

Research Article

From forest mosaics to yucales: noninvasive monitoring untangles mammal–crop interactions in eastern Honduras

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Abstract

Forest–farm interfaces in tropical landscapes are pivotal hotspots of human–wildlife interaction. However, they remain poorly documented across Central America. This study investigated crop depredation at the forest edge of a 10 ha cassava (*Manihot esculenta*) field (“yucal”) in Mavita, Honduran Mosquitia, embedded within a mosaic of *Pinus caribaea* and tropical moist forest. From December 2024 to February 2025, three camera traps, coupled with solar-powered, motion-activated LED lights (“silent technology”), were deployed to identify the true crop-raiding community and describe diel activity. Contrary to local expectations, rabbits (*Sylvilagus hondurensis*) emerged as the primary crop raiders, while tapirs (*Tapirus bairdii*) were present but not the sole culprits. No evidence of pacas (*Cuniculus paca*) or armadillos (*Dasypus mexicanus*) was found. Light-assisted traps consistently recorded rabbits but were less effective for other taxa (e.g., ocelots), despite moderate-to-high temporal overlap among species. Ordinal models indicated that higher behavioral response codes were more likely later in the day, and rabbits showed lower behavioral intensities than other groups. These findings highlight how forest structure and edge context can shape detection and behavior and how misattribution of damage can arise in remote forest landscapes. Non-invasive diagnostics, including light-assisted camera traps, and buffer cassava plots at forest margins are recommended to accommodate wildlife foraging while reducing direct impacts on fields. This study provides forest-centric evidence to guide conflict mitigation and co-existence strategies within Miskitu territories of the Honduran Caribbean Lowlands.

Key words: Camera traps, cassava, forest–farm interface, human–wildlife conflict, light deterrents, Miskitu territory, *Pinus caribaea* mosaic, tropical moist forest

Introduction

Human–wildlife interactions are an inevitable component of the ecological and cultural history of human societies (Marchini and Crawshaw 2015). Although in some cases these interactions provide benefits, such as ecosystem, recreational, or cultural services, they are often perceived as conflicts in which the



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activities of wildlife or humans produce adverse impacts on the other party (Dickman and Hazzah 2015). In Central America, human–wildlife conflicts are mainly expressed as crop damage, livestock predation, or, to a lesser extent, attacks on people (Mesmer 2000; Estrada 2006; Madden and McQuinn 2014; Pérez-Flores et al. 2021; Serrano-MacGregor et al. 2021). In most cases, affected communities respond to these losses with retaliatory actions that threaten wildlife survival (Treves et al. 2009).

Currently, wildlife interactions with rural crops are among the main threats to biodiversity conservation in Central America, particularly in areas where subsistence agriculture forms the basis of local economies (Nyhus 2016). A wide variety of wildlife species are responsible for crop damage, with birds and mammals being the most frequent (Romero-Balderas et al. 2006; Songhurst and Coulson 2014; Can-Hernández et al. 2019). Among mammals, large-sized species are often involved in these conflicts due to their extensive energetic requirements and the large areas they must cover to meet their food and water needs (Songhurst and Coulson 2014). A notable example is Baird's tapir (*Tapirus bairdii*), the largest terrestrial mammal in the Neotropics and an Endangered species (García et al. 2016), which has been reported to cause damage to bean, maize, and plantain crops (Suárez-Mejía and Lizcano 2002; Naughton-Treves et al. 2003; Dunn et al. 2012; Waters 2025; Pérez-Flores et al. 2021; Serrano-MacGregor et al. 2021). However, previous studies indicate that such damage is often overstated or misattributed, as other species, such as peccaries (*Tayassu pecari* and *Pecari tajacu*), pacas (*Cuniculus paca*) (Estrada 2006; Reyna-Hurtado and Tanner 2005), or even rabbits (*Sylvilagus hondurensis*), also contribute to crop depredation.

In response to human–wildlife conflict associated with agricultural and livestock losses, nonlethal, noninvasive strategies based on deterrent devices have been increasingly promoted. These approaches include visual and auditory stimuli, such as air cannons, lights, reflectors, and lasers (Adams et al. 2021; Elbers and González 2021; Ohrens et al. 2019). However, the effectiveness of these methods varies greatly and depends on multiple factors, including the taxon involved, species-specific visual and auditory capacities, ecological context, implementation strategies, and habituation processes. As a result, deterrent devices are strongly species- and context-dependent, and their isolated use rarely eliminates crop damage, often requiring integrated, adaptive, and timely approaches to be effective (Adams et al. 2021; Elbers and González 2021; Kikkert et al. 2024; Gilsdorf et al. 2002; Rivadeneira et al. 2018; Miranda Paez et al. 2021).

Within this framework, the use of light traps as a noninvasive monitoring tool represents a relevant methodological opportunity. Light traps enable direct documentation of which species interact with crops and when, reducing misattribution of damage and providing a more robust empirical basis for adaptive management decisions.

Human–wildlife interactions in agricultural contexts, particularly those involving crop damage, are evident in the Mosquitia region of northeastern Honduras, where cassava (*Manihot esculenta*), a staple food for Miskitu communities, is highly vulnerable to wildlife consumption. In the community of Mavita, farmers have reported crop losses attributed to lowland pacas, armadillos (*Dasypus mexicanus*), and “tilva,” the local name used to refer to Baird's tapir

(*Tapirus bairdii*). However, preliminary observations suggest that small mammals, such as *Sylvilagus hondurensis*, may be the primary agents of crop depredation. These misperceptions increase the likelihood of retaliatory hunting of threatened species, particularly tapirs, thereby elevating the risk of persecution in response to agricultural losses (Koster 2008; Dunn et al. 2012).

Given that residents of Mavita expressed persistent concerns regarding interactions associated with cassava crops involving fields, tapirs, pacas, and armadillos, and recognizing the lack of alternative institutional support, the Wildlife Conservation Society (WCS) implemented a mitigation strategy based on a noninvasive approach: the use of light traps. The primary objective was to evaluate their potential effectiveness in reducing crop damage, while secondary objectives included documenting mammalian activity patterns and generating community-based recommendations for managing human–wildlife interactions in the area. In this way, the present study seeks to identify the species truly responsible for the depredation of cassava crops in Mavita and to assess the potential of light traps as a mitigation tool, contributing to a balance between rural food security and mammal conservation.

Methods

The expedition took place in Mavita (14°46'32.6"N, 84°27'50.8"W, 93 m), a village within the municipality of Puerto Lempira in the department of Gracias a Dios, Honduras (Fig. 1). This region encompasses ancestral lands of the Miskitu people. The sampling was conducted specifically within a cassava (*Manihot esculenta*) field, locally known as a yucal, covering approximately 10 ha. The surrounding landscape includes forests dominated by *Pinus caribaea* and a variety of tropical moist forest species, classified according to Holdridge's life zone system (1978). The area experiences an annual mean temperature of 23–27 °C, with evapotranspiration ranging from 800 to 2000 mm (Herlihy 1997).

Three camera traps (Browning Elite HP5 SPEC OPS) were deployed within cassava plantations (yucales) following a stratified design along a forest–crop gradient. Cameras were installed both at the plantation edge (0–50 m from the adjacent forest boundary) and within the interior of the crop (> 50 m from the edge) to capture potential differences in wildlife activity across habitat interfaces. Inter-station distances ranged from approximately 1,500 to 6,500 m, depending on topography and accessibility (Fig. 2). All cameras were positioned at a height of 40–60 cm above ground level and oriented parallel to the ground to maximize detection of medium- and small-sized mammals. The cameras were active from 9 December 2024 to 15 February 2025. They were programmed to record 10 s videos per activation, with no delay between events. An infrared flash was used in blur-reduction mode to enhance the quality of nighttime footage. In front of each camera trap, a solar-powered LED motion-sensor light with three adjustable heads (Sunforce model) was installed to enhance nighttime visibility and record species behavior during nocturnal activity.

The Sunforce 82401 solar motion lights provide illumination in the range of approximately 1000–2100 lumens, with a motion detection distance of up to 9.10 m and a detection angle of 180°. The lights were mounted at an approximate height of 1.5 to 2.0 m above ground level and angled downward toward the camera detection zone to optimize illumination of animal activity areas.

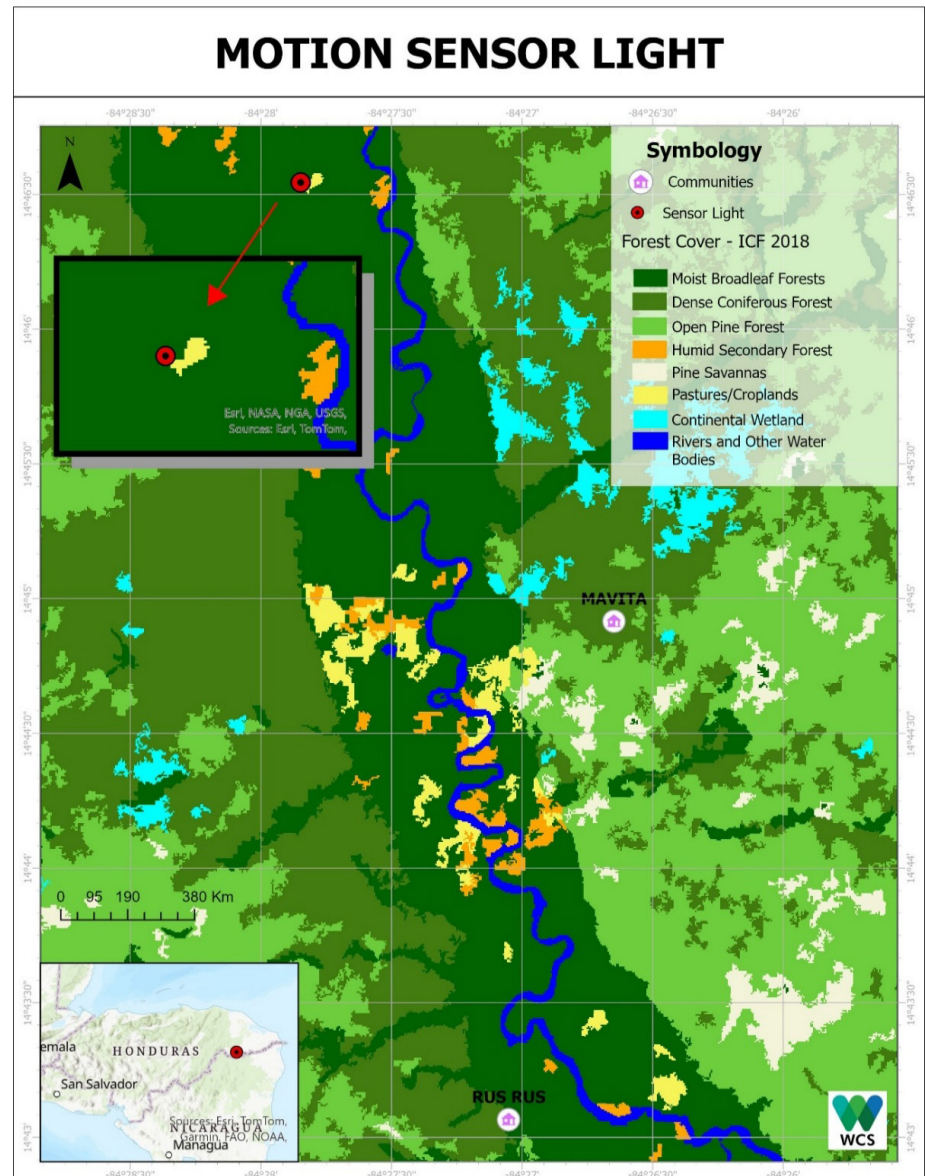


Figure 1. Location of the motion-sensor light installed in the cassava field of Mavita, within the Mosquitia region of eastern Honduras, highlighting nearby communities (Mavita and Rus Rus) and the surrounding forest matrix based on the 2018 ICF land-cover classification.

Lights were configured in motion-activated mode, ensuring that illumination was triggered only upon animal presence, thereby reducing continuous exposure and potential habituation effects.

Camera trap surveys were conducted to record species identity, behavioral codes, and timestamps. The dataset was imported into RStudio version 2024.12.1 (RStudio Team 2024) and processed using the tidyverse suite (Wickham et al. 2019) and lubridate (Grolemund and Wickham 2011). Variables were converted appropriately: species and behavioral codes as factors, temperature as numeric, and timestamps as decimal hours. Hourly activity was further converted to radians to facilitate circular statistical analyses:

$$radians = \frac{hour - decimal}{24} \times 2\pi$$

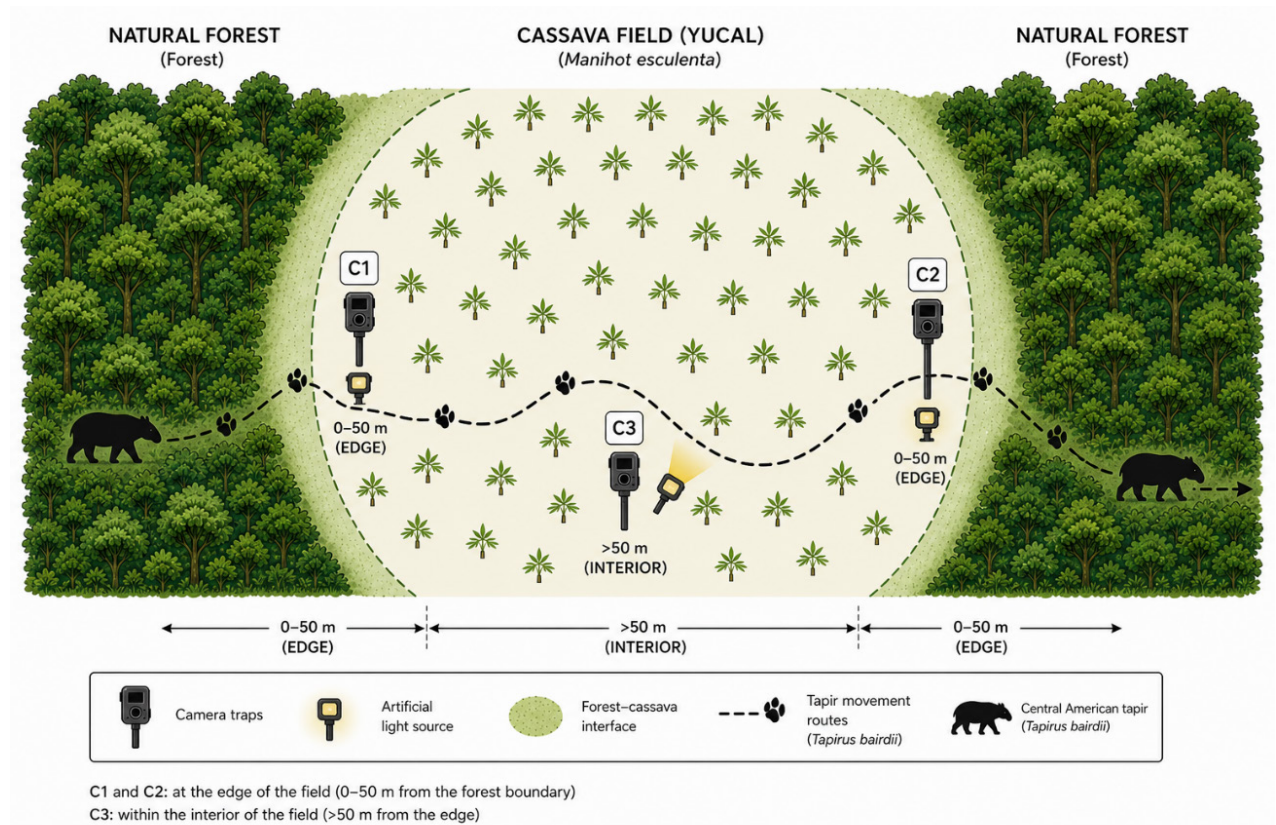


Figure 2. Schematic representation of camera trap placement within cassava plantations (yucales) in Mavita, embedded within a natural forest mix. The three camera traps were deployed following a stratified design to capture variation in wildlife activity. Sampling stations were located at the field edge (0–50 m from the adjacent forest boundary; Cameras 1 and 2) and within the interior of the plantation (>50 m from the edge; Camera 3). The shaded zone represents the forest–cassava interface, where the natural forest transitions into the agricultural matrix. Tapir (*Tapirus bairdii*) tracks and inferred movement routes, used to guide camera placement, are also indicated across the field and surrounding forest. Author's elaboration with conceptual assistance from ChatGPT (OpenAI).

Analyses focused on seven focal taxa: *Sylvilagus hondurensis*, *Leopardus pardalis*, *Herpailurus yagouaroundi*, *Didelphis marsupialis*, *D. virginiana*, *Dasyprocta punctata*, and *Tapirus bairdii*. Small cats (*L. pardalis* + *H. yagouaroundi*) and didelphids (*D. marsupialis* + *D. virginiana*) were pooled due to low sample sizes.

Normality of behavioral codes and hourly activity was assessed with the Shapiro–Wilk test. Homogeneity of variances was evaluated using Levene's test from the car package (Fox and Weisberg 2019). Differences in behavioral codes between species were examined using the Kruskal–Wallis rank-sum test and post hoc Dunn's test with Bonferroni correction (FSA package; Ogle et al. 2023). Descriptive statistics, including mean, median, and standard deviation, were computed for each species group. Behavioral codes were modeled as ordinal responses using proportional-odds logistic regression (MASS::polr) (Venables and Ripley 2002), with species group and hour of day as predictors. Model fit was evaluated via residual deviance and Akaike information criterion (AIC). Behavioral responses were recorded on an ordinal categorical variable with three discrete levels (1–3). Code 1 indicated a strong reaction (fearful response and passage with clear disturbance); code 2 indicated no activation of the device despite presence or proximity; and code 3 indicated passage without

any observable reaction (weak or no response). All observations were recorded as integer values; no intermediate scores were possible. The estimated regression coefficient (β) for *T. bairdii* in the proportional-odds logistic regression model was extremely large, likely due to quasi-complete separation in the data; therefore, this category was excluded from the model.

Circular analyses of hourly activity were conducted using CircStats (Agostinelli and Lund 2017). Rao's spacing test evaluated departures from uniformity, while Watson–Williams tests compared mean activity times between species. Temporal overlap between species pairs was estimated with the overlap package (Meredith and Ridout 2021), using multiple estimators (Δ^1 , Δ^4 , and Δ^5) and bootstrap confidence intervals where data permitted. Some pairs could not be evaluated due to insufficient data (NA values for species with < 3 observations).

Results

A total of 27 independent interaction events were recorded across seven mammal species. *S. hondurensis* accounted for most records ($n = 14$), followed by *L. pardalis* ($n = 4$), *Dasyprocta punctata* ($n = 3$), *D. marsupialis* ($n = 2$), *T. bairdii* ($n = 2$), and single records of *D. virginiana* and *H. yagouaroundi*. This pattern suggests that *S. hondurensis* represents the primary taxon interacting with cassava crops in the study area. Behavioral responses varied among taxa. *S. hondurensis* showed a mixed response pattern, with six events classified as strong reactions (code 1), six as no activation of the device (code 2), and two as passage without observable reaction (code 3), indicating frequent interaction with the crop accompanied by variable responses to deterrent stimuli. *L. pardalis* predominantly exhibited weak or no reaction (code 3; three of four records), with a single event showing no activation (code 2), suggesting low sensitivity to the devices or interactions not directly associated with crop use. *Dasyprocta punctata* displayed mostly weak or absent responses (code 3; two of three records), while the remaining event corresponded to no activation (code 2), which may reflect occasional crop use with low perceived risk. Both *Didelphis* species and *H. yagouaroundi* were exclusively associated with no-activation events (code 2), indicating marginal or transit interactions. In contrast, *T. bairdii* consistently showed strong behavioral reactions (code 1), although sample size was limited ($n = 2$), suggesting high sensitivity to deterrent stimuli rather than intensive crop use.

Shapiro–Wilk tests indicated non-normality for *S. hondurensis* ($p = 0.001$) and small cats (*L. pardalis* + *H. yagouaroundi*, $p = 0.025$). *D. punctata* ($p = 0.400$) and didelphids (*D. marsupialis* + *D. virginiana*, $p = 0.095$) did not deviate significantly from normality. Normality could not be evaluated for *T. bairdii* ($n = 2$). Levene's test did not detect heterogeneity of variances in behavioral codes among the five species groups ($F_{(4, 26)} = 0.989$, $p = 0.431$).

Sample sizes were uneven across species groups (e.g., *S. hondurensis* $n = 19$; small cats $n = 4$; *D. punctata* $n = 3$; didelphids $n = 3$; *T. bairdii* $n = 2$), which limits the statistical power and precision of pairwise comparisons. Overall, *S. hondurensis* accounted for most behavioral records, whereas other groups were represented by relatively few observations. The Kruskal–Wallis test revealed significant differences in behavioral codes across species groups ($\chi^2 = 14.86$,

$df = 4, p = 0.005$). Post hoc Dunn tests with Bonferroni correction indicated that small cats tended to exhibit higher behavioral codes (i.e., weaker or absent reactions, values closer to 3) than *S. hondurensis*, which predominantly exhibited lower behavioral codes (1), indicating stronger behavioral responses (adjusted $p = 0.045$). In contrast, none of the other pairwise comparisons were significant (adjusted $p \geq 0.072$).

Rao's spacing test strongly rejected uniformity of activity across the 24 h cycle ($U = 200.96, p < 0.001$; Fig. 3), confirming pronounced diel patterning. Watson–Williams tests indicated significant differences in mean circular activity times between species groups ($F_{(4, 26)} = 3.23, p = 0.028$). Estimated mean activity times ranged from -1.68 radians in *D. punctata* to 0.67 radians in *T. bairdii*, highlighting temporal partitioning between taxa.

Pairwise temporal overlap (Δ) estimates revealed clear ecological patterns (Fig. 4). Overlap was low between *S. hondurensis* and *D. punctata* ($\Delta \approx 0.12$ – 0.16) and near zero for *D. punctata* versus small cats or *T. bairdii* ($\Delta \approx 0.001$), indicating temporal segregation. Moderate-to-high overlap occurred between *S. hondurensis* and small cats ($\Delta \approx 0.42$ – 0.59), small cats and didelphids ($\Delta \approx 0.58$ – 0.58), and small cats and *T. bairdii* ($\Delta \approx 0.70$ – 0.75).

The proportional-odds model (AIC = 49.66; residual deviance = 35.66) indicated that time of day was positively associated with higher behavioral code values ($\beta_{\text{hour}} = 0.157 \pm 0.064, z = 2.46, p = 0.014$; Figs 5, 6), suggesting that weaker or absent responses are more likely to occur later in the day. Relative to the reference category, *S. hondurensis* showed lower behavioral codes ($\beta = -3.98 \pm 1.77, z = -2.25, p = 0.025$). In contrast, the coefficients for small cats ($\beta = 2.38 \pm 1.95$) and didelphids ($\beta = -2.50 \pm 1.80$) were not statistically significant.

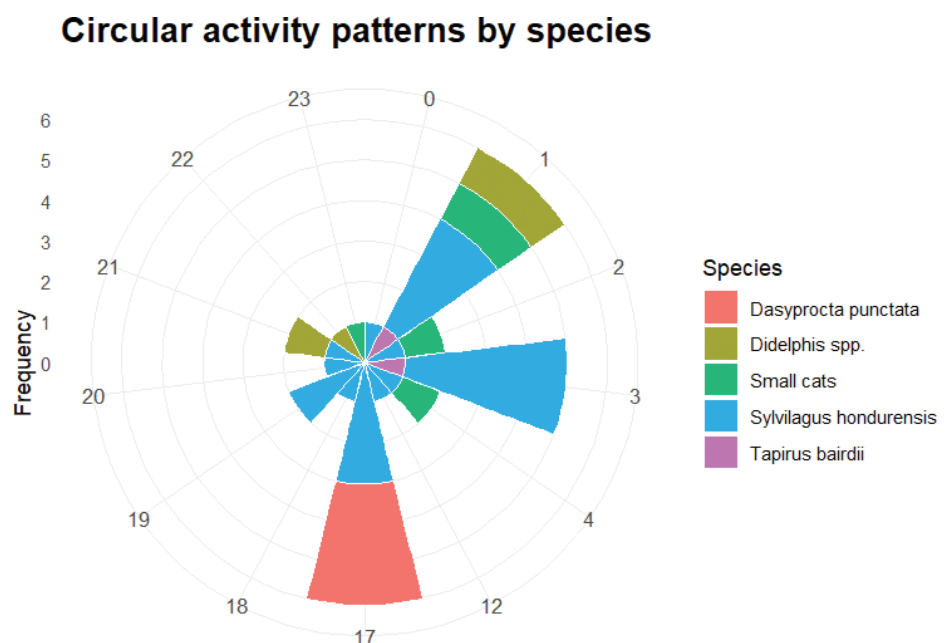


Figure 3. Circular activity patterns of the focal mammal species recorded in Mavita, showing hourly distributions of detections across the 24-h cycle. These patterns highlight temporal partitioning among species and support the analyses indicating marked differences in hourly activity across the mammal assemblage.

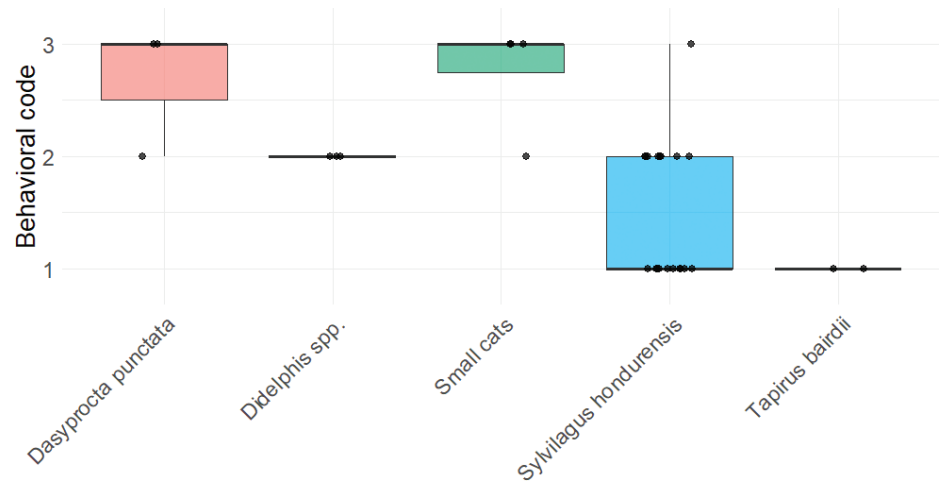


Figure 4. Boxplots showing the distribution of behavioral codes for each mammal group recorded at the light-trap stations in Mavita. Behavioral responses were recorded on an ordinal scale ranging from 1 to 3, where 1 indicates a strong reaction (fearful response and passage with clear disturbance), 2 indicates no activation of the device during passage, and 3 indicates passage without observable reaction (weak or no response). The plot highlights interspecific differences in behavioral responses. *Sylvilagus hondurensis* and small cats exhibited higher behavioral codes (predominantly values of 3, corresponding to weak or absent reactions), whereas *Dasyprocta punctata* showed lower behavioral codes, indicating stronger behavioral reactions (values closer to 1). *Didelphis* sp. and *Tapirus bairdii* showed limited variability due to small sample sizes but tended to exhibit intermediate to high codes (2–3), suggesting weak or no reaction during passage. Individual observations are shown with slight jittering to reduce overplotting. All values represent discrete ordinal categories (1–3); no continuous data were recorded.

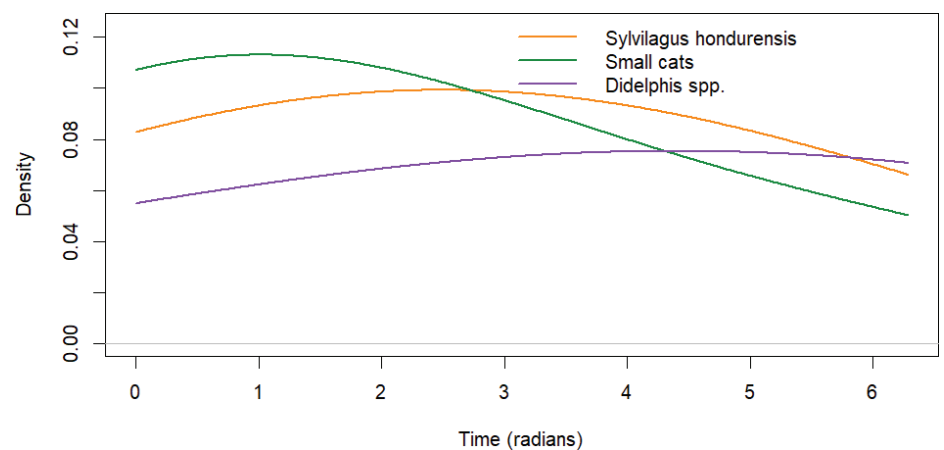


Figure 5. Density estimates of circular activity times for *Sylvilagus hondurensis*, small cats, and *Didelphis* sp., illustrating differences in their diel activity distributions. *S. hondurensis* shows a broad activity peak centered around mid-radians, while small cats exhibit a stronger early-night peak that declines steadily toward later hours. In contrast, *Didelphis* sp. displays a more gradual increase in activity, reaching its highest densities toward the middle of the cycle before tapering off. These smoothed curves reflect the temporal structure detected in the camera-trap dataset and highlight partial overlap but distinct activity patterns among the three taxa.

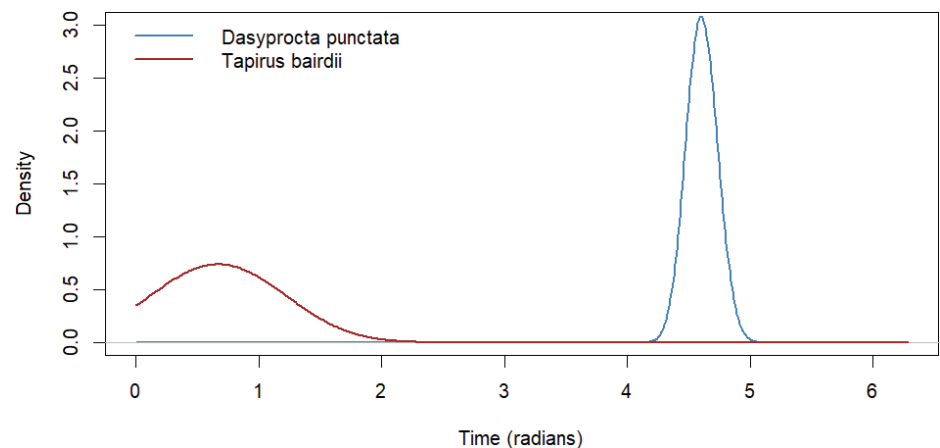


Figure 6. Density estimates of circular activity times for *Dasyprocta punctata* and *Tapirus bairdii*, illustrating the strong temporal segregation between the two species. *Dasyprocta punctata* shows a sharply concentrated peak of activity around late-night to early-morning radians, indicating a highly restricted and well-defined activity window. In contrast, *Tapirus bairdii* exhibits a broader and lower activity curve centered near early-night hours, reflecting more dispersed and limited detections. The near-zero overlap between the curves underscores the distinct diel niches of these species within the study area.

Discussion

This study provides exploratory evidence of mammal interactions with cassava fields (yucales) in an undocumented context in the Honduran Mosquitia, contributing to the understanding of human–crop–wildlife interactions. The results indicate that attributing crop damage to a single species may be inaccurate, as multiple vertebrate taxa may be involved in agricultural losses. This finding is consistent with regional studies highlighting the ecological and social complexity of these systems, where crop depredation is driven by multiple interacting factors rather than a single problem species (Pérez-Flores et al. 2021; Serrano-MacGregor et al. 2021). Although the Central American tapir may occasionally enter agricultural areas, the magnitude and frequency of damage are strongly influenced by ecological features, such as water availability, landscape context, crop spatial configuration (such as size and degree of edge exposure), and social perceptions, all of which can amplify or misdirect these interactions (Pérez-Flores et al. 2021).

In Honduras, Baird's tapir has been perceived as one of the primary species responsible for crop damage, leading to retaliatory hunting in areas near agricultural lands; for example, Dunn et al. (2012) reported the killing of up to eight individuals. This pattern is consistent with observations from the present study, where local perceptions attributed crop damage mainly to tapirs, despite evidence indicating the involvement of other taxa, particularly *Sylvilagus hondurensis*. These findings highlight the importance of accurately identifying the species involved to guide appropriate management actions and avoid negative impacts on species of conservation concern.

Behavioral responses to light traps varied among species. In particular, small cats exhibited higher behavioral code values (i.e., weaker or absent responses), whereas *S. hondurensis* showed stronger responses relative to other taxa. How-

ever, uneven sample sizes, especially the low representation of *D. punctata*, didelphids, and *T. bairdii* (Fig. 4), limit the robustness of these comparisons and highlight the need for more balanced sampling in future studies. Additionally, ordinal regression analyses indicated that higher behavioral codes (3), corresponding to weaker or absent responses, were more likely to occur later in the day. Overall, these results demonstrate that responses to light stimuli are not uniform across species, with direct implications for the design and targeting of noninvasive mitigation tools. Temporal analyses revealed partitioning of activity among species, with *D. punctata* (Fig. 6) showing strong temporal segregation from both *S. hondurensis* and other sympatric mammals, whereas moderate-to-high overlap was detected among small cats (Fig. 4), *S. hondurensis*, and *T. bairdii*. These patterns suggest that interactions with crops occur within specific temporal windows, indicating that mitigation measures should align with species-specific patterns. Integrating behavioral and temporal information is therefore key to optimizing strategies and minimizing impacts on nontarget species.

The broader literature on human–wildlife interaction management consistently indicates that the lack of accurate species identification in cases of crop damage increases the risk of implementing ineffective, ecologically harmful, or socially costly interventions. Treves et al. (2024) further argue that many nonlethal strategies are promoted without meeting minimal experimental standards, making it difficult to distinguish genuine effects from context-dependent or short-term responses. These findings support this concern and reinforce the importance of clearly separating problem diagnosis—identifying the species involved and their temporal patterns—from the evaluation of mitigation effectiveness (see Figs 7–9 for specific behaviors).

Regarding the use of visual stimuli, both classical and recent reviews concur that deterrent devices are not solutions *per se*, as their effectiveness depends strongly on the sensory biology and behavior of each taxonomic group (Gilsdorf et al. 2002; Rivadeneira et al. 2018). Experimental studies have demonstrated taxon-specific responses to light-based deterrents: intermittent lighting can reduce the approach of large carnivores under certain conditions (Ohrens et al. 2019), whereas automated laser systems have shown effectiveness primarily in birds rather than in mammals (Elbers and González 2021; Kikkert et al. 2024). These differences highlight the risk of extrapolating results across species or regions without context-specific evidence.

From a management perspective, these results support a precautionary and stepwise approach to mitigation. First, noninvasive diagnostic tools, such as the combined use of light traps and camera traps, are essential for reducing errors in attributing crop damage and improving the social legitimacy of management decisions. Second, once the species involved and the critical periods of interaction have been identified, mitigation measures, including visual stimuli or other nonlethal strategies, should be evaluated using robust experimental designs whenever possible, following recommendations for standard experiments in human–wildlife coexistence research (Treves et al. 2024). In subsistence agricultural systems with high socio-environmental sensitivity, such as those in the Honduran Mosquitia, this approach can help minimize impacts, avoid unnecessary effects on wildlife populations, and establish a solid foundation for more effective and ethically consistent coexistence strategies.



Figure 7. Solar-powered LED motion-sensor light interacting with female *Tapirus bairdii* (A), male *Tapirus bairdii* (B), and *Sylvilagus hondurensis* (C).

The results are consistent with this body of evidence, showing that light traps functioned as a selective tool effective at consistently detecting certain taxa but limited others potentially involved in crop depredation. This pattern aligns with studies indicating that artificial lighting and reflective elements can induce avoidance behavior in some vertebrates, particularly birds, thereby altering detection probabilities and introducing monitoring biases (Yi-Hao et al. 2019). Furthermore, artificial light can modify movement patterns and spatial distribution, reinforcing the need to interpret light-based devices as methods with inherent behavioral effects rather than neutral monitoring tools (Adams et al. 2021).



Figure 8. Solar-powered LED motion-sensor light interacting with *Herpailurus yagouaroundi* (above) and *Dasyprocta punctata* (below).

Conclusion

Overall, these findings suggest that light traps show promise as a noninvasive tool for reducing crop damage in Miskitu yucales, although their effectiveness is likely to be species-specific. The relatively low behavioral responses and temporal segregation observed in *S. hondurensis* and *D. punctata*, both frequently cited by residents as crop raiders, indicate that these species may not be strongly deterred by light under the current deployment conditions. And contrary to what local people mentioned, who believed that agoutis and armadillos were responsible for the loss of their crops, no evidence was found that these species caused such damage. In contrast, the higher behavioral responses exhibited by small cats and their temporal overlap with tapirs suggest that some nontarget species may be more sensitive to illumination. Taken together, these results highlight that while light traps can help mitigate human–wildlife conflict, they should be implemented as part of an integrated strategy—incorporating community-based monitoring, adaptive placement, and complementary deterrents—to maximize crop protection while avoiding disproportionate disturbance to nontarget fauna.

However, these findings should be interpreted as preliminary, as the limited sample size and uneven sampling effort constrain the statistical power and generalizability of the results. Therefore, the present study provides primarily exploratory and descriptive evidence, which should be validated through more extensive and systematically balanced sampling designs before light-based deterrents can be considered a fully reliable management tool in this system.



Figure 9. Solar-powered LED motion-sensor light interacting with *Leopardus wiedii* (above) and *Didelphis marsupialis* (below).

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Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statement

No ethical statement was reported.

Artificial Intelligence (AI) use

The authors accept full responsibility for the content of the manuscript, including the disclosure of any use of AI.

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Author contributions

MATC and CML designed the study and developed the methodology. MATC deployed camera traps and motion-sensor lights and compiled the resulting data. All authors wrote the manuscript and interpreted the results. MATC, BP, and MJ secured funding.

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Data availability

All of the data that support the findings of this study are available in the main text.