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Screwworm re-emergence, illegal cattle movements, and emerging risks to wildlife and protected areas in Mesoamerica

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Abstract

New World Screwworm (*Cochliomyia hominivorax*), eradicated from North and Central America through decades of Sterile Insect Technique programs, has re-emerged across Mesoamerica with alarming speed. Following a surge in Panama in 2023, the parasite spread northward through Central America, reaching Mexico by late 2024. Nearly 100,000 domestic animal cases and hundreds of human cases have since been reported, prompting livestock trade restrictions and significant economic losses. Despite this scale, wildlife impacts have received limited attention.

Here, we collate confirmed and suspected screwworm infestation cases in free-ranging wildlife across Mesoamerica, discuss conservation implications and the role of livestock movements as a main driver of the parasite's re-emergence, and propose priority One Health planning. We report screwworm myiasis in four Baird's tapirs (*Tapirus bairdii*) in Costa Rica and camera-trap images from Guatemalan protected areas showing potential screwworm infestation in two pumas (*Puma concolor*) and an additional tapir.

Considering historical data, recent modeling, and current conditions in Mesoamerica such as reduced wildlife populations, degraded habitats, elevated livestock densities, and limited veterinary capacity, we argue that this parasite poses a credible conservation threat. Evidence from detection patterns, enforcement outcomes, and documented trafficking routes implicates illegal livestock movements as a key driver of re-emergence and spread. Sustained control will likely require addressing this underlying driver alongside expanded sterile fly release, strengthened wildlife health surveillance, and cross-sector, transboundary coordination. Integrating wildlife into screwworm response frameworks is essential to protect biodiversity, ecosystem integrity, and sustainability of eradication investments.

New World Screwworm (*Cochliomyia hominivorax*; hereafter "screwworm") is a parasitic fly of the Americas (World Organization for Animal Health [WHOA] 2019). Females lay eggs in open wounds of warm-blooded animals (WOAH 2019); larvae then feed on living tissue, causing damage, pain, and potentially severe morbidity and death (WOAH 2019). Screwworm was a major pest in the early-to-mid 20th century, causing significant economic damage (Novy 1991; Alexander 2006). Impacts on agricultural producers led to a full-scale eradication program in the 1950s in the United States (US) through release of sterile male flies (Sterile Insect Technique [SIT] (Krafsur et al. 1987; Novy 1991; Wyss 2000; Vargas-Terán et al. 2021). After successful eradication from the US, the strategy was repeated southward through Mexico to Panama, rendering Central America screwworm-free by the 2000s (Wyss 2000; WOAH 2019; Vargas-Terán et al. 2021). The Darién Gap jungle straddling the Panama-Colombia border was designated a barrier zone to prevent reinfestation from South America (WOAH 2019; Vargas-Terán et al. 2021). Here, millions of sterile flies were released weekly for decades (Comisión Panamá - Estados Unidos para la Erradicación y Prevención del Gusano Barrenador del Ganado [COPEG] 2024).

Between 2001-2022, Panama experienced sporadic screwworm cases, averaging 25 cases per year (Maxwell et al. 2017; Zaldivar-Gomez et al. 2025). However, cases surged to >6,500 cases in 2023 alone, a 260-fold increase (De Escobar 2023; WOAH 2023; USDA APHIS 2025). From Panama, screwworm rapidly spread northwards across Central America (Zaldivar-Gomez et al. 2025), reaching Mexico by late 2024 (WOAH 2024b). Currently, almost 100,000 screwworm cases in domestic animals and hundreds of human cases have been reported across Mesoamerica (Supplementary Tables S1 and S2). Legal livestock trade among countries has been repeatedly or permanently halted, with significant economic losses (Venegas-Montero et al. 2024; USDA 2025). To date, surveillance has focused primarily on livestock and humans, with wildlife often overlooked despite their susceptibility to infestation and potential consequences for biodiversity, parasite spread, and ecosystem health.

Here, we (i) collate and contextualize emerging screwworm confirmed and suspected infestation cases in wildlife across Mesoamerica, drawing on official reports, field observations, and camera-trap data; (ii) discuss potential impacts for biodiversity conservation (ii) present converging indications that livestock movements constitute a credible driver of the parasite's rapid re-emergence and spread; and (iv) propose priority One Health actions for surveillance, management, and policy.

Confirmed wildlife cases from official sources are detailed in Table 1, excluding exotic species (see Supplementary Table S3 for unofficial reports). We also report four Baird's tapirs (*Tapirus bairdii*) with confirmed screwworm infestation in a fragmented landscape in northwestern Costa Rica between August 2024 and April 2025 (Figure 1): the first tapir screwworm cases during five years of monitoring, occurring ~one year after initial domestic animal cases in the country (Zaldivar-Gomez et al. 2025). Affected individuals presented deep, suppurative wounds with active myiasis in living tissue. The TapirVet Project provided successful veterinary intervention (immobilization, treatment, and post-release monitoring), but two tapirs were subsequently reinfested. Another infested tapir, detected in southwestern Costa Rica, died despite intervention. Additionally, in April 2025, camera-trap monitoring in Guatemala's Mirador-Rio Azul and Laguna del Tigre National Parks, and Naachtun-Dos Lagunas Biotope captured images of two pumas (*Puma concolor*) and a Baird's tapir with distinctive wounds exposing live tissue, consistent with suspected screwworm myiasis (Figure 2A-C). Across >20,000 camera-trap nights in these parks since 2019, diverse morbidities have been documented, including injured or missing limbs. These represent the first lesions observed with characteristics suggestive of screwworm infestation. The first puma (Figure 2A) was detected seven months after Guatemala's first domestic case (Zaldivar-Gomez et al. 2025) and within two weeks of cases in Mexico ~35 km away (Figure 2D). The second puma and tapir (Figure 2B–C) were photographed one month apart and ~2 km from each other, with domestic cases reported within 12–18 km in the preceding 2–3 months (Figure 2D). Given limited wildlife health surveillance (WHS) in many countries (Machalaba et al. 2021) and the inherent challenges of detecting disease in free-ranging wildlife, reported cases likely underestimate the true extent of infestation.

Short-term, population-level impacts on Mesoamerican wildlife remain to be assessed; however, screwworm poses a plausible conservation threat. Following a reintroduction to the Florida Keys in 2016, a region similarly suitable for year-round screwworm reproduction, 15–20% of endangered Florida Key deer (*Odocoileus virginianus clavium*) died or were euthanized (Delgado et al. 2016; Skoda et al. 2018; Parker et al. 2020). The outbreak was contained before fawning season, likely averting greater population-level effects (Lopez et al. 2016; Parker et al. 2020). The Florida Keys constitute a highly managed, insular system with intensive surveillance and rapid response capacity, enabling faster containment than is generally feasible in mainland Mesoamerican settings.

Medium- to long-term impacts, should endemicity be reestablished, are difficult to infer due to limited comparable data. Reports from pre-eradication endemic North America, where ecological and socio-environmental conditions differed from contemporary Mesoamerica, describe seasonal infestation, periodic large outbreaks in wildlife (Lindquist 1937; Allen 1950; Strode 1954) and reductions of up to 60% in deer fawn survival (Teer et al. 1965; Marburger & Thomas 1965), suggesting that the parasite contributed to regulating wild mammal populations (Marburger & Thomas 1965; Alexander 2006).

Pre-eradication data on wildlife populations and screwworm infestation levels in Mesoamerica are lacking; however, screwworm myiasis cases in an endangered tapir species (*Tapirus pinchaque*) were reported in Colombia, where screwworm remains endemic (Cepeda-Duque et al. 2025). Recent published modeling suggests that the parasite could drive local extinction of this species within a national park surrounded by degraded landscape, even in the absence of hunting or further habitat loss (Mantilla-Meluk et al. 2025). Several key socio-ecological conditions shaping parasite-wildlife dynamics have changed in Mesoamerica since pre-eradication and now resemble aspects of the Colombian scenario. Wildlife populations have sharply declined (World Wildlife Fund for Nature 2024), while natural habitats have been degraded (Auliz-Ortiz et al. 2024). At the same time, a substantially larger regional cattle population (Food and Agriculture Organization of the United Nations [FAO] 2025; Supplementary Information Figure S1) has altered landscape connectivity (Devine et al. 2020a) and potential host density. Gutierrez et al. (2019) noted that SIT succeeded partly because oviposition sites were sparse; in contrast, contemporary livestock densities may provide abundant and continuous oviposition opportunities, potentially increasing infestation pressure on both domestic animals and wildlife relative to historical conditions.

Taken together, this context—along with confirmed animal infestations near and within protected areas (Figures 2 and 3; Supplementary Information Figure S2), the fly's broad host range and dispersal capacity (Mayer & Atzeni 1993; Alexander 2006; WOAH 2019; Venegas-Montero et al. 2024), detection of suspect wildlife cases shortly after nearby domestic cases (Figure 2D), reinfestation of treated wild animals, repeated parasite incursions into cleared zones, limited veterinary capacity in remote landscapes (Pérez-Flores et al. 2025), and potential for climate-driven range expansion— underscores the need for proactive WHS and monitoring of conservation impacts.

In response to screwworm reemergence, governments across the region are implementing a range of measures aimed at containing reinfestation and protecting livestock and public health. This includes strengthening law enforcement, controlling livestock movement, conducting livestock surveillance and treatment, awareness campaigns, and fly trapping (Instituto de Protección y Sanidad Agropecuaria 2024; Servicio Nacional de Salud Animal 2024; Ministerio de Agricultura y Ganadería 2025; Servicio Nacional de Sanidad e Inocuidad Agroalimentaria 2025; Servicio Nacional de Sanidad, Inocuidad y Calidad Agroalimentaria [SENASICA] 2025a, 2025b; Ministerio de Agricultura, Ganadería y Alimentación 2025). Sterile flies are being released in Mexico, with expanded release and distribution planned for 2026, especially along the US-Mexico border (COPEG 2025, USDA 2025, USDA 2026).

Despite these efforts, WHS remains limited. Strengthened and sustained monitoring of wildlife populations and health is essential to assess screwworm impacts, identify species relevant to dispersal, clarify contemporary disease ecology, inform adaptive conservation and management planning, enable timely detection of newly infested areas, support targeted fly trapping, evaluate control measures and sterile fly release effectiveness, and increase confidence in elimination during re-eradication efforts (Matlock et al. 1996; USDA 2025; WOAH 2019). In addition to targeted wildlife capture for research or mitigation, broader coverage of suspect cases could be achieved by leveraging existing field networks, including rangers, community members, and camera traps (Lawson, Petrovan, Cunningham, AA. 2015; Barroso & Palencia 2025; Montecino-Latorre et al., 2026).

Livestock movement, historically a primary driver of propagation (Novy 1991; Lindquist et al. 1992; Reichard 1999; Alexander 2006; Vargas-Terán et al. 2021), appears to be a key contributor to screwworm's reemergence and spread (Zaldivar-Gomez et al. 2025). This hypothesis is supported by earlier-than-expected reemergence in Mexico (Zaldivar-Gomez et al. 2025); detection patterns bypassing adjacent administrative units rather than following a diffusion-like process (Zaldivar-

Gomez et al. 2025 and Supplementary Information 1); and introduction into new Mexican states and municipalities linked to cattle movements (SENASICA 2025c, 2025d). Moreover, large-scale illegal cattle transport routes running from Nicaragua through Honduras and Guatemala into Mexico are well-documented (Asmann & Dittmar 2022; InSight Crime 2022; Montoya 2022; Hidalgo, 2025). Cattle trafficking bypasses sanitary controls, supporting spread of parasites and pathogens (Asmann & Dittmar 2022). Despite sterile-male fly releases during the northward advance, the parasite reached Mexico (COPEG 2025). Initial detections in several countries were in illegally imported horses and cattle (WOAH 2024a, 2024b), and within-Mexico spread appears to have slowed following stricter enforcement of "healthy-only" livestock transport (SENASICA 2025a).

We argue that sustained control of screwworm is unlikely without addressing illegal livestock traffic, although clarifying its relative importance versus other drivers of reemergence remains a critical research need. Other potentially contributing factors include SIT failure (Maxwell et al. 2017), climate change (Gutierrez & Ponti 2014), and migration of people and potentially domestic animals. The relative contribution of wildlife- or invasive species- mediated screwworm spread remains uncertain, however these animals could become comparatively more important in maintaining or spreading the parasite if livestock infestations and illegal movements are effectively controlled.

Facilitation of screwworm re-emergence is just one social-ecological concern associated with illegal cattle movements. Cattle trafficking, linked to organized crime and some of the world's highest rates of deforestation, creates conditions that intensify wildlife–livestock interfaces, undermine disease control, and amplify conservation risks. (FAO 2006; Consejo Nacional de Areas Protegidas & WCS 2018; McSweeney et al. 2018; Devine et al. 2020b; Tellman et al. 2020; Wrathall et al. 2020; Asmann & Dittmar 2022; InSight Crime 2022; Dittmar et al. 2022, Montoya 2022). By 2022, at least 1 million cattle illegally occupied Mesoamerican protected areas (McSweeney et al. 2014; Tellman et al. 2020; Asmann & Dittmar 2022; InSight Crime 2022; Montoya 2022), and key cross-border trade points include such zones (Soberanes 2018; Dittmar et al. 2022; InSight Crime 2022). Unregulated livestock movement also risks introducing other transboundary pathogens, e.g., Foot and Mouth Disease or African Swine Fever, which threaten wildlife health, livestock, livelihoods, and economies, and can cause trophic cascades (WOAH 2025; Humphreys et al. 2025; Kuiken and Cromie 2022).

Re-emergence of screwworm in Mesoamerica brings renewed focus to a potentially consequential threat to biodiversity, protected area integrity, and ecosystem health. While screwworm eradication programs have long prioritized livestock protection, wildlife impacts have remained largely peripheral to surveillance and response strategies. Given cross-cutting ecological, economic, and public health implications, screwworm re-emergence constitutes a One Health challenge that extends beyond livestock production. Sustained transboundary and cross-sector coordination, coupled with the integration of wildlife considerations into national One Health frameworks, can reduce disease risk while reinforcing conservation governance and landscape integrity. This requires a comprehensive, coordinated, multi-pronged strategy that combines existing control measures with integration of wildlife health monitoring into protected area management, establishment of rapid response protocols, strengthened enforcement against livestock trafficking, and support for legal ranchers and affected communities.

Without such integration, gains achieved through decades of eradication, conservation progress, and public investment may prove fragile in the face of shifting ecological and socio-economic pressures.

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Table 1. Confirmed cases of screwworm infestation in native wild species in Central America, as reported in official sources until July 2025.

Country	**Affected wild animal** (identified to taxonomic level reported in the source)	**Number of cases**	**Captivity status**	**Source**
Panama	New World porcupine (*Coendou sp*)	1^	Unknown	https://mida.gob.pa/wp-content/uploads/2025/07/BoletinMensual_Mayo-2025.pdf?csrt=4956185204491234556
	Folivora (species of sloth)	1*		https://mida.gob.pa/wp-content/uploads/2025/06/BoletinMensual_Abril-2025.pdf?csrt=4956185204491234556.
	Kinkaju (*Potus flavus*)	2		https://www.copeg.org/situacion-actual/situacion-panama/
	Deer	1		
	Sloth	1*		
	Porcupine	1^		
Costa Rica	Unknown[$]	20	Probably free-ranging	https://www.senasa.go.cr/informacion/centro-de-informacion/informacion/estado-sanitario/boletines-epidemiologicos/10349-2025-04-boletin-epidemiologico/file https://www.senasa.go.cr/informacion/centro-de-informacion/informacion/estado-sanitario/boletines-epidemiologicos/10301-2025-03-boletin-epidemiologico/file https://www.senasa.go.cr/informacion/centro-de-informacion/informacion/estado-sanitario/boletines-epidemiologicos/10302-boletines-epidemiologicos-2024/file
	Brown-throated sloth (*Bradypus variegatus*)	1	Probably free-ranging	https://www.senasa.go.cr/informacion/centro-de-informacion/informacion/estado-sanitario/boletines-epidemiologicos/10302-boletines-epidemiologicos-2024/file

Guatemala	Common opossum (*Didelphis marsupialis*)	1	Free-ranging	https://wahis.woah.org/#/in-review/5986?reportId=175268&fromPage=event-dashboard-url
Mexico	Roadside hawk (*Rupornis magnirostris*)	2	Free-ranging	Reported in WAHIS as an Eurasian sparrowhawk (*Accipiter nisus*) in Event 6269 (https://wahis.woah.org/#/in-review/6269?reportId=175092&fromPage=event-dashboard-url) which is not native to Mexico. A red-shouldered hawk was also reported later in https://www.excelsior.com.mx/nacional/gusano-barrenador-confirman-primer-caso-animal-silvestre/171993. However, Servicio Nacional de Sanidad, Inocuidad y Calidad Alimentaria (SENASICA) México confirmed both birds were in fact Roadside hawk.

* ^: They could be the same individual

[$]: A press release by Sistema Nacional de Áreas de Conservación in September 2024 mentions 6 infestation cases of two-toed sloth (*Choloepus hoffmani)*, two of the infestation cases in Baird's tapirs (*Tapirus bairdii*) reported in this document, and a case in Mexican hairy dwarf porcupine (*Sphiggurus mexicanus*; see http://www.sinac.go.cr/ES/noticias/ComPrensa/ComunicadosPrensaSetiembre22102024.zip

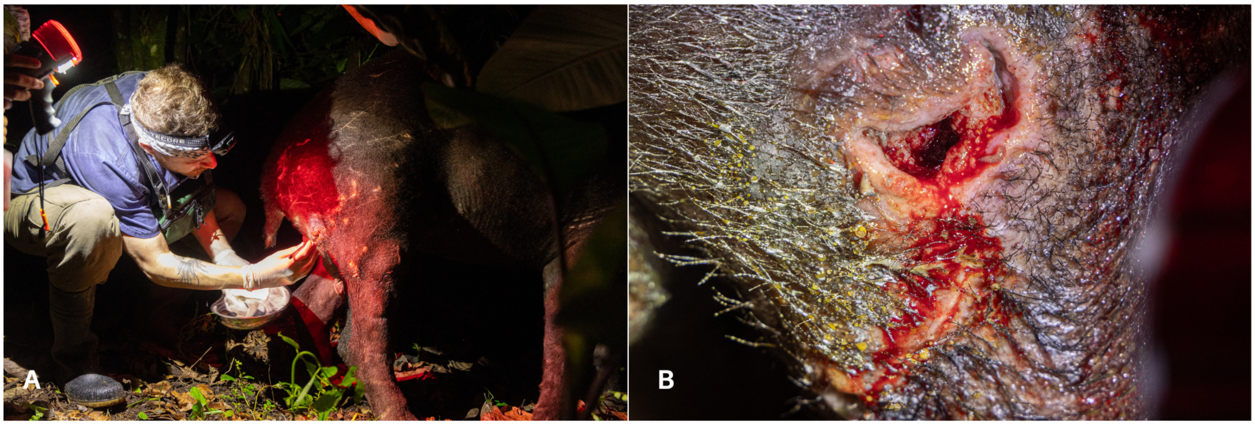

Figure 1. A) Treatment of a wound in a sedated Central American tapir (*Tapirus bairdii*) likely resulting from intraspecific conflict and infested by New World Screwworm (*Cochliomyia hominivorax*). Treatment administered by co-author Dr. Jorge Rojas-Jiménez (TapirVet Project). B) Close-up of the infested wound with fly larva on the low edge. The tapir was successfully treated and fully recovered. Photographs: Michiel van Noppen.

Figure 2. Camera trap images of two pumas (*Puma concolor*; panel A and B) and a Baird’s tapir (panel C) with open wounds, potentially caused by screwworm infestation, documented in the Naachtún-Dos Lagunas Biotope, Maya Biosphere Reserve, and Laguna del Tigre National Park, Guatemala (WCS 2025). D) Locations of screwworm confirmed infestations in domestic animals (points) in northern Guatemala and southern Mexico between October 2024 and June 2025 according to data in the World Animal Health Information System (WAHIS) database and Ministerio de Agricultura, Ganadería y Alimentación, Guatemala; and locations of the pumas and Baird’s tapir described in panels A-C (asterisks). The color scale of points and asterisks shows the date of the report with grading from dark blue (for cases detected in October 2024) to yellow (for cases detected in June 2025); points and asterisks with similar colors indicate cases closer in time.

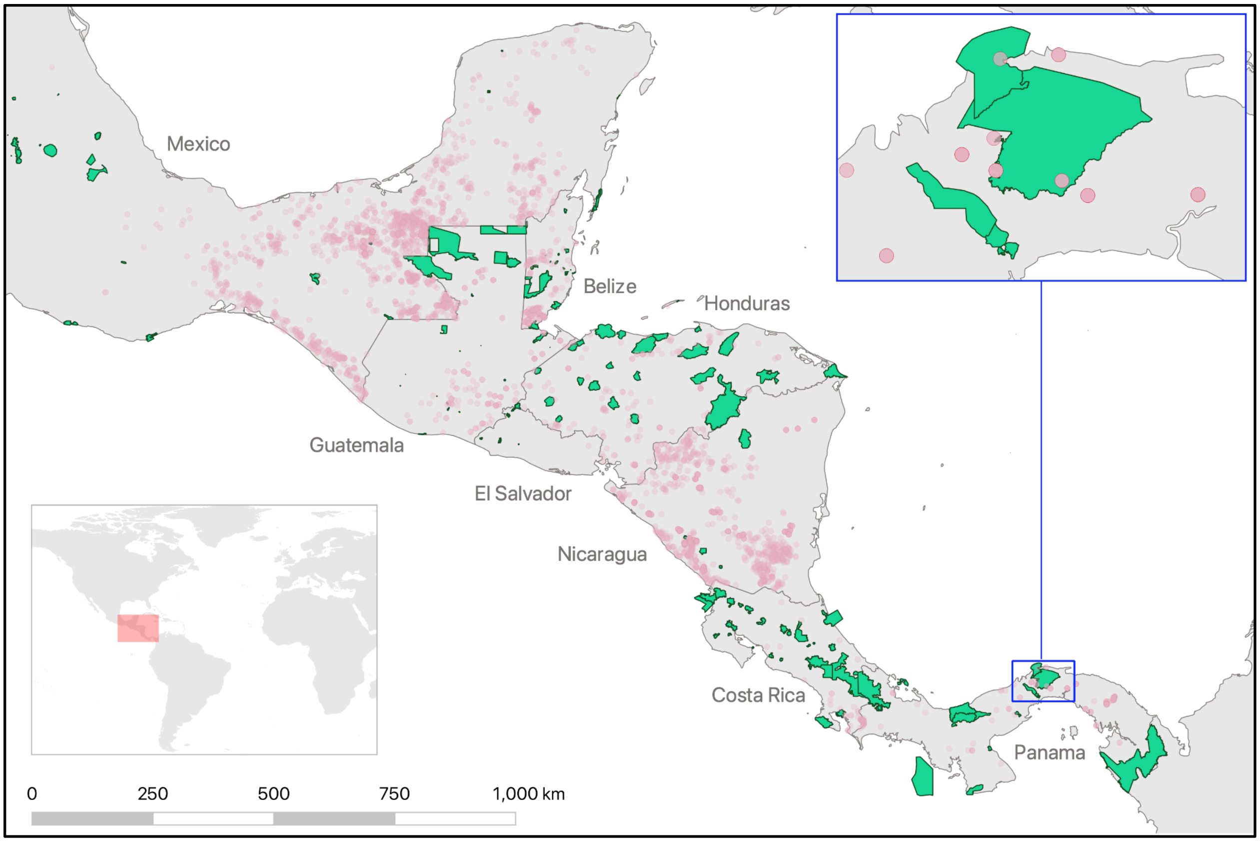

Figure. 3. The spatial distribution of confirmed screwworm infestation in animals between January 1st, 2023, and July 26th, 2025 (red circles) according to data in the WAHIS database; and national parks with terrestrial components (green polygons) according to the World Database on Protected Areas in Central America and Southern Mexico. Other protected area types, such as RAMSAR sites, are not shown. The blue-framed inset shows reported cattle infestation cases in Chagres and Portobelo National Parks, Panama.