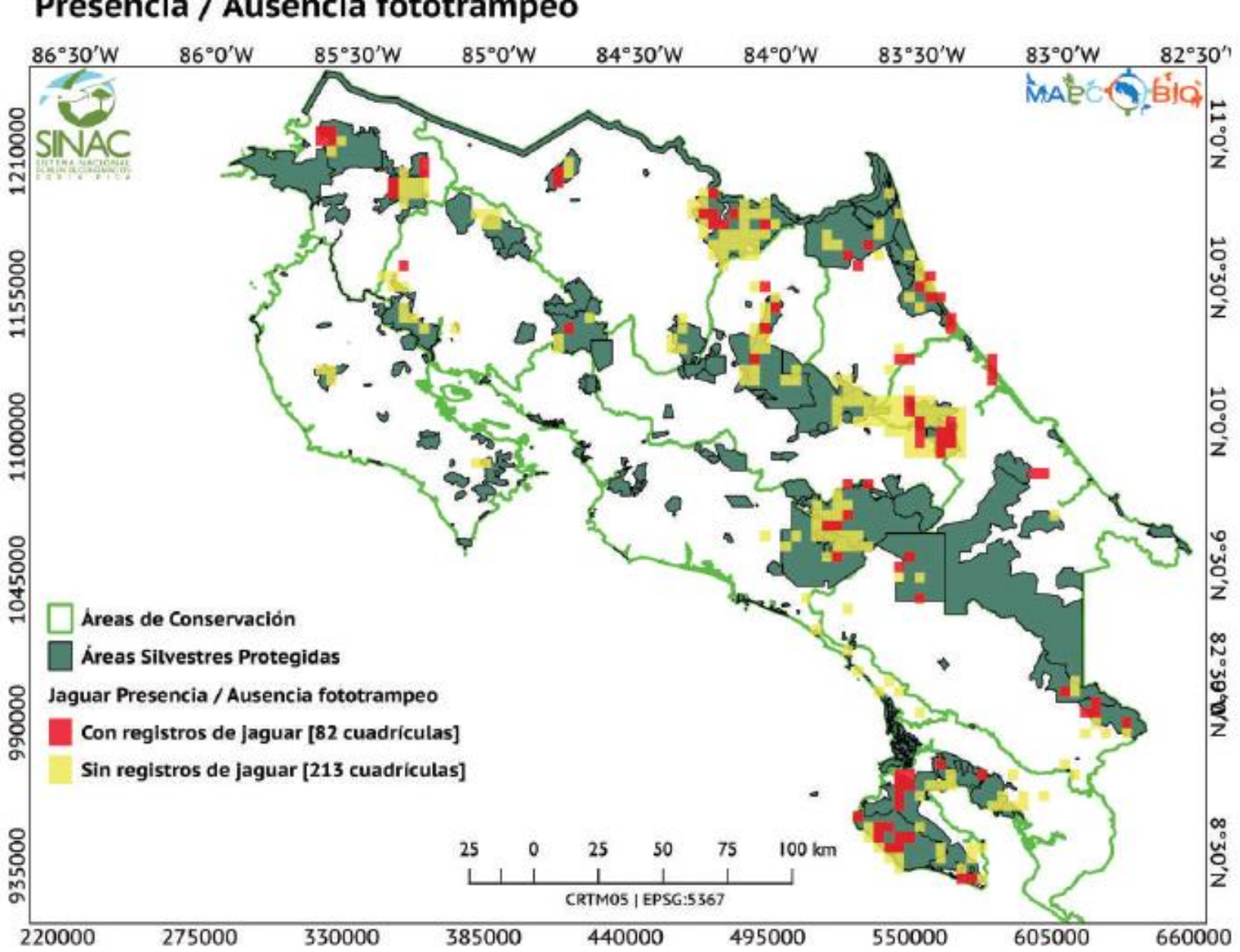


Figura 16. Mapa con la ubicación de todas las celdas 4x4 km donde han sido instaladas estaciones de trampeo de todos los estudios con cámaras trampa y donde se ha registrado jaguar (presencias – celdas rojas) durante el periodo comprendido entre enero 2012 a julio 2017.

Habitat models-covariables

COVARIABLES GENERALES SELECCIONADAS PARA UTILIZAR EN EL MODELO DE HÁBITAT IDÓNEO PARA EL JAGUAR

COVARIABLE SELECCIONADA	FACTOR/INFLUENCIA	VARIABLE A MEDIR	FUENTE DISPONIBLE DE INFORMACIÓN
1.Densidad de poblados(POB)	AntropogénicoRelación negativa: se asume a > densidad de poblados > presión de cacería y < disponibilidad de presas, por ende condiciones de hábitat no idóneas para la ocurrencia del jaguar.	# poblados total /celda. Se ponderan las tres categorías del INEC. Para muy denso una escala de 6 Basado en la visualización de la capa de topónimos del SNIT, se dio un valor de 6 para muy denso, un valor de 3 para denso y un valor de 1 para poco denso.	INEC: Información del censo poblacional 2013 que describe las categorías: urbano, urbano periférico (muy denso), rural concentrado (denso) y rural disperso (poco denso). IGN: Capa de áreas específicas densamente pobladas. SNIT: Capa de Topónimos que incluye las categorías de poblados: cabeceras de cantón, provincia, distritos, pueblos, urbanizaciones y barrios.

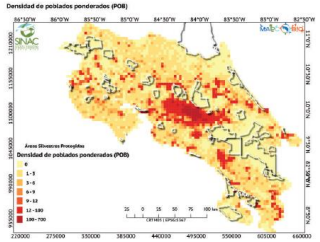


Figura 1. Representación gráfica de la variable densidad de poblados (# poblados por celda de 4kmX4km)

COVARIABLE SELECCIONADA	FACTOR/INFLUENCIA	VARIABLE A MEDIR	FUENTE DISPONIBLE DE INFORMACIÓN
2. Porcentaje de cobertura boscosa (BOS)	Hábitat Relación positiva: a > cobertura boscosa > condiciones de hábitat idóneas para el jaguar.	Numero de pixeles de bosque/celda (%).	Inventario Forestal 2012 – SIREFOR (se incluyen todas las categorías plantación forestal, pastos y área agrícola).

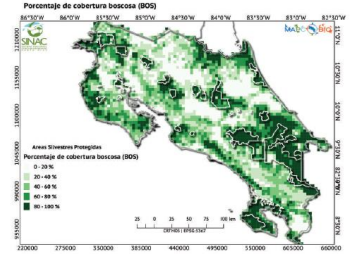


Figura 2. Representación gráfica de la variable Porcentaje de cobertura boscosa (# pixeles de bosque por celda de 4kmX4km).

COVARIABLE SELECCIONADA	FACTOR/INFLUENCIA	VARIABLE A MEDIR	FUENTE DISPONIBLE DE INFORMACIÓN
3. Km de distancia de caminos asfaltados (pavimentados) (CAMG)	Antropogénico-Distarrollo asociadoRelación negativa: a > km de distancia de caminos asfaltados > perturbación > Barreras.	Numero de pixeles de bosque/celda (%).	SNIT: Capa de Infraestructura vial que incluye las categorías caminos asfaltados de 1 y 2 vías y autopistas.
4. Km de distancia de caminos no asfaltados (CAMP).	Relación negativa: a > km de distancia de caminos asfaltados > perturbación > Barreras y > presión de cacería.	4. Km de distancia recorrida de caminos no asfaltados por celda.	SNIT: Capa de Infraestructura vial que incluye las categorías caminos no asfaltados de lastre y tierra.

Figura 3. Representación gráfica de la variable Km de distancia recorridos de caminos asfaltados por celda de 4x4 km.

Figura 4. Representación gráfica de la variable Km de distancia recorridos de caminos no asfaltados por celda de 4kmX4km

COVARIABLE SELECCIONADA	FACTOR/INFLUENCIA	VARIABLE A MEDIR	FUENTE DISPONIBLE DE INFORMACIÓN
5. Distancia a Área Silvestre Protegida más cercana (DASP).	Hábitat Relación positiva: Entre más cerca de un ASP > hábitat disponible o mejores condiciones de hábitat para el jaguar.	Distancia lineal en Km al límite más cercano del ASP tomando el centro de la celda como punto de inicio y tomando como valor cero aquellas celdas con ASP dentro de estas.	CENIGA (se incluyen solo las áreas de protección estricta considerando las categorías I y II de la UICN). Para el caso de Costa Rica sería Parques Nacionales y Reservas Biológicas.

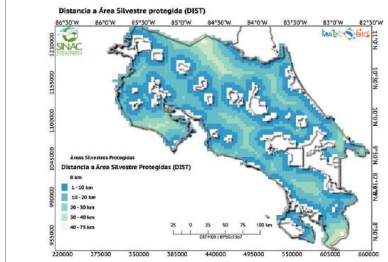


Figura 5. Representación gráfica de la variable Distancia al límite de Área Silvestre Protegida más cercana.

COVARIABLE SELECCIONADA	FACTOR/INFLUENCIA	VARIABLE A MEDIR	FUENTE DISPONIBLE DE INFORMACIÓN
8. Km de distancia de ríos con caudal alto y medio (RIOSG)	Hábitat Relación negativa asumiendo que a > caudal > barrera geográfica.	Km de distancia recorridos de ríos con caudal alto y medio.	WWF: Capa del proyecto hydroSHEDS V1.0 basado en el modelo topográfico SRTM en el caudal.

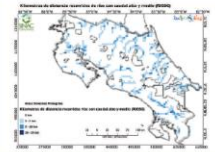


Figura 8. Representación gráfica de la variable Km de distancia recorridos de ríos con caudal alto y medio por celda de 4kmX4km.

COVARIABLE SELECCIONADA	FACTOR/INFLUENCIA	VARIABLE A MEDIR	FUENTE DISPONIBLE DE INFORMACIÓN
9. Km de superficie de rios con caudal bajo (RIOP)	Relación positiva asumiendo que el jaguar a ésta asociado a cuerpos de agua.	Km de distancia recorridos de ríos con caudal bajo.	WWF: Capa del proyecto hydroSHEDS V1.0 basado en el modelo topográfico SRTM en el Caudal.

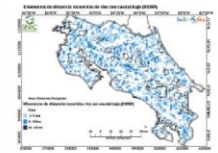


Figura 9. Representación gráfica de la variable Km de distancia recorridos de ríos con caudal bajo por celda de 4kmX4km.

COVARIABLE SELECCIONADA	FACTOR/INFLUENCIA	VARIABLE A MEDIR	FUENTE DISPONIBLE DE INFORMACIÓN
6. Elevación (ELEV).	Hábitat Relación negativa: a > elevación < disponibilidad de presas < condiciones de hábitat idóneas para el jaguar.	Promedio de la elevación/celda.	SRTM.CSI.CGIAR.ORG

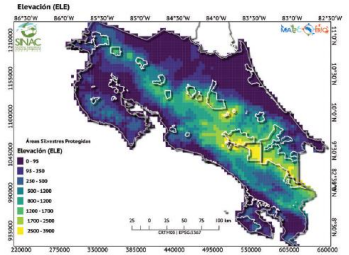


Figura 6. Representación gráfica de la variable Promedio de la elevación por celda de 4kmX4km.

COVARIABLE SELECCIONADA	FACTOR/INFLUENCIA	VARIABLE A MEDIR	FUENTE DISPONIBLE DE INFORMACIÓN
10. Precipitación (PREC)	Climática Relación negativa: a < precipitación < condiciones idóneas de hábitat para la ocurrencia del jaguar.	Promedio de precipitación anual.	WORLDCLIM

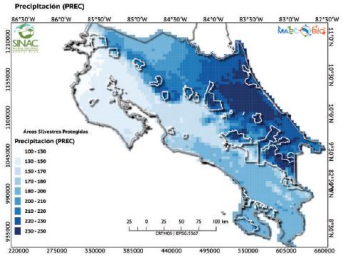


Figura 10. Representación gráfica de la variable Promedio anual de precipitación por celda de 4kmX4km.

COVARIABLE SELECCIONADA	FACTOR/INFLUENCIA	VARIABLE A MEDIR	FUENTE DISPONIBLE DE INFORMACIÓN
7. Pendiente (PEND)	Hábitat Relación negativa: a > pendiente < condiciones de hábitat idóneas para el jaguar.	Promedio de la elevación/celda.	SRTM.CSI.CGIAR.ORG

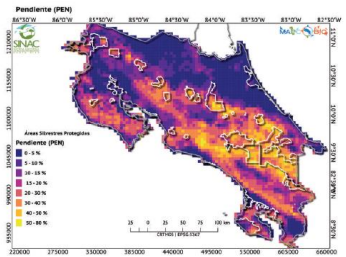


Figura 7. Representación gráfica de la variable Promedio de la elevación por celda de 4kmX4km.

COVARIABLE SELECCIONADA	FACTOR/INFLUENCIA	VARIABLE A MEDIR	FUENTE DISPONIBLE DE INFORMACIÓN
11. Temperatura (TEMP)	Climática Relación negativa: a < temperatura < condiciones idóneas de hábitat para la ocurrencia del jaguar.	Promedio de temperatura anual.	WORLDCLIM

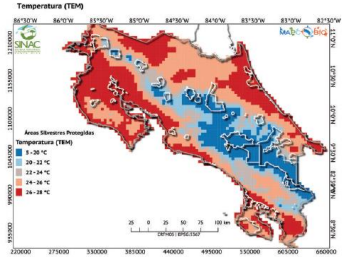


Figura 11. Representación gráfica de la variable Promedio anual de temperatura por celda de 4kmX4km.

Selected Model

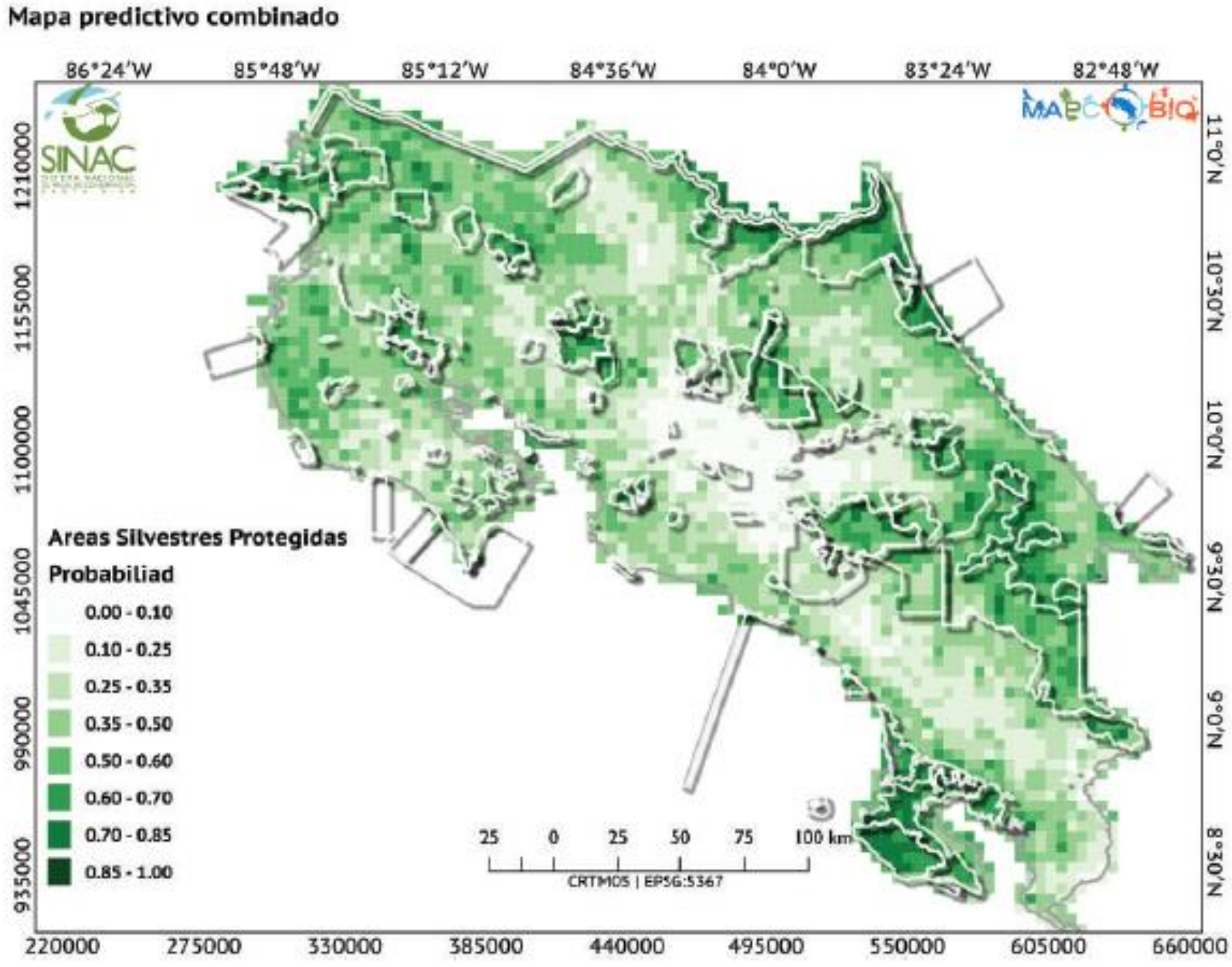


Figura 19. Mapa predictivo arrojado por el modelo mixto resultante del promedio de cada celda de 4kmX4km de los modelos 9 y 7 (Maxlike y Random Forest).

Mapa predictivo combinado y áreas focales

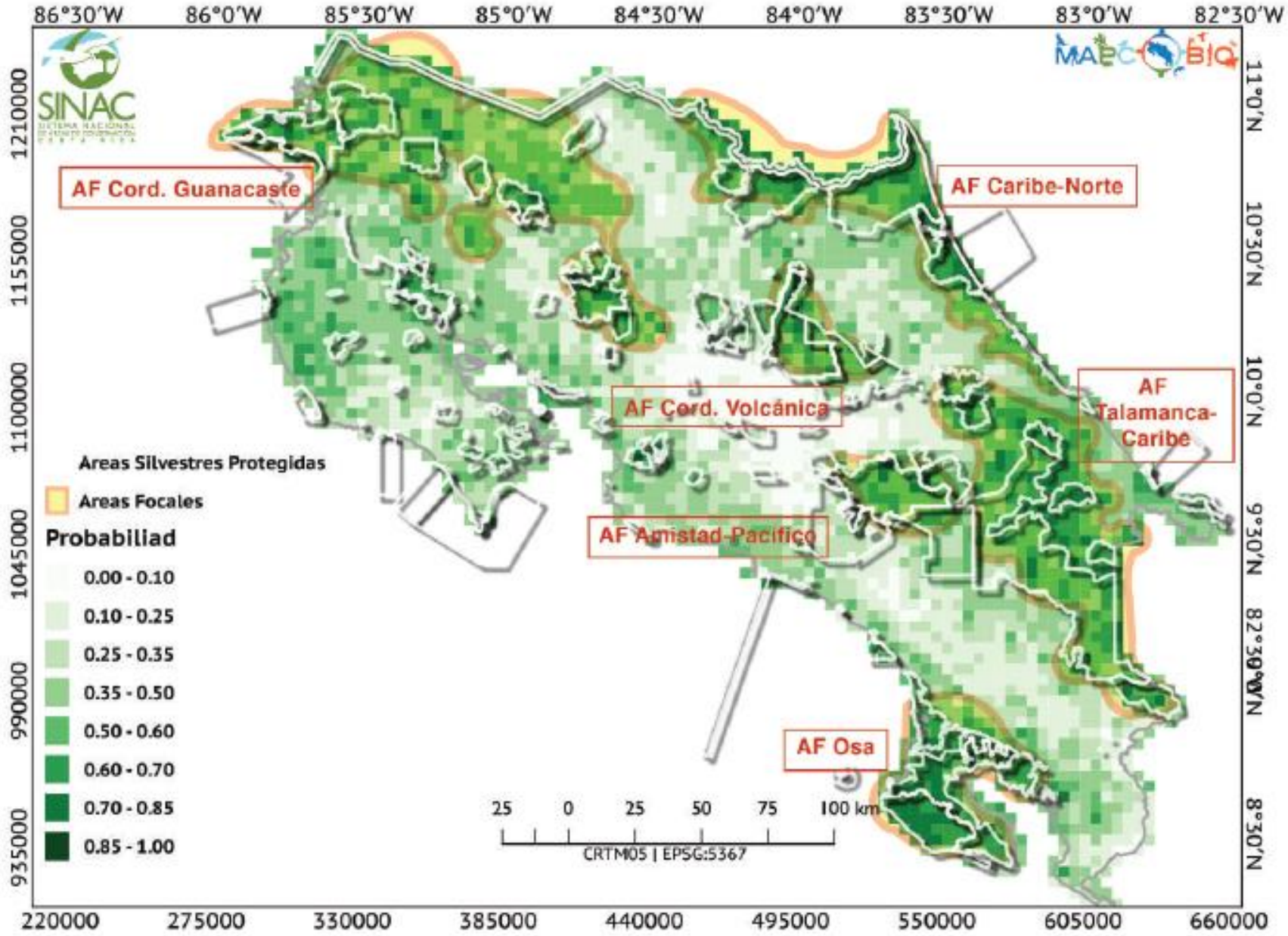


Figura 20. Mapa del hábitat idóneo predicho para el jaguar en Costa Rica (modelo mixto) con las Áreas Silvestres Protegidas, áreas focales identificadas delineadas como polígonos.

Priorities

1. Strengthen and maintain conservation and monitoring efforts within wildlife protected areas

2. Strengthen and maintain/create conservation and monitoring efforts within focal areas

3. Strengthen conservation efforts in biological corridors to enhance connectivity between focal areas

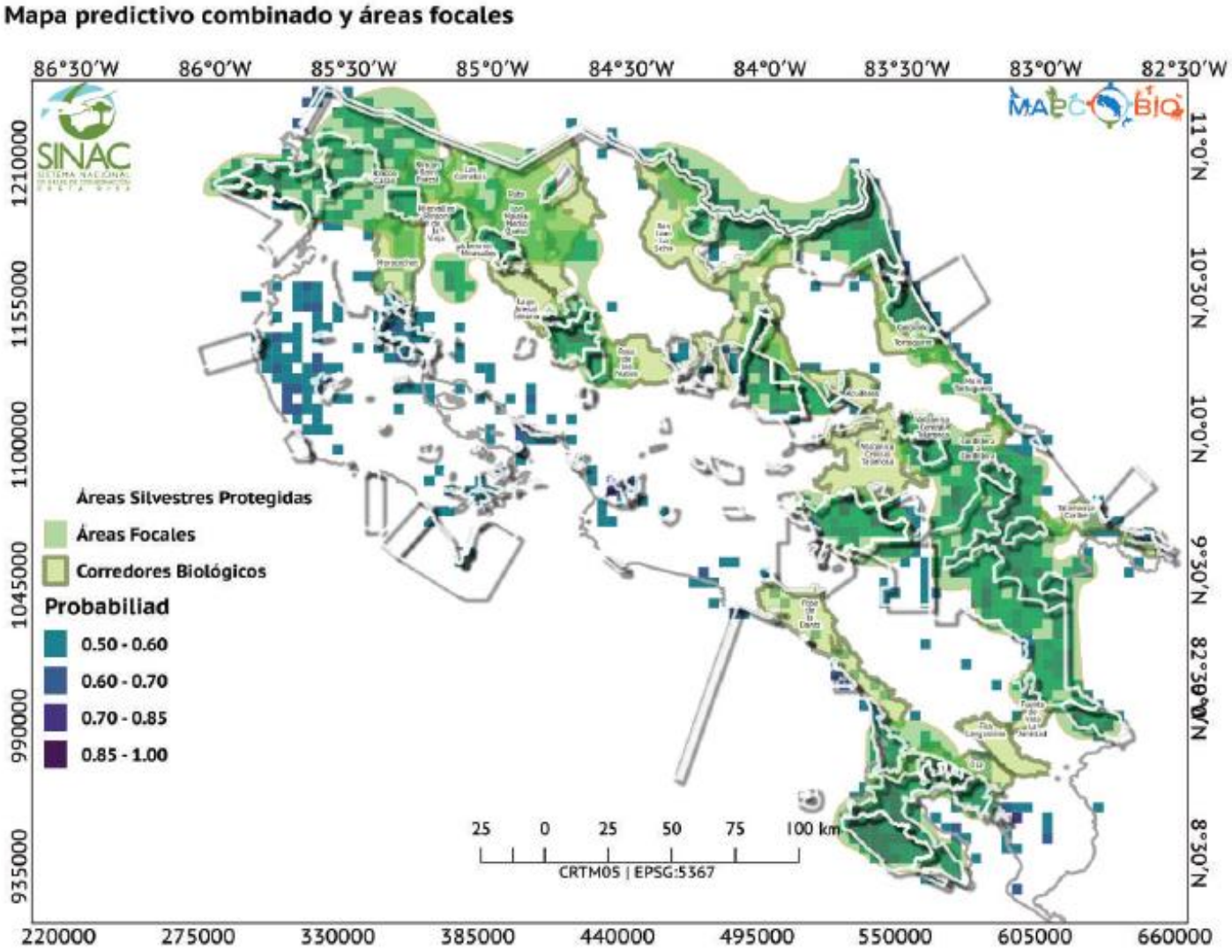


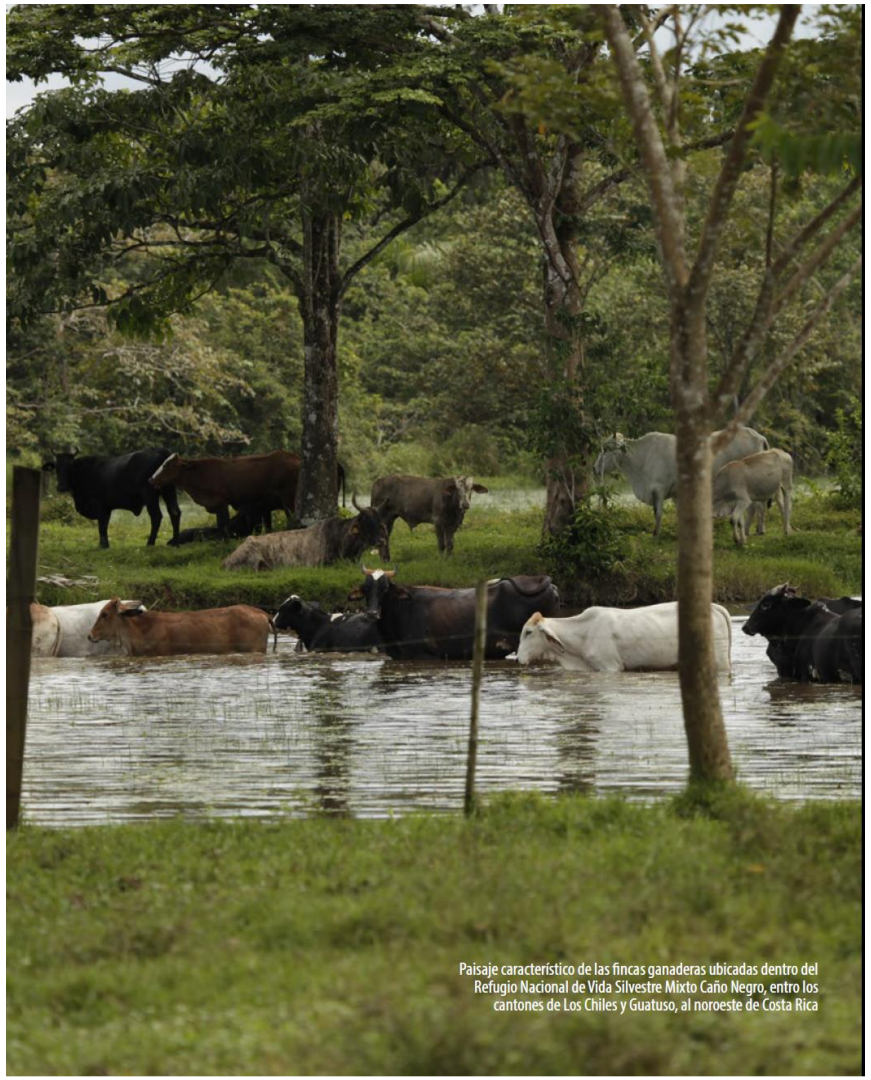
Figura 21. Mapa del hábitat idóneo predicho (probabilidades medias y altas) con las Áreas Silvestres Protegidas, áreas focales identificadas, corredores biológicos propuestos y registros de presencia de la especie.

UACFel

Unidad de Atención de Conflictos con Felinos (UACFel)

Fotografía de cámara-trampa colocada por integrantes de la UACFel en gira de campo en la que participaron representantes de SINAC y Panthera en el año 2014, en una finca con problemas de depredación en el Área de Conservación La Amistad - Caribe.

Jaguars as a threat to livestock



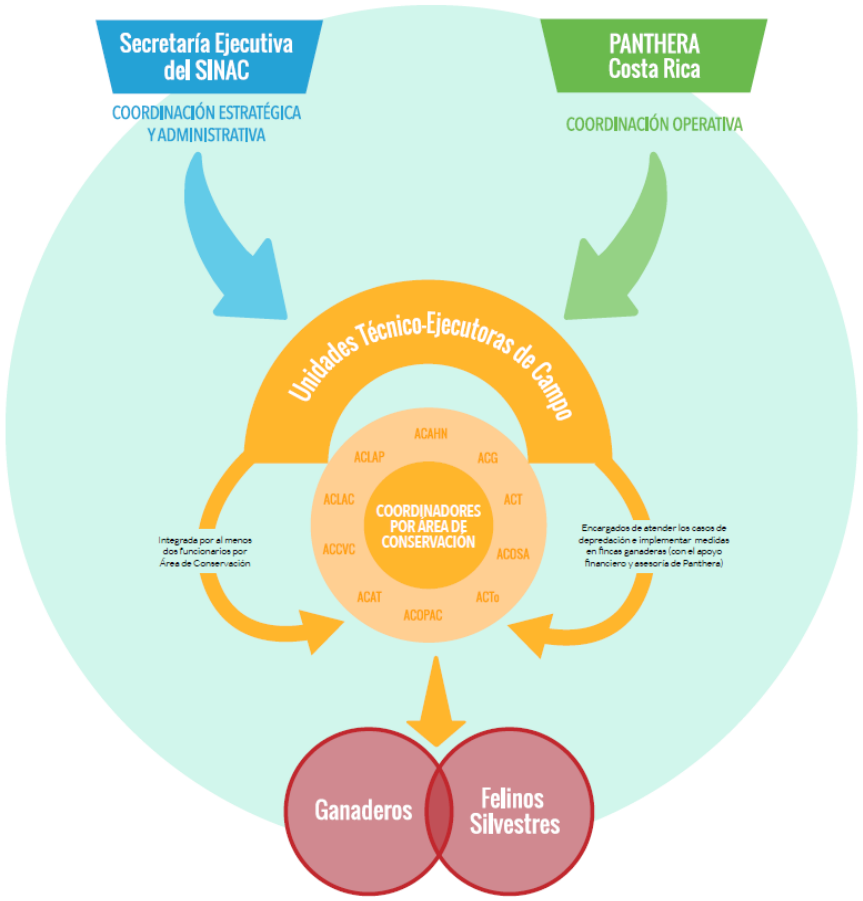
Paisaje característico de las fincas ganaderas ubicadas dentro del Refugio Nacional de Vida Silvestre Mixto Caño Negro, entro los cantones de Los Chiles y Guatuso, al noroeste de Costa Rica

FIG 4. | Primer caso de depredación atendido por la UACFel en setiembre 2013.

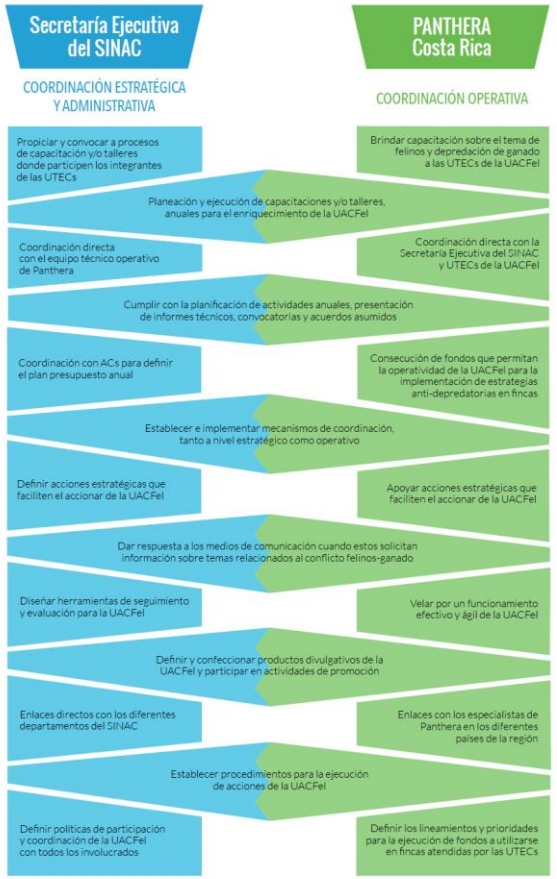
Political decision

El Director Ejecutivo de Panthera, Dr. Alan Rabinowitz (izquierda) y el Ministro de Ambiente de Costa Rica de la época, el Dr. René Castro (derecha), en el año 2012, durante la firma del Convenio Marco de Cooperación entre el Ministerio de Ambiente y Energía (MINAE) y Panthera

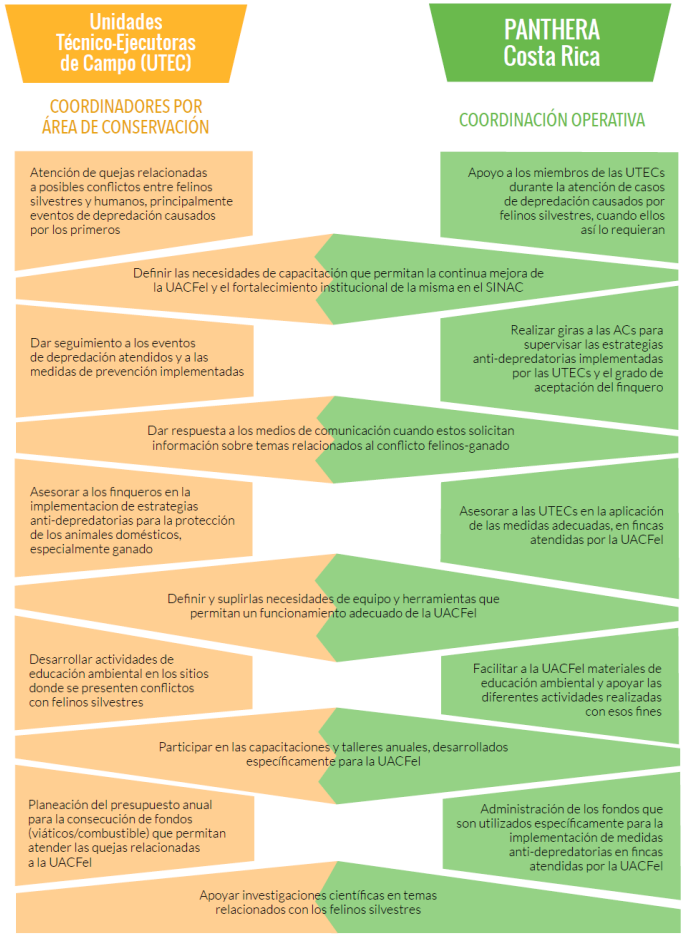
Clear Management Structure



Funciones específicas y conjuntas del SINAC y Panthera



Funciones específicas y conjuntas de las UTECs y Panthera



Institutional capity building

FIG 3. | Primer taller de conformación de la UACFel, realizado en setiembre del 2013, Siquirres, Limón.

Breaking barriers

Rótulos informativos son colocados en las fincas que ingresan al proyecto para identificarlas y que las comunidades en las que se encuentran conozcan sobre esta iniciativa, persuadiendo a otros finqueros a formar parte de este proyecto en caso de sufrir eventos de depredación.

Aplicación de la entrevista de depredación en la primer visita que se hace en las fincas, donde la intención no es llegar de manera condenatoria, sino de manera cooperativa, pues no se visita una finca para ayudar un felino, sino para solucionarle un problema a un ser humano.

Entrega de los materiales a un finquero de la zona de Pavón de Los Chiles, Alajuela, para construcción de un encierro con malla ganadera y alambre de púas.

Working together

FIG 1. Primera finca involucrada al proyecto con implementación de estrategias anti-depredatorias, en Boca Tapada de San Carlos.

Results

- Anti-predator Strategies

CUADRO 3
Efectividad de las diferentes estrategias anti-depredatorias

ESTRATEGIA ANTI-DEPREDATORIA	APLICACIÓN / EFECTIVIDAD
Detener la cacería de jaguares y de sus presas	Si / No es medible individualmente, ya que se utiliza en combinación con otras estrategias
Uso de corrales nocturnos	Si / Alta
Distribución de fuentes de agua	Si / No es medible individualmente, ya que se utiliza en combinación con otras estrategias
Cercado de áreas boscosas	No ha sido aplicada aún
Uso de la temporada de monta o de servicios[1]	No ha sido aplicada aún
Diseño y localización de potreros de paritorio	Si / Alta
Utilización de animales con experiencia[2]	Si / No es medible individualmente, ya que se utiliza en combinación con otras estrategias
Reconocimiento de la especie depredadora	Si / No es medible individualmente, ya que se utiliza en c otras estrategias
Sistema de "rueda de carreta" o "pizza"[3]	No ha sido aplicada a
Utilización de burros[4]	No ha sido aplicada a
Repelente visual: luces	Si / Alta
Repelente acústico: campanas	Si / Baja
Repelente acústico: radios	Si / Alta
Utilización de cercas eléctricas	Si / Alta
Utilización del búfalo de agua[4]	Si / Alta

CUADRO 2
Efectividad del uso de campanas por Área de Conservación

ÁREA DE CONSERVACIÓN	NÚMERO DE FINCAS SOLO CON CAMPANAS	EFECTIVIDAD
ACAHN	2	100%
ACAT	1	100%
ACCVC	4	100%
ACG	3	67%
ACLAP	3	100%
ACOPAC	6	100%
ACTo	7	72%

Results

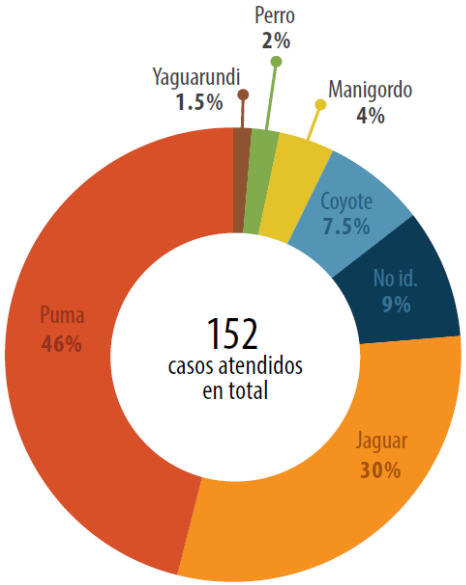
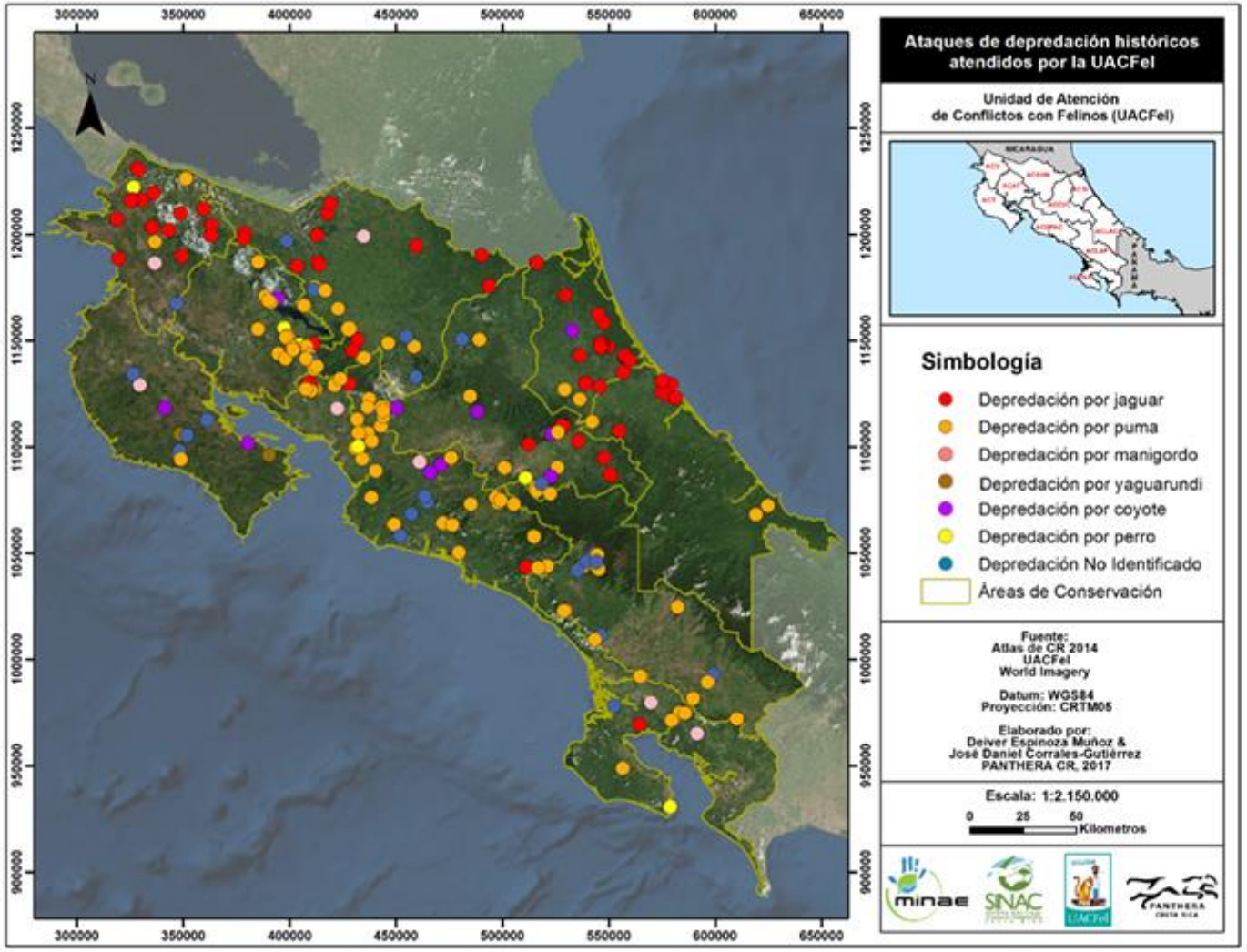


FIG 29. Porcentaje de casos de depredación atendidos según tipo de depredador.



Preguntas!

Tico Haroutiounian

https://www.ticoharoutiounian.com/index/G0000iaPeA9FSHeo