Title: Illegal cattle trade brings New World Screwworm to wildlife and continues to destroy protected areas in Mesoamerica

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Abstract

The New World Screwworm (*Cochliomyia hominivorax*; “screwworm”) is a parasitic fly historically endemic to the Americas. Females lay eggs in open wounds of warm-blooded animals, including humans. The emerging larvae feed on the host’s living tissue, often resulting in severe damage and potentially death.

After five decades of coordinated efforts, the screwworm was successfully eradicated from North and Central America by the early 2000s. However, it reemerged in 2023, spreading across Mesoamerica and southern Mexico. Almost one hundred thousand domestic animal infestation cases and hundreds of human cases have been reported in this region as of July 2025.

Wildlife has also been affected. We report confirmed infestations in *Tapirus bairdii* (Baird’s tapir) in Costa Rica and a probable infestation in a *Puma concolor* (puma) in Guatemala, and outline additional wildlife cases reported in official and non-official sources. Given the ongoing decline of wildlife populations and regional ecological conditions in Mesoamerica, the parasite could be catastrophic for biodiversity in this region. It is urgent to establish coordinated monitoring of cases in wildlife, assess screwworm consequences in these populations, and adjust conservation plans as needed.

Documented cattle trafficking routes that allow evasion of sanitary control points have likely played a central role in the parasite's resurgence by fast-tracking movement of larval stages across Central America. We summarize previously described connections between cattle trafficking networks, narcotrafficking, habitat destruction, and deforestation of natural habitats, including protected areas in this region, and discuss their link with wildlife health through the screwworm. Urgent action is needed to halt cattle trafficking in order to control screwworm spread, prevent the introduction, propagation, and spillover of other high-risk pathogens into wildlife populations, and safeguard regional biodiversity conservation objectives.

Communication

The New World Screwworm (*Cochliomyia hominivorax*; hereafter "screwworm") is a parasitic fly originally found in the Americas (World Organization for Animal Health [WOAH] 2019). Females lay eggs in open wounds of warm-blooded animals and humans (WOAH 2019). The hatched larvae feed on the living tissue, causing damage, severe pain, and facilitating secondary infections, potentially resulting in death of the host (WOAH 2019).

The screwworm was a major pest in the early to mid-20th century, causing losses in livestock and wild animals and economic damage (Novy 1991; Alexander 2006). In the 1950s, a full-scale eradication program was initiated in the southeastern United States through the release of sterile male flies (Sterile Insect Technique [SIT]; Krafsur et al. 1987; Novy 1991; Wyss 2000; Vargas-Terán et al. 2021). After eradicating the parasite, 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 that straddles 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 (Maxwell et al. 2017; Zaldivar-Gomez et al. 2025); however, the parasite reemerged in this country in 2023 (De Escobar 2023; WOAH 2023). Potential factors facilitating this reemergence include SIT failure (Maxwell et al. 2017), operational challenges to produce and release sterile male flies (WOAH 2024), climate change (Gutierrez & Ponti 2014), and migration of half a million people in 2023 alone, and potentially domestic animals, from South to Central America across the Darien gap, (Maxwell et al. 2017; United Nations High Commissioner for Refugees & International Organization for Migration 2023; COPEG 2024).

From Panama, the screwworm rapidly spread northwards, reemerging throughout Central America (Zaldivar-Gomez et al. 2025) and reaching Mexico by late 2024 (WOAH 2024b). Movement of domestic livestock, historically a primary driver of screwworm propagation (Novy 1991; Lindquist et al. 1992; Reichard 1999; Vargas-Terán et al. 2021), is linked to the current reemergence (Zaldivar-Gomez et al. 2025). Indeed, initial detection in Honduras and Mexico occurred in illegally imported horses and cattle (WOAH 2024a, 2024b). Well-documented routes for illegal cattle trafficking run from Nicaragua through Honduras and Guatemala into Mexico,

where animals are integrated into the legal trade and even transported onward to the United States (Asmann & Dittmar 2022; InSight Crime 2022; Montoya 2022). Key cross-border points, including Benemérito de las Américas and protected areas, are also known (Soberanes 2018; Dittmar et al. 2022; InSight Crime 2022). Such cattle trafficking favors the spread of parasites and pathogens, as sanitary controls are bypassed (Asmann & Dittmar 2022).

The epidemiological consequences of this illegal activity were foreseeable. Currently, almost one hundred thousand screwworm infestation cases in domestic animals and hundreds of human cases have been reported from Panama to Mexico, and case numbers continue to rise (Supplementary Tables S1 and S2). Additionally, animal imports have been permanently or repeatedly halted, resulting in significant economic losses (Venegas-Montero et al. 2024; United States Department of Agriculture [USDA] 2025). Major media outlets in the United States are warning about the potential impacts of reemergence in the country, including increases in beef prices (Sulhotra 2025).

Wildlife in the region is also being impacted. Cases reported in official bulletins and unofficial sources are detailed in Table 1. We detected three Baird's tapirs (*Tapirus bairdii*) infested with screwworm in a fragmented landscape in northwestern Costa Rica between August 2024 and April 2025 (Figure 1). The initial detection occurred about a year after the first case in domestic animals in this country. These individuals presented deep, suppurative wounds with active myiasis, receiving successful veterinary intervention through the TapirVet Project. However, one of these tapirs was subsequently reinfested. These are the first screwworm infestation cases found during five years of monitoring. Another tapir case was detected in the Osa Peninsula, southwestern Costa Rica, which died despite veterinary intervention. Each affected animal required field mobilization, chemical immobilization, wound treatment, and post-release monitoring for 15-21 days, costing between 3,000-5,000 USD.

Table 1. Cases of screwworm infestation in wild species in Central America as reported in official and unofficial sources.

Country	Species	Number of cases	Captivity status	Source	Official Source
Panama	Hystricomorpha	1^	Unknown	https://mida.gob.pa/wp-content/uploads/2025/07/BoletinMensual_Mayo-2025.pdf?csrt=4956185204491234556	Yes
	Folivora	1*		https://mida.gob.pa/wp-content/uploads/2025/06/BoletinMensual_Abril-2025.pdf?csrt=4956185204491234556.	Yes
	Kinkaju (*Potus flavus*)	2		https://www.copeg.org/situacion-actual/situacion-panama/	No
	Deer	1			
	Leopard (*Panthera pardus*)[#]	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	Yes
	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	Yes
	Three-toed sloth (*Bradypodidae*)	Unknown	Unknown	https://news.mongabay.com/2024/11/a-deadly-fly-is-spreading-through-central-america-experts-blame-illegal-cattle-ranching/?utm_source=chatgpt.com	No
	Two-toed sloths (*Choloepus sp*)				

	Erethizontidae				
	Howler monkey (*Alouatta sp*)				
Honduras	*Egret* (*Egretta sp*)	1	Unknown	https://criterio.hn/tras-casi-30-anos-de-erradicacion-honduras-enfrenta-una-emergencia-sanitaria-por-el-gusano-barrenador	No
Nicaragua	Unknown	26	Unknown	https://radiolaprimerisima.com/managua-lidera-casos-de-personas-afectadas-por-gusano-barrenador/	No
El Salvador	Deer	1	Unknown	https://diario.elmundo.sv/economia/un-venado-aves-y-mapaches-positivos-a-gusano-barrenador-docente-de-la-ues-advierte-de-riesgo-a-la-biodiversidad	No
	Racoon (*Procyon lotor*)	Unknown			
	Bird				
Guatemala	Lion (*Panthera leo*)	1	Captive	https://wahis.woah.org/#/in-review/5986?reportId=175268&fromPage=event-dashboard-url	Yes
	Common possum (*Didelphis marsupialis*)	1	Free-ranging		
Belize	Howler monkey (*Alouatta sp*)	2	Unknown	https://www.facebook.com/100063547151268/posts/1315123747282518/	No
Mexico	Red-shouldered hawk (*Buteo lineatus*)	1	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), but reported as a Red-shouldered hawk later. See https://www.excelsior.com.mx/nacional/gusano-barrenador-confirman-primer-caso-animal-silvestre/1719933	Yes

* ^: They could be the same individual

[#]: Not native to Panama

[$]: 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).

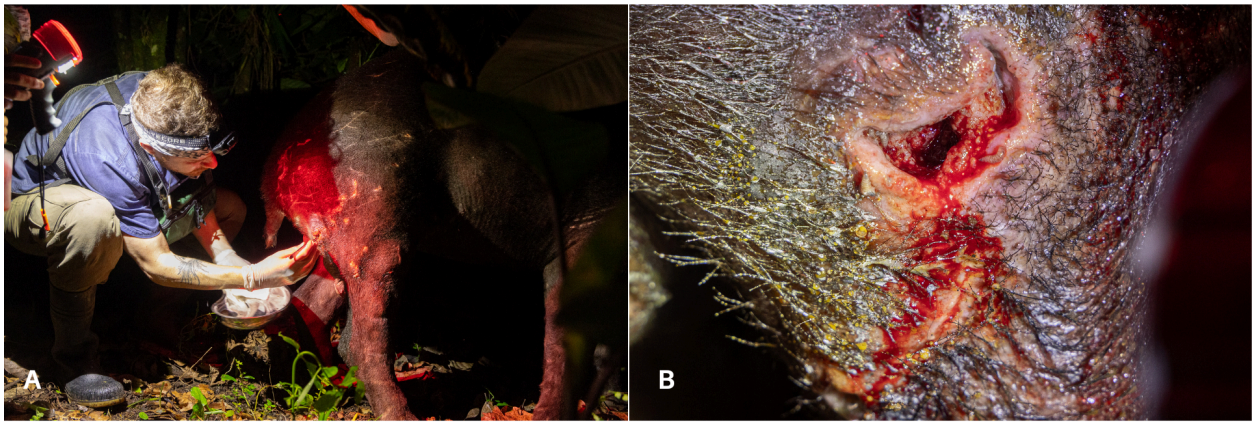

Figure 1. A) Treatment of a wound in a sedated Central American tapir (*Tapirus bairdii*) infested by New World Screwworm (*Cochliomyia hominivorax*), likely resulting from intraspecific conflict. The wound was treated by co-author Dr. Jorge Rojas-Jiménez and the TapirVet Project team. B) Close view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

In April 2025, our camera-trap wildlife monitoring in Guatemala's Mirador-Rio Azul National Park and Naachtun-Dos Lagunas Biotope, captured photographic evidence of a puma (*Puma concolor*) likely infested with screwworm (Figure 2). This animal was recorded seven months after the first domestic animal case reported in this country (Zaldivar-Gomez et al. 2025). Hundreds of mammals, including pumas, jaguars, and tapirs, have been recorded during more than 20,000 camera-trap nights at this national park since 2019. This is the first time an animal with this type of lesion has been observed.

Figure 2. Camera trap image of a puma (*Puma concolor*) with an open wound, potentially caused by New World Screwworm (*Cochliomyia hominivorax*) infestation, documented in the Naachtún-Dos Lagunas Biotope, Maya Biosphere Reserve, Guatemala (WCS 2025).

Historically, the screwworm may have acted as a natural regulator of wildlife populations (Novy 1991; Alexander 2006). Today, however, large and increasing cattle numbers (Food and Agriculture Organization of the United Nations [FAO] 2025) expose wildlife to parasitic loads that exceed pre-eradication levels. Along with the sharp decline of wild animal populations across Mesoamerica (World Wildlife Fund for Nature 2024), this means that remaining wildlife may no longer be able to withstand the added pressure of screwworm infestations.

Several converging factors compound this risk: screwworm infestations in domestic animals near and within protected areas (Figure 3), suitable climatic conditions for the parasite (Venegas-Montero et al. 2024), poor livestock condition and limited rural veterinary coverage near biodiversity hotspots (Pérez-Flores et al. 2025), the screwworm's broad host range and dispersal capacity (Mayer & Atzeni 1993; Alexander 2006; WOAH 2019), and the 20% mortality observed in Florida's Key deer during a 2017 outbreak (Skoda et al. 2018), together suggest the parasite could further reduce wildlife populations. This outcome would increase wildlife vulnerability to stochastic events and other concomitant threats, such as ongoing habitat destruction in Central America (Devine et al. 2020a), potentially triggering cascading ecosystem effects and catastrophically impacting biodiversity conservation in the region.

Continuous monitoring of Mesoamerican wildlife populations and their health is essential for understanding the impacts of screwworm and the timely adaptation of conservation plans and priorities. Biologists, rehabilitation centers, and rangers, such as those at Reserva Maya trained to document health events (Montecino-Latorre et al. 2024), can all contribute. We encourage active and open collaboration between global and regional organizations (e.g., Organismo Internacional Regional de Sanidad Agropecuaria and WOAH), national authorities, conservation and other private organizations, legal ranchers, researchers, and the public. The Wildlife Conservation Society, a WOAH collaborating center with on-the-ground presence in Guatemala, Belize, and Honduras, could facilitate these efforts regionally.

In addition to the immediate economic losses, screwworm reemergence undermines seven decades of eradication efforts and millions of dollars in prior investments. Governments are reacting by finally enforcing existing laws, controlling livestock movement, conducting surveillance, treating cases, raising public awareness, 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 2025a, 2025b; Ministerio de Agricultura, Ganadería y Alimentación 2025). Sterile male flies are being released in Mexico (COPEG 2025), with expanded sterile insect releases planned but not expected before the end of 2026 (USDA 2025).

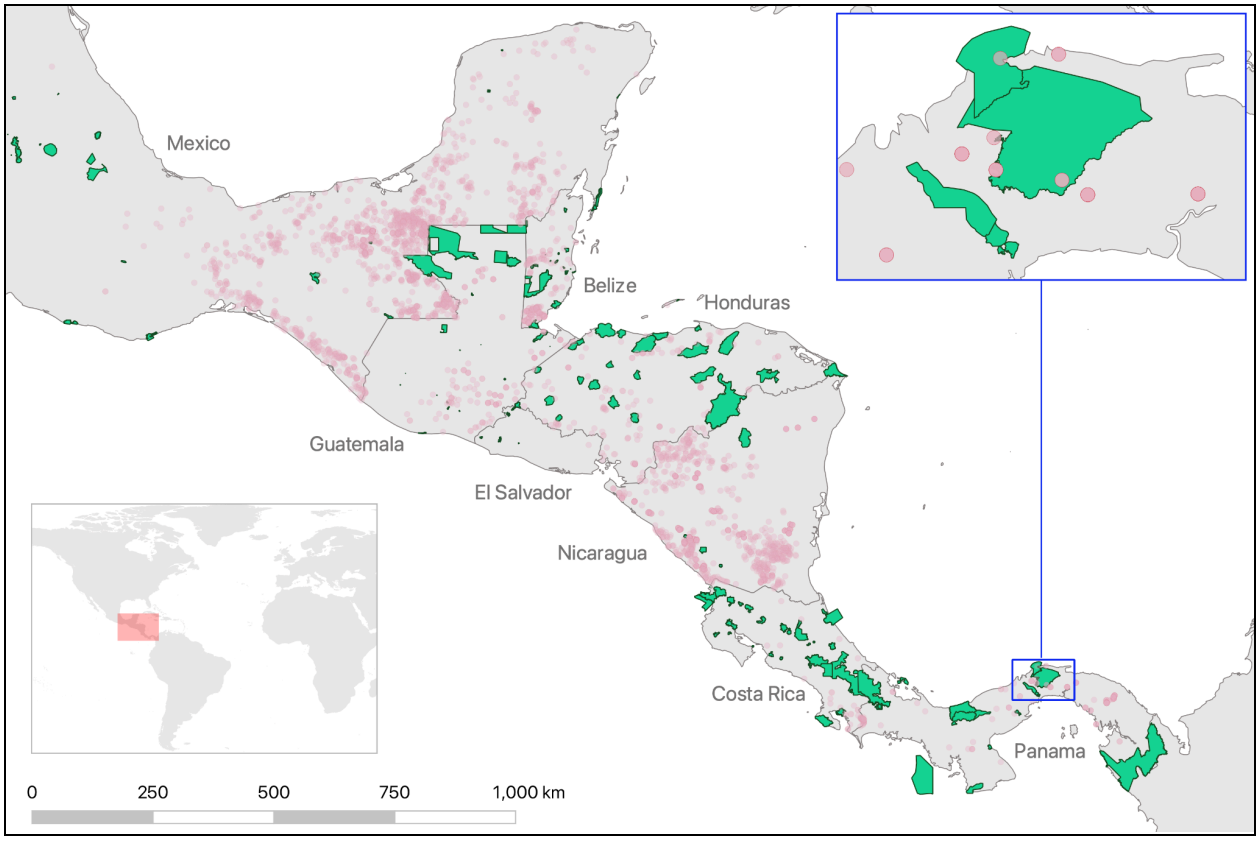

Figure. 3. The spatial distribution of confirmed screwworm infestation in animals between January 1st, 2023, and July 26th, 2025 (red circles) according to data in the World Animal Health Information System database (https://wahis.woah.org/#/event-management), and national parks with terrestrial components (green polygons) according to the World Database on Protected Areas (https://www.protectedplanet.net/en/thematic-areas/wdpa?tab=WDPA) 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.

These activities mirror those implemented to achieve screwworm eradication in the 20th century (Krafsur et al. 1987; Novy 1991; Wyss 2000). However, cattle trafficking has, until recently, operated openly for years, and control and eradication efforts require sustained political and financial commitment. Continued spread and reinfestation are likely unless illegal cattle corridors are effectively controlled. Despite the release of sterile male flies across countries as the screwworm advanced northward from Panama, the parasite still reached Mexico (COPEG 2025), likely fast-tracked in its larval stage through these unregulated livestock pathways. Moreover, SIT may no longer be as effective as it was in the 20th century. A retrospective study by Gutierrez, Ponti, and Arias (2019), indicates that this technique succeeded in tropical regions partly due to low success rates of flies in finding oviposition sites and their sparse availability. Current ecological conditions, particularly the contemporary expansion of cattle rearing, have likely modified these parameters.

Screwworm emergence is the latest social-ecological consequence of cattle trafficking in Mesoamerica. But this activity could also facilitate the introduction and spread of other transboundary pathogens. For example, Central America and Mexico currently maintain “Foot-and-Mouth Disease-free without vaccination” status, while parts of South America are “Foot-and-Mouth Disease-free with vaccination” or do not have an official status (WOAH 2025). African Swine Fever, historically absent from the Americas, has been present in the Dominican Republic and Haiti since 2021 (WOAH 2025). These pathogens could not only devastate regional livestock economies but also further threaten conservation efforts across Mesoamerica and the rest of the continent.

Moreover, cattle trafficking and ranching represent a major driver of deforestation and environmental degradation across Central America, operating within what researchers term "narco-degradation" networks that systematically target the region's most vulnerable ecosystems (Asmann and Dittmar 2022; Devine et al. 2021; Devine et al. 2020; Tellman et al. 2020). Honduras, Guatemala, and Nicaragua have experienced some of the world's highest deforestation rates since 2000, with forest loss accelerating after 2005, coinciding with increased drug trafficking activity (Food and Agriculture Organization 2006; McSweeney et al. 2014; Tellman et al. 2020). Cattle trafficking is usually tied to organized narcotrafficking, money laundering, violence, and land usurpation (McSweeney et al. 2014; Tellman et al. 2020; Asmann & Dittmar 2022; InSight Crime 2022; Montoya 2022). Many smuggling routes cross protected areas, with “narco-ranches” clearing forest for grazing along international borders (Wrathall et al. 2020; Dittmar et al. 2022), including Laguna del Tigre National Park in Guatemala (Consejo Nacional de Areas Protegidas & Wildlife Conservation Society 2018; Devine et al. 2020b) and the Honduran Mosquitia (McSweeney et al. 2018; Asmann & Dittmar 2022; Montoya 2022). The consequence is at least ~ 1 million cattle occupying protected areas across Mesoamerica by 2022 (Dittmar et al. 2022), creating, expanding, and intensifying wildlife-livestock interfaces and increasing the chances of livestock-wildlife pathogen spillover.

The convergence of criminal enterprises and illegal cattle ranching, with associated disease emergence, environmental degradation, and habitat loss, represents a fundamental threat to biodiversity conservation in Central America. Without urgent, intersectoral, coordinated intervention, decades of conservation achievements are being rapidly undone.

Combining current reactive controls with a comprehensive multi-pronged strategy can address drivers of screwworm emergence while advancing broader conservation and sustainability goals across Mesoamerica. Win-win actions need increased governmental investment and sustained political commitment and include: reclaiming protected areas from illegal ranchers; incorporating livestock and wildlife health monitoring into protected area management plans (Montecino-Latorre, Pruvot, and Olson 2025); enforcing buffer zones around protected areas; developing and implementing rapid response protocols for screwworm and other health threats in and around protected areas; supporting alternative income sources to farmers in rural areas; promoting legal ranchers to lobby against and combat the broader conditions that fuel screwworm resurgence (Hidalgo 2025); and rigorously enforcing laws against illegal trafficking, unauthorized grazing, and habitat encroachment. Given impacts across interconnected social-ecological-health domains, screwworm reemergence and its drivers represent a One

Health crisis. Confronting this urgent challenge requires a paradigm shift towards truly integrated approaches that incorporate simultaneous intervention across livestock management, law enforcement, human healthcare, biodiversity conservation, community engagement, and environmental monitoring. Delayed action risks serious long-term consequences for Mesoamerica's forests, wildlife populations, protected areas, and rural livelihoods.

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Supplementary Information

Supplementary Table S1. Number of cases of New World Screwworm in non-human animal species in Central America and Mexico between January 2023 and July 2025 as reported in the World Animal Health Information System database (WAHIS) of the World Animal Health Organisation and reported by the Organismo Internacional Regional de Sanidad Agropecuaria (OIRSA) in March 2025 and June 2025.

Country	**WAHIS July 27th, 2025**	**OIRSA, March 2nd - 8th, 2025[1]**	**OIRSA, June 22nd - 28th, 2025[2]**
Belize	218	25	198
Costa Rica	14878	16325	22122
El Salvador	1	356	2973
Guatemala	815	282	1353
Honduras	960	863	1984
Mexico	2500	164	2791
Nicaragua	8569	13945	19430
Panama	29776	37697	48133
Total	**57717**	**68257**	**98986**

[1]https://rr-americas.woah.org/en/events/19th-meeting-of-the-regional-steering-committee-of-the-gf-tads-for-the-americas/ and https://rr-americas.woah.org/app/uploads/2025/04/Situacion-actual-GBG-OIRSA_GFTAD%C2%B4s-17.03.2025_ENG.pdf)

[2]https://www.sica.int/noticias/se-comisca-realizo-webinario-sobre-el-gusano-barrenador-con-enfoque-regional_1_135415.html

Supplementary Table S2. Number of cases of New World Screwworm in humans in Central America and Mexico since the reemergence of this parasite in each country as reported in the last national surveillance bulletin available in July, 2025.

Country	Number of cases	Source	Official Source
Panama	116 by week 28, 2025	https://www.minsa.gob.pa/sites/default/files/publicacion-general/boletin_epidemiologico_semanal_se28final-mm.pdf	Yes
Costa Rica	56 cases by week 27, 2025	https://www.ministeriodesalud.go.cr/index.php/biblioteca/material-educativo/material-publicado/boletines/boletines-vigilancia-vs-enfermedades-de-transmision-vectorial/boletines-epidemiologicos-2025/9420-boletin-epidemiologico-n-27-6/file	Yes
Nicaragua	125 cases by July 9th , 2025	https://www.lavanguardia.com/vida/20250607/10764415/nicaragua-reporta-117-casos-gusano-barrenador-humanos-abril-2024-agenciaslv20250607.html https://nicaraguainvestiga.com/nacion/162216-reportan-100-casos-gusano-barrenador-humanos-nicaragua/#utm_source=chatgpt.com	No
Honduras	126 cases by week 29, 2025	https://drive.google.com/drive/u/0/folders/1DS2ZYq6Jecm786xXtaaRml5TgIwn9Reu	Yes
El Salvador	3 cases by week 27, 2025	https://boletin.salud.gob.sv/superset/dashboard/2/?standalone=2	Yes
Belize	0 cases	No cases found. However, the website of the ministry of health was not functional by the time of data searching	No
Mexico	31 cases by week 28, 2025	https://www.gob.mx/cms/uploads/attachment/file/1009372/sem28.pdf	Yes