

Diet and hunting behavior of the gray wall jumping spider *Menemerus bivittatus* (Araneae: Salticidae) in homes in southern Campeche, Mexico

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Abstract

This research focused on identifying the prey consumed by the gray wall jumping spider *Menemerus bivittatus* in homes in southern Campeche state, Mexico, through direct observations of predation events. Between February and June 2026, direct observations of *M. bivittatus* individuals present on interior and exterior walls of houses were conducted. The capture and consumption of prey, as well as the hunting behavior of the observed individuals, were recorded. The results show that *M. bivittatus* primarily preyed on houseflies (*Musca domestica*), which were visually located and captured through precise jumps. The species used the walls of houses as foraging areas, taking advantage of the frequent presence of insects associated with urban environments. The study was based on direct observations, so the actual range of the species' diet may be greater than recorded. Future studies incorporating molecular tools could provide a more detailed characterization of the prey consumed. *Menemerus bivittatus* acts as an active predator of houseflies in urban environments in Campeche, potentially contributing to the natural control of synanthropic insects associated with human dwellings.

Keywords: Salticidae, predation, biological control, *Musca domestica*.

Dieta e comportamento de caça da aranha-saltadora-cinzenta *Menemerus bivittatus* (Araneae: Salticidae) em residências no sul de Campeche, México

Resumo

Esta pesquisa teve como foco a identificação das presas consumidas pela aranha-saltadora-de-paredes-cinzenta (*Menemerus bivittatus*) em residências no sul do estado de Campeche, México, por meio de observações diretas de eventos de predação. Entre fevereiro e junho de 2026, foram realizadas observações diretas de indivíduos de *M. bivittatus* presentes em paredes internas e externas de casas. A captura e o consumo das presas, bem como o comportamento de caça dos indivíduos observados, foram registrados. Os resultados mostram que *M. bivittatus* se alimenta principalmente de moscas domésticas (*Musca domestica*), que foram localizadas visualmente e capturadas por meio de saltos precisos. A espécie utilizou as paredes das casas como áreas de forrageamento, aproveitando-se da presença frequente de insetos associados a ambientes urbanos. O estudo foi baseado em observações diretas, portanto, a amplitude real da dieta da espécie pode ser maior do que a registrada. Estudos futuros incorporando ferramentas moleculares poderão fornecer uma caracterização mais detalhada das presas consumidas. *Menemerus bivittatus* atua como um predador ativo de moscas domésticas em ambientes urbanos em Campeche, contribuindo potencialmente para o controle natural de insetos sinantrópicos associados a habitações humanas.

Palavras-chave: Salticidae, predação, controle biológico, *Musca domestica*.

1. Introduction

Spiders constitute one of the most abundant and diverse predator groups in terrestrial ecosystems, playing a fundamental role in regulating arthropod populations and maintaining ecological balance. Their importance lies in their ability to exploit a wide variety of trophic resources and occupy different ecological niches, allowing them to actively participate in the food webs of both natural and human-modified ecosystems (Kripp et al., 2026; Zuev et al., 2020). Several studies have demonstrated that spider diets are influenced by environmental, seasonal, and ecological factors.

Climatic conditions, species functional characteristics, and prey availability can significantly modify their dietary composition (Birkhofer et al., 2022). Furthermore, seasonality, hunting methods, and habitat specialization affect predation patterns and trophic interactions between spiders and their prey (Bollinger et al., 2023; Whitney et al., 2018). In recent years, the development of molecular tools, particularly gut content analysis using DNA metabarcoding, has allowed for a deeper understanding of predator-prey relationships in numerous spider species (Macías-Hernández et al., 2018; Melcher et al., 2024; Ramírez et al., 2021). This research has revealed that many species have generalist diets, consuming a wide variety of insects and other arthropods (Eitzinger et al., 2018; Saqib et al., 2021).

However, it has also been documented that prey selection can be determined by nutritional value, body size, and availability in the environment (Cuff et al., 2024; Schmidt et al., 2012; Van Schrojenstein Lantman et al., 2020). Within the Salticidae family, jumping spiders are notable for their excellent vision and complex hunting behaviors. These spiders are active predators that visually locate their prey and execute precise attacks through directed jumps. Among them, *Menemerus bivittatus* (Dufour, 1831) (Araneae: Salticidae: Chrysillini), commonly known as the gray wall jumping spider, is a cosmopolitan species frequently associated with human-made structures, where it is often found on walls, windows, and other vertical surfaces exposed to sunlight (Dufour, 1831; Teipathy, 2022).

Despite its wide distribution and frequent presence in urban environments, there is little specific information on the diet of *M. bivittatus* in Mexico, and particularly in the southeastern region of the country. Understanding the feeding habits of this spider is relevant due to its potential role as a natural regulator of insect populations associated with human dwellings. Therefore, the objective of this study was to identify the prey consumed by the gray wall jumping spider *Menemerus bivittatus* in homes in southern Campeche State, Mexico, through direct observation of predation events occurring between February and June 2026.

2. Materials and Methods

2.1 Study area

The study was conducted in private homes located in southern Campeche State, Mexico, between February and June 2026. Observations were made in the communities of Matamoros, Libertad, and the municipal seat of Ciudad Escárcega, all within the municipality of Escárcega, Campeche. The municipality's climate, according to the Köppen classification modified by García (1988), is A1(i')g, meaning a warm sub-humid climate with summer rains. These rains begin in May and stabilize in June, reaching their peak in September. The humidity level, expressed as the ratio of average annual precipitation to average annual temperature (P/T), is 49.7; the monthly temperature range fluctuates between 5 and 7 °C. Annual precipitation reaches 1390 mm, and the average annual temperature is 24.1 °C, with average maximum and minimum temperatures of 32.1 and 15.9 °C, respectively. The geographical location of the municipality, according to the National Institute of Statistics and Geography (INEGI), is north latitude: between 18° 10' and 19° 00'; west longitude: between 90° 02' and 91° 02', and altitude: between 100 and 200 m above sea level (INEGI, 2010).

2.2 Field observations

Observations were made on the interior and exterior walls of houses where specimens of the gray jumping spider *Menemerus bivittatus* (Araneae: Salticidae) were found. Individuals of *M. bivittatus* were directly observed at different times of day to identify their prey, and hunting and consumption events were recorded. This observation was carried out in homes that granted permission to enter. The selected homes were those with light colors inside and out, and preferably with concrete walls, as this would facilitate observation of the species. Wooden houses were not selected, as observation is more difficult in these due to the many holes where the spiders hide.

2.3 Data collection

For each observed predation event, the type of prey captured, the spider's approach behavior, and the location of the predation were recorded. Prey identification was performed through direct visual observation during the capture and feeding process.

2.4 Data analysis

The records obtained were organized and descriptively analyzed to determine the main prey consumed by the species during the study period. The study was conducted in private homes located in southern Campeche State, Mexico, between February and June 2026. Observations were made on the interior and exterior walls of houses where specimens of the gray jumping spider *M. bivittatus* (Araneae: Salticidae) were found. Direct observations of *M. bivittatus* individuals were made to identify their prey. Observations were carried out at different times of day, recording hunting and prey consumption events. For each observed event, the type of prey captured, the spider's approach behavior, and the location of the predation were recorded. Prey identification was performed through direct visual observation during the capture and feeding process. The records obtained were organized and descriptively analyzed to determine the main prey consumed by the species during the study period.

Observation took place from 10:00 AM to 1:00 PM on Saturdays. This schedule was chosen because spiders of the Salticidae family are predominantly diurnal, relying on highly developed vision to locate and capture their prey by stalking and leaping. Their greatest hunting activity occurs during daylight hours, particularly between morning and early afternoon, while at night they remain sheltered in silken nests and significantly reduce their activity (Harland et al., 2019; Pekár et al., 2019). To avoid observing the same individual multiple times, observations were made for half an hour on each wall. If the presence of a spider was detected, it was recorded, and observation continued on the next wall. Photographs were only taken of spiders observed to have hunted.

2.5 Ethical considerations

This study was based exclusively on non-invasive field observations of naturally occurring predation events. No spiders or prey organisms were captured, handled, manipulated, or experimentally disturbed during the study.

3. Results

During the observation period, multiple predation events involving *M. bivittatus* were recorded on house walls. In all the cases observed, the captured prey corresponded to houseflies (*Musca domestica* Linnaeus, 1758) (Figure 1). *Menemerus bivittatus* individuals visually located their prey and executed a slow and directed approach before making a precise jump on them. They then immobilized the prey by inoculating it with poison and consuming the internal tissues. The observations showed that the walls of homes function as foraging sites for this species, where it takes advantage of the frequent presence of house flies attracted to human environments. The results suggest that *M. bivittatus* plays a role as a natural predator of synanthropic insects in urban environments of Campeche.



Figure 1. Individual of *Menemerus bivittatus* capturing a housefly (*Musca domestica*) on the exterior wall of a house in Campeche, Mexico. Source: Authors, 2026.

4. Discussion

The results obtained indicate that *M. bivittatus* actively preys on houseflies (*M. domestica*) in urban environments in southern Campeche, demonstrating its role as an opportunistic predator associated with human dwellings. This finding aligns with numerous studies that describe spiders as important regulators of insect populations in natural and human-modified ecosystems (Birkhofer et al., 2022; Bollinger et al., 2023). The exclusive capture of houseflies observed during the study period may be related to the high abundance and availability of this species in domestic environments. Previous studies have shown that generalist spiders tend to adjust their diet based on the local availability of prey, even while maintaining some dietary selectivity (Eitzinger et al., 2018; Whitney et al., 2018).

Consequently, the frequency of encounters between *M. bivittatus* and *M. domestica* could explain the predominance of this prey in the recorded sightings. Predation of flying insects by spiders has been documented in various taxonomic groups. Kar et al. (2022), for example, recorded the capture of dipterans of the genus *Culicoides* by different spider species, demonstrating the importance of these predators in regulating insects of public health concern. Similarly, the predation of houseflies by *M. bivittatus* could represent a relevant ecosystem service within urban environments, since this fly species is recognized as a mechanical vector of various pathogenic microorganisms associated with human health.

The hunting behavior observed in *M. bivittatus* is consistent with the typical characteristics of the Salticidae family. These spiders primarily use visual cues to locate their prey, making careful approaches followed by precise jumps to capture them. The high visual acuity of jumping spiders allows them to efficiently exploit mobile food resources, particularly insects that are temporarily perched on vertical surfaces.

Regarding prey selection, several studies have shown that spiders choose their prey not only based on availability but also on nutritional content and the energy benefit they provide (Cuff et al., 2024; Schmidt et al., 2012). In this sense, houseflies could be a suitable food source for *M. bivittatus* due to their body size, mobility, and nutritional value, factors that favor a positive cost-benefit ratio during hunting. Although direct observations identified *M. domestica* as a frequent prey of *M. bivittatus*, this spider's diet is likely broader than what was recorded in this study.

Several metabarcoding studies have revealed that many species considered specialists consume a considerable diversity of arthropods that are difficult to detect through conventional observation (Macías-Hernández et al., 2018; Melcher et al., 2025; Ramírez et al., 2021). Therefore, future research could complement field observations using molecular tools to more accurately characterize the dietary breadth of this species. Taken together, the results suggest that *Menemerus bivittatus* actively participates in the natural control of synanthropic insects in urban environments in Campeche. The frequent presence of this spider in homes and its ability to capture houseflies highlight its potential ecological importance as a beneficial predator within urban ecosystems.

5. Conclusions

The gray wall jumping spider, *Menemerus bivittatus*, exhibited predatory habits primarily associated with the capture of houseflies (*Musca domestica*) in homes in southern Campeche. Observations revealed that this species actively utilizes the vertical surfaces of human-made structures as hunting grounds. The observed hunting behavior is consistent with the typical characteristics of spiders in the Salticidae family, which rely primarily on vision to detect and capture moving prey through precise jumps. The results suggest that *M. bivittatus* could play an important ecological role in the natural regulation of synanthropic insect populations in urban environments. Given the sanitary importance of houseflies as mechanical vectors of various microorganisms, the presence of this spider in homes could represent an indirect benefit to residents. Finally, further research using molecular tools, such as gut content analysis via DNA metabarcoding, is recommended to more accurately determine the diversity of prey consumed by this species in urban and peri-urban environments of southeastern Mexico.

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7. Authors' Contributions

Maximiliano Vanoye Eligio: conceived the study, designed the methodology, conducted fieldwork, analyzed the data, and prepared the original manuscript draft. *Felix Alejandra Luna Medina*: participated in field investigations, data collection, validation of observations, and manuscript revision. *María del Carmen Gómez Camal*: participated in field investigations, data collection, validation of observations, and manuscript revision. *Paula Viveros Moreno*: participated in field investigations, data collection, validation of observations, and manuscript revision. *Edith González Lazo*: participated in field investigations, data collection, validation of observations, and manuscript revision. *Jimmy Ricardo Mier Guerra*: participated in field investigations, data collection, validation of observations, and manuscript revision. *Rosa Elena Medina Hernández*: participated in field investigations, data collection, validation of observations, and manuscript revision. *Ludwin Jaime Estrada Ramírez*: contributed to the methodology, data analysis, and critical revision of the manuscript. *Juan Manuel Ortega Almeyda*: contributed to the study design, methodology, and critical review of the manuscript. *Benito Bernardo Dzib Castillo*: conceived and supervised the research, contributed to the study design, critically revised the manuscript for important intellectual content, and approved the final version. All authors read and approved the final manuscript and agreed to be accountable for all aspects of the work.

8. Conflicts of Interest

No conflicts of interest.

9. Ethics Approval

Not applicable.

10. Artificial Intelligence Statement: Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

The authors declare that generative artificial intelligence was used exclusively for English grammar and language editing. No AI tools were used to generate the scientific content, interpret the results, conclude, or create figures, images, diagrams, or tables. All AI-assisted language revisions were carefully reviewed, verified, and approved by the authors, who assume full responsibility for the accuracy, integrity, and scientific content of this manuscript. Artificial intelligence tools are not considered authors and bear no responsibility for the content of this work.

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