

(Linnaeus) [Insecta: Dictyoptera: Blattidae] as carriers of human intestinal parasites in few selected areas of West Bengal, India: Implications for public health

Soumyajit Maji, Sagata Mondal*

Department of Zoology, Vidyasagar College, Salt Lake Campus, West Bengal, India

Corresponding Author: Sagata Mondal

Abstract

Cockroaches are cosmopolitan insects distributed across tropical and subtropical regions worldwide, thriving in toilets, kitchens, sewers, and drains. With a fossil history spanning over 300 million years and more than 4,600 described species, they rank among the most evolutionarily successful organisms on Earth. Their feeding habits—on decaying organic matter, human faeces, food waste, garbage, and sewage—make cockroaches significant reservoirs of parasites, pathogens, bacteria, viruses, nematodes, and protozoa, allowing them to function as mechanical vectors of disease transmission. Pathogens associated with cockroaches have been linked to conditions including asthma, allergic rhinitis, skin allergies, bronchitis, balantidiasis, amoebiasis, ulcerative colitis, Crohn's disease, and bacterial dysentery, highlighting their considerable public health relevance. This study examined the gut parasite composition of domiciliary *Periplaneta americana* collected from four districts of West Bengal, India: Kolkata, Howrah, Purba Medinipur, and South 24 Parganas (15 specimens per district, 60 total). Specimens were dissected under laboratory conditions, and gut smears were stained with methylene blue for microscopic examination.

Six pathogen taxa were identified: three nematodes (*Thelastoma attenuatum*, *Leidynema appendiculatum*, *Hammerschmidtella diesingi*) and three protozoa (*Gregarina blattarum*, *Nyctotherus ovalis*, *Balantidium blattarum*). Infection prevalence was highest in Kolkata (93.33%), followed by Howrah (80%), South 24 Parganas (66.67%), and Purba Medinipur (60%). Of the identified parasites, *Gregarina blattarum*, *Nyctotherus ovalis*, *Balantidium blattarum*, and *Leidynema appendiculatum* were associated with respiratory, allergic, and gastrointestinal disorders in humans, whereas *Thelastoma attenuatum* and *Hammerschmidtella diesingi* showed no known pathogenic association.

These findings establish a baseline for the gut parasite fauna of domiciliary cockroaches in West Bengal and confirm their role as potential vectors of human intestinal parasites. The notably high infection prevalence in Kolkata underscores an urgent need for targeted pest control and public health surveillance in urban households across the region.

Keywords: Cockroach, intestinal parasites, four selected districts, West Bengal, India

Introduction

Among the oldest surviving insect lineages, cockroaches have persisted on Earth for over 300 million years, making them one of the most resilient and evolutionarily successful animal groups known to science. More than 4,600 species have been documented worldwide, classified primarily under the order Blattodea. Their remarkable longevity as a group is largely attributed to an exceptional capacity to adapt to shifting environmental conditions across geological time. Of the roughly 3,500 recognized cockroach species globally, only about thirty are known to inhabit human dwellings. Among these, *Periplaneta americana* (Linnaeus, 1758) and *Blattella germanica* (Linnaeus, 1767) are the most frequently encountered in and around homes, particularly across tropical and subtropical climates; notably, neither is formally classified as an agricultural pest. These species congregate near standing water and humid microhabitats—toilets, kitchens, sewer lines, and drains—which double as pathways for their movement between locations. Being nocturnal by nature, they favour warm, damp, dark spaces where food residue is readily accessible (Oriolowo & Adeniran, 2025).

Because cockroaches routinely feed on human excrement, food scraps, garbage, and sewage, they frequently pick up and later transmit parasites through contamination of food and drink that humans subsequently ingest. Beyond fouling food with droppings and microbial contamination, they have also been implicated in cases of food poisoning. Their

sewage-feeding habits make them efficient reservoirs for a broad spectrum of disease agents—protozoa, arthropods, helminths, bacteria, and viruses (Fotouhi-Ardakani *et al.*, 2022). A substantial body of research has examined the broader question of how insects contribute to pathogen transmission. *P. americana* in particular is a widely distributed urban pest thriving in warm, humid conditions globally; Documented pathogen associations include bacteria such as *Klebsiella pneumoniae*, *Enterobacter cloacae*, *Enterobacter aerogenes*, *Salmonella* spp., *Shigella sonnei*, *Vibrio cholerae*, and *Citrobacter freundii*; viruses such as poliovirus; protozoan cysts and oocysts including *Isospora belli*, *Cryptosporidium parvum*, *Cyclospora cayetanensis*, *Entamoeba histolytica*, *Balantidium coli*, and *Giardia lamblia*; fungal genera such as *Candida*, *Rhizopus*, *Aspergillus*, and *Mucor*; and eggs of intestinal helminths including *Ascaris lumbricoides*, *Trichuris trichiura*, hookworm, *Enterobius vermicularis*, *Hymenolepis nana*, *Toxocara canis*, and *Strongyloides stercoralis* larvae (Tatang & Tsila, 2017).

P. americana is capable of disseminating bacteria, fungi, and other pathogenic organisms from contaminated environments (Czajka *et al.*, 2003) and triggering allergic responses in humans (Kinfu & Erko, 2008)^[20], contributing to disease transmission through both mechanical and biological routes (Kim *et al.*, 2016)^[19]. Given that it spends much of its life cycle within sewers and sewage pipes—environments with high pathogen density (Basseri *et al.*,

2016)—and forages extensively on garbage, it has ample opportunity to spread pathogens to humans (Pai *et al.*, 2005) [25]. Its nocturnal habits, combined with coprophagic tendencies, further reinforce its efficiency as a disease carrier (Allen, 1987) [5]. Pathogen transfer also occurs via the cuticle (Mpuchane *et al.*, 2006b) [22, 23], particularly during nymphal ecdysis when the cuticle is shed (Mpuchane *et al.*, 2006a) [22, 23], and even vertically, from an infected mother to her offspring (Jennifer, 2008) [18]. Collectively, these pathogens pose a considerable threat to both animal and human populations (Somia, 2026) [30].

Studies conducted in West Bengal and elsewhere indicate that the faunal composition associated with *P. americana* is considerably complex (Bhatia & Gulati, 1927; Chitwood, 1932; Basir, 1940 [6, 8, 9]; Parveen & Jairajpuri, 1980; Osawa *et al.*, 2016; Ghosh, 2017; Al-Badrani *et al.*, 2024; Paul *et al.*, 2025) [4, 14, 27, 28]. However, detailed morphological characterization of the smaller parasitic forms remains limited, and surveys specifically addressing cockroaches as carriers of human gastrointestinal parasites are similarly scarce (Haile *et al.*, 2018; Adenusi *et al.*, 2018; Al-Azab *et al.*, 2025) [2, 3, 15] with no such study previously conducted in West Bengal or India more broadly. To address this gap, the present study was designed to conduct a cytomorphological investigation of the protozoan and nematode fauna in the mid- and hind-gut of domiciliary *P. americana*, and to assess the prevalence of these gut parasites and their public health relevance across selected residential areas in four districts of West Bengal, India.

Materials and Method

Study area and collection of cockroach specimens

The present study was conducted between March 2025 and April 2026 across four districts of West Bengal, India, Kolkata, Howrah, Purba Medinipur, and South 24 Parganas selected to represent both urban and semi-urban ecological settings. From each district, cockroach specimens (*Periplaneta americana* Linnaeus) were collected monthly from domiciliary habitats, including bathrooms, kitchens, sinks, and other household areas known to favour cockroach infestation, using hand-picking and baited-trap methods.

Result

a. Prevalence of infected *P. americana* across across the selected district in West Bengal, include Kolkata, Hawrah, Purbamedinipur, South 24 pargana

Table 1: Prevalence of intestinal parasite based on site of collection on *P. Americana*

Districts	No. of cockroach’s gut examined for intestinal parasites	Cockroaches with GI parasites	% of Infested samples
Kolkata	15	14	93.33%
Hawrah	15	12	80%
Purba Medinipur	15	9	60%
South 24 pargana	15	10	66.67%

Prevalence of positive cockroaches from selected district like Kolkata, Hawrah, Purba Medinipur, South 24 Pargana in Table 1. The results revealed a higher positive cockroach species in Kolkata (93.33%) followed by Hawrah (80%), than less positive Purba Medinipur (60%) and South 24 Pargana (66.67%) among the four-district sampled. The overall prevalence of parasitic protozoans and Nematodes associated with cockroaches in this study. There is a significance different in terms of frequency of positive samples across the selected district (Table.1).

Live specimens were transported to the laboratory in ventilated plastic containers and processed within 24 hours of collection at the Department of Zoology, Vidyasagar College, for parasitological examination.

Dissection and microscopic examination of the gut

Collected cockroaches were sacrificed by asphyxiation in water and immediately dissected under aseptic conditions. The alimentary canal was carefully excised, and the midgut and hindgut were separated and individually macerated in 0.67% physiological saline. Wet mounts of the gut contents were prepared and examined under a compound light microscope to assess the morphology and motility of living organisms present. Additional wet mounts were stained using Lugol's iodine (iodine and distilled water, 1:5 dilution) and 1% methylene blue to aid in the visualization of nuclear and cytoplasmic structures for accurate taxonomic identification of protozoan and nematode parasites.

Identification of parasites

Protozoan and nematode parasites recovered from the gut were identified to species level based on their morphological characteristics, using standard parasitological keys and taxonomic descriptions available in the published literature [cite relevant identification keys/references used].

Determination of prevalence

The percentage prevalence of each parasite species was calculated following the formula of Margolis *et al.* (1982): Percentage prevalence = (Number of cockroaches infected with a given parasite / Total number of cockroaches examined) × 100

Statistical analysis

Descriptive statistical analysis of parasite prevalence in the midgut and hindgut of *P. americana* was performed using Microsoft Excel (2024). For each parasite species, the monthly mean, median, standard deviation, and 95% confidence intervals were calculated, and the resulting data were summarized and presented in tabular form.

b. Composition of parasitic protozoans and Nematodes associated with cockroach samples collected in West Bengal include Kolkata, Hawrah, Purba Medinipur, South 24 Pargana

The study revealed that there are three parasitic protozoan species and three parasitic nematodes associated with cockroach samples which is collected from four district. Three protozoas are *Gregarina blattarum*, *Nyctotherus ovalis*, *Balantidium blattarum*, and three nematodes are

Thelastoma attenuatum, *Leidynema appendiculatum*, *Hammerschmidtella diesingi*. the study also show that 977 Nematode and 981 Protozoa are found from 1958 specimen. In percentage nearly 50% are Nematode and nearly 50% are protozoa. All Nematode and Protozoas are found from four district, the district involve Kolkata, Howrah, Purba Medinipur, South 24 Pargana.

c. Parasites distribution on cockroach samples with respect to selected district in West Bengal

From the present study, 97(14.39%) *Leidynema appendiculatum*, 125 (18.54%) *Gregarina blattarum*, 137 (20.32%) *Thelastoma attenuatum*, 85(12.61%) *Nyctotherus ovalis*, 95(14.09%) *Hammerschmidtella diesingi*, 135(20.02%) *Balantidium blattarum* Are found from Kolkata. 89 (16.06%) *Leidynema appendiculatum*,

97(17.50%) *Gregarina blattarum*, 91 (16.42%) *Thelastoma attenuatum*, 73(13.1%) *Nyctotherus ovalis*, 85(15.34%) *Hammerschmidtella diesingi*, 119(21.48%) *Balantidium blattarum* are found from Howrah, 42(13.16%) *Leidynema appendiculatum*, 56(17.55) *Gregarina blattarum*, 41 (12.85%) *Thelastoma attenuatum*, 49(15.36%) *Nyctotherus ovalis*, 53 (16.61%) *Hammerschmidtella diesingi*, 78(24.45%) *Balantidium blattarum* are found from Purba Medinipur. 57(13.86%), *Leidynema appendiculatum*, 78(18.97%) *Gregarina blattarum*, 71(17.27%) *Thelastoma attenuatum*, 57 (13.86%) *Nyctotherus ovalis*, 59 (14.355%) *Hammerschmidtella diesingi*, 89 (21.65%) *Balantidium blattarum*, are found from South 24 Pargana. We found that Kolkata has high parasite population then Hswrah, than South 24 Pargana and then Purba Medinipur.

Table 2: Parasites distribution on cockroach samples with respect to selected district in West Bengal.

Parasites	Districts			
	Kolkata	Howrah	Purba medinipur	South 24 pargana
<i>Leidynema appendiculatum</i>	97	89	42	57
<i>Gregarina blattarum</i>	125	97	56	78
<i>Thelastoma attenuatum</i>	137	91	41	71
<i>Nyctotherus ovalis</i>	85	73	49	57
<i>Hammerschmidtella diesingi</i>	95	85	53	59
<i>Balantidium blattarum</i>	135	119	78	89

d. Monthly variations in occurrence of Parasites in *Periplanata americana*

Nine-month study period was undertaken from August, 2025 to April, 2026 to observe the influence of seasonal variations on parasitic prevalence in *Periplanata Americana*. During the study period month wise analysis of GI parasites in *Periplanata americana*, showed the maximum percentage of prevalence during December 2025, and the minimum percentage of prevalence is in February 2025.

District – kolkata

Table 3 presents the month-wise prevalence of six gastrointestinal parasite taxa recovered from *Periplaneta americana* collected from Kolkata district between August 2025 and April 2026. Over the study period, a total of 97 individuals of *Leidynema appendiculatum*, 136 of

Gregarina blattarum, 161 of *Thelastoma attenuatum*, 85 of *Nyctotherus ovalis*, 95 of *Hammerschmidtella diesingi*, and 135 of *Balantidium blattarum* were recorded. *Thelastoma attenuatum* was the numerically dominant taxon throughout most of the sampling period, peaking sharply in September (29) and remaining high in October (24) and August (22), while *Gregarina blattarum* followed a similar trend with its highest count also recorded in September (23). *Nyctotherus ovalis* remained the least abundant taxon overall, with counts ranging from as low as 6 (February) to 15 (August). Considered collectively, monthly parasite recovery peaked in September (111 individuals across all taxa), followed closely by August (99) and October (94), coinciding with the late monsoon and post-monsoon period, whereas the lowest recovery was observed in February (59 individuals), during winter.

Table 3: Showing the prevalence of GI parasites in *P. americana* (for August -April, 2026) from Kolkata district

GI intestinal parasites	August	September	October	November	December	January	February	March	April
<i>Leidynema appendiculatum</i>	14	13	13	11	9	9	7	15	6
<i>Gregarina blattarum</i>	19	23	16	12	15	14	11	15	11
<i>Thelastoma attenuatum</i>	22	29	24	12	16	17	17	11	13
<i>Nyctotherus ovalis</i>	15	14	11	7	9	8	6	8	7
<i>Hammerschmidtella diesingi</i>	12	14	15	8	9	10	7	12	8
<i>Balantidium blattarum</i>	17	18	15	13	12	16	11	15	18

District – howrah

Table 4 presents the month-wise prevalence of six gastrointestinal parasite taxa recovered from *Periplaneta americana* collected from Howrah district between August 2025 and April 2026. Over the study period, a total of 89 individuals of *Leidynema appendiculatum*, 97 of *Gregarina blattarum*, 91 of *Thelastoma attenuatum*, 75 of *Nyctotherus ovalis*, 85 of *Hammerschmidtella diesingi*, and 119 of *Balantidium blattarum* were recorded. *Balantidium blattarum* remained the numerically dominant taxon in almost every month, with peak recovery in September (17)

and March (16), followed by *Gregarina blattarum* and *Thelastoma attenuatum*, both of which reached their highest counts in October (14 and 16, respectively). *Nyctotherus ovalis* was consistently the least abundant taxon across the sampling period, with counts ranging from 5 (January) to 11 (October and April). Considered collectively, monthly parasite recovery was highest during October (77 individuals across all taxa), coinciding with the post-monsoon period, and lowest during the winter months of November and February (47 and 46 individuals, respectively),

Table 4: Showing the prevalence of GI parasites in *P. americana* (for August -April, 2026) from Hawrah district

GI intestinal parasites	August	September	October	November	December	January	February	March	April
<i>Leidynema appendiculatum</i>	11	9	14	7	9	8	6	15	10
<i>Gregarina blattarum</i>	13	10	14	9	6	11	7	12	15
<i>Thelastoma attenuatum</i>	9	12	16	7	11	10	8	7	11
<i>Nyctotherus ovalis</i>	10	9	11	7	6	5	7	9	11
<i>Hammerschmidtella diesingi</i>	12	11	9	7	11	9	7	10	9
<i>Balantidium blattarum</i>	15	17	13	10	11	14	11	16	12

District purba medinipur

Table 5 presents the month-wise prevalence of six gastrointestinal parasite taxa recovered from *Periplaneta americana* collected from Purba Medinipur district between August 2025 and April 2026. Over the study period, a total of 42 individuals of *Leidynema appendiculatum*, 56 of *Gregarina blattarum*, 41 of *Thelastoma attenuatum*, 49 of *Nyctotherus ovalis*, 53 of *Hammerschmidtella diesingi*, and 78 of *Balantidium blattarum* were recorded, confirming *B. blattarum* as the numerically dominant taxon throughout the sampling period. Recovery of most taxa was comparatively higher in August and September, coinciding with the late monsoon period, after which counts declined markedly through November and January. Notably, *B. blattarum* and *H. diesingi* both showed a secondary rise toward the end of

the sampling period, reaching their highest counts in April (13 and 11, respectively), while *N. ovalis* similarly peaked in March (9) after remaining low through the winter months. Considered collectively, total monthly parasite recovery was highest in August (50 individuals across all taxa), declined to its lowest point in November and January (23 individuals each), and rose again toward March–April (40 and 46, respectively). One pattern worth noting for your overall Discussion: across all three districts so far, the "monsoon and winter peak" narrative doesn't hold uniformly — Kolkata peaked in late monsoon (Aug–Sep) with a winter dip, Howrah peaked post-monsoon (October), and Purba Medinipur peaked in August with a *second* rise in March–April rather than winter.

Table 5: Showing the prevalence of GI parasites in *P. americana* (for August -April, 2026) from Purba Midnapur district

GI intestinal parasites	August	September	October	November	December	January	February	March	April
<i>Ledyrima appendiculatum</i>	7	7	6	4	3	5	4	2	4
<i>Gregorian blattarum</i>	9	8	8	4	6	5	3	7	6
<i>Thelastoma attenuatum</i>	9	6	5	3	4	2	4	3	5
<i>Nyctotherus ovalis</i>	8	6	4	2	5	3	5	9	7
<i>Hammerschmidtella diesingi</i>	8	6	7	2	5	3	4	7	11
<i>Balantidium blattarum</i>	9	11	7	8	6	5	7	12	13

District south 24 pargana

Table 6 presents the month-wise prevalence of six gastrointestinal parasite taxa recovered from *Periplaneta americana* collected from South 24 Parganas district between August 2025 and April 2026. Over the study period, a total of 57 individuals of *Leidynema appendiculatum*, 78 of *Gregarina blattarum*, 71 of *Thelastoma attenuatum*, 57 of *Nyctotherus ovalis*, 59 of *Hammerschmidtella diesingi*, and 89 of *Balantidium*

blattarum were recorded, with *B. blattarum* again emerging as the numerically dominant taxon. Parasite recovery was comparatively high during August–September, declined sharply through October–December, and reached its lowest point in November, before rising progressively from February onward to peak in March. *Balantidium blattarum* showed particularly high counts in February (13) and April (13), while *Thelastoma attenuatum* and *Gregarina blattarum* both peaked in August (13 and 11, respectively).

Table 6: Showing the prevalence of GI parasites in *P. americana* (for August -April, 2026) from South 24 parganas district

GI intestinal parasites	August	September	October	November	December	January	February	March	April
<i>Ledyrima appendiculatum</i>	8	10	2	3	5	7	6	9	7
<i>Gregorian blattarum</i>	11	10	9	3	6	7	9	13	10
<i>Thelastoma attenuatum</i>	13	8	5	9	7	5	6	10	8
<i>Nyctotherus ovalis</i>	7	9	6	3	5	4	4	11	8
<i>Hammerschmidtella diesingi</i>	9	7	5	4	5	5	6	8	10
<i>Balantidium blattarum</i>	11	12	9	6	7	9	13	9	13

Discussion

The intestinal parasitic fauna recovered from *Periplaneta americana* varied both in composition and prevalence across the four sampling localities. In Kolkata, six taxa were recorded: *Leidynema appendiculatum* (97; 14.39%), *Gregarina blattarum* (125; 18.54%), *Thelastoma attenuatum* (137; 20.32%), *Nyctotherus ovalis* (85; 12.61%), *Hammerschmidtella diesingi* (95; 14.09%), and figure of 6

Different Parasite Isolated from Cockroach Gut Across West Bengal

Balantidium blattarum (135; 20.02%). A broadly similar assemblage was recovered from Howrah — *L. appendiculatum* (89; 16.06%), *G. blattarum* (97; 17.50%), *T. attenuatum* (91; 16.42%), *N. ovalis* (73; 13.14%), *H. diesingi* (85; 15.34%), and *B. blattarum* (119; 21.48%) — from Purba Medinipur — *L. appendiculatum* (42; 13.16%), *G. blattarum* (56; 17.55%), *T. attenuatum* (41; 12.85%), *N.*

ovalis (49; 15.36%), *H. diesingi* (53; 16.61%), and *B. blattarum* (78; 24.45%) — and from South 24 Parganas — *L. appendiculatum* (57; 13.86%), *G. blattarum* (78;

18.97%), *T. attenuatum* (71; 17.27%), *N. ovalis* (57; 13.86%), *H. diesingi* (59; 14.36%), and *B. blattarum* (89; 21.65%) (Table 1).

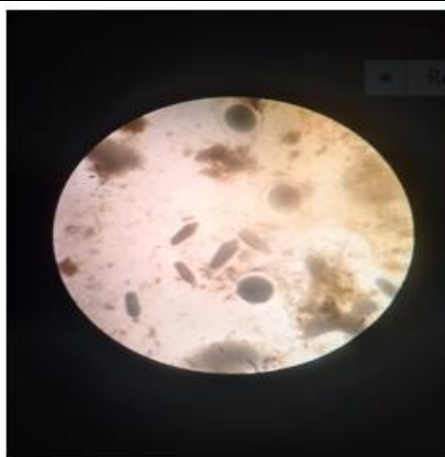


Figure 1 : *Gregarina blattarum*

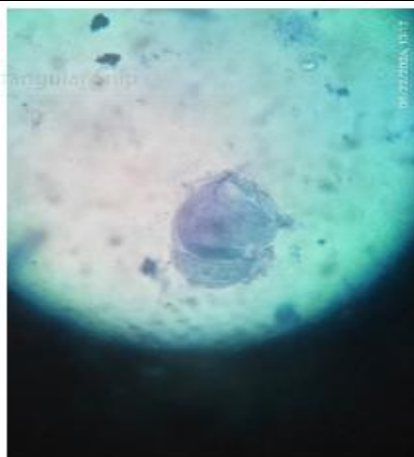


Figure 2: *Nyctotherus ovalis*



Figure 2: *Balantidium blattarum*

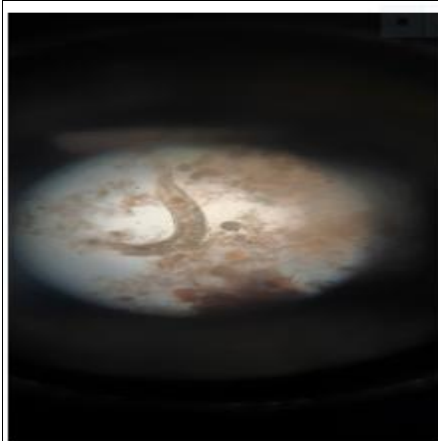


Figure 4: *Leidynema appendiculatum*

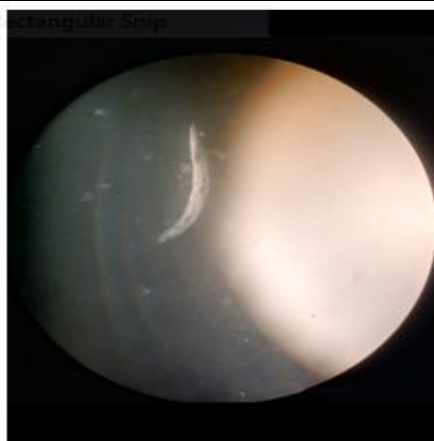


Figure 5: *Thelastoma attenuatum*

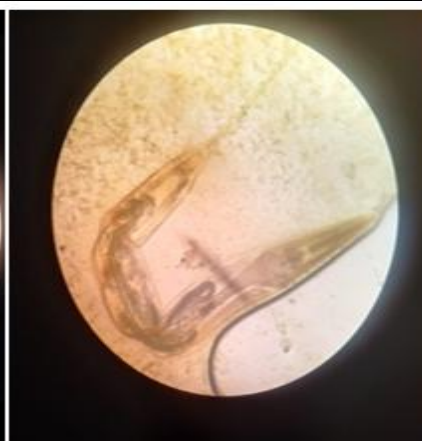


Figure 6: *Hammerschmidtella diesingi*

Taken together, these findings reaffirm that domiciliary cockroaches act as important reservoirs and mechanical vectors of both protozoan and nematode parasites of public health relevance, corroborating earlier reports from other geographic regions. Azad *et al.* (2025) similarly reported cockroaches functioning as mechanical vectors of multiple intestinal parasites in Yemen, while Onah *et al.* (2023) documented a comparable vector role for cockroach populations sampled in Nigeria. The convergence of these independent findings across South Asia, West Asia, and West Africa underscores the ubiquity of cockroach-associated parasite transmission in tropical and subtropical urban setting.

Paul *et al.* (2024) “Characterizing gut fauna of American cockroach: Presence of *Lophomonas striata* and *Iodamoeba bütschlii*” evaluated that this kind of protozoa and nematode are present in the gut of cockroaches in West Bengal. They found the same kind of nematode and protozoa population like *Leidynema appendiculatum*, *Gregarina blattarum*, *Thelastoma attenuatum*, *Nyctotherus ovalis*, *Hammerschmidtella diesingi*, *Balantidium blattarum* so, we can concluded that West Bengal have this kind of protozoa and nematode which present in American cockroaches .

Badrani *et al.* (2024) also seen same kind of protozoa and nematode in cockroaches gut in Iraq, therefore, this kind of pathogens are seen in the gut of cockroaches.

Nedelchev *et al.* (2013) evaluated different cockroach sample in Bulgaria, they also found same kind of protozoan like *Nyctotherus ovalis*, and nematode *Hammerschmidtella diesingi* s like in cockroaches’ gut.

In the present study it was observed that the cockroaches collected from the Kolkata district shows more parasitic infections than other, the similar result was also observed by Ghosh and Gayen in 2006 [31]. They also confirmed high densities of gut pathogens in urban settings. Kolkata's dense population and humid climate create an ideal environment for cockroaches to thrive and contract a higher load of pinworms (such as *Hammerschmidtella diesingi* and *Leidynema appendiculatum*) and protozoans compared to drier or more rural districts.

Moreover, it was also observed that the parasitic load in the cockroach gut was maximum during the monsoon and the winter months than the summer. Scientific studies, including research conducted in the Marathwada region and across tropical environments, confirm that the internal carriage rate of medically important intestinal parasites in cockroaches is

significantly higher during the monsoon and winter seasons than in the summer (Dongare *et al.*,2025).

Conclusion

Cockroaches are some of the most common insects found in homes and buildings. While most people just think of them as pests, they actually have interesting relationships with tiny parasites called gregarines. These microscopic organisms live in the guts of cockroaches and can affect how they grow, behave, and even how many of them survive. In this study, one cockroach species: the American cockroach (*Periplaneta americana*) found in the all the four selected districts of West Bengal. To see how often these cockroaches were infected by different GI parasites with human health importance, and whether the number of infections changed with the seasons. Over several months, 60 cockroaches were collected and dissected under laboratory microscope. It was observed that more than half of them were infected in *P. americana*.

The rate of gut parasites in cockroaches was higher in Kolkata districts than other districts was also recorded during the present study. Research indicates that the high prevalence of gut parasites in cockroaches within the Kolkata district—often exceeding 90% in certain urban and slum areas—is directly linked to the city's humid climate, high population density, and open drainage systems. Cockroaches in highly congested, unsanitary areas of Kolkata act as prolific mechanical vectors for medically significant pathogens. In the densely populated districts of Kolkata, these insects frequently scavenge in highly contaminated environments like open drains, sewers, and unmanaged garbage.

Along with it the rate of infection was higher during the monsoon and winter months compared to summer. High humidity and moderate temperatures during the monsoon season prolong the survival of infective parasitic stages (like protozoan oocysts and helminth eggs) in the environment. Many parasites enter developmental dormancy (diapause) in the host or environment, leading to massive synchronized outbreaks when optimal, slightly warmer spring conditions return. During cold winters and heavy rains, cockroaches migrate indoors to find warm, moist refuges, heavily concentrating their populations in kitchens, bathrooms, and around sewer lines.

The American cockroach, *Periplaneta americana* lives in human dwelling places and their health threats to human due to their habits and the parasites they harbour have been underrated. It is very important to raise people's awareness of the need to keep themselves and their food safe from cockroach contamination as they could play a significant role in the mechanical transmission of parasite-related diseases. Cockroaches constitute an important reservoir for pathogens. Therefore, close contact with cockroaches especially in human dwellings should be discouraged.

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