Available online at www.sciencedirect.com

Revista Mexicana de Biodiversidad

Revista Mexicana de Biodiversidad 86 (2015) 962–971

Instituto de Biología UNAM
www.ib.unam.mx/revista/

Ecology

Diversity and seasonal abundance of anthropogenic spiders (Arachnida: Araneae) in different urban zones of the city of Chilpancingo, Guerrero, Mexico

Diversidad y abundancia estacional de arañas antropogénicas (Arachnida: Araneae) en diferentes zonas urbanas de la ciudad de Chilpancingo, Guerrero, México

Susana Eva Rodríguez-Rodríguez [a], Karen Paulina Solís-Catalán [a], Alejandro Valdez-Mondragón [b,c,*]

[a] *Unidad Académica de Ciencias Químico Biológicas, Universidad Autónoma de Guerrero, Av. Lázaro Cárdenas S/N, Ciudad Universitaria, 39087 Chilpancingo de los Bravo, Guerrero, Mexico*

[b] *Colección Nacional de Arácnidos, Departamento de Zoología, Instituto de Biología, Universidad Nacional Autónoma de México, Apartado Postal 70-153, 04510 México City, Mexico*

[c] *Conacyt Research fellow, Laboratory of Arachnology. Laboratorio Regional de Biodiversidad y Cultivo de Tejidos Vegetales, Instituto de Biología, Universidad Nacional Autónoma de México, Ex-fábrica San Manuel, San Miguel Contla, 90640 Santa Cruz Tlaxcala, Tlaxcala, Mexico*

Received 24 January 2015; accepted 29 July 2015
Available online 11 November 2015

Abstract

The diversity of anthropogenic spiders in the city of Chilpancingo, Guerrero, Mexico was studied using a systematized collection method in 4 sampling zones: urban with a garden, urban without a garden, suburban, and rural. The total species richness was 63 morphospecies, 49 genera and 21 families. The family Theridiidae had the highest diversity (22 species). The total abundance of spiders was 4,120 individuals, with the highest abundance in the urban zone with a garden (1,163 individuals). The most abundant species were: *Physocyclus globosus* (1,998 individuals) (Pholcidae), *Oecobius navus* (1,388) (Oecobidae), *Nesticodes rufipes* (313) (Theridiidae), *Filistatoides* sp.1 (83) (Filistatidae), and *Dictyna jacalana* (52) (Dictynidae). The abundance of spiders found on the first story of the 16 sampled houses was higher than the abundance of spiders found on the second one. The morphospecies richness was higher for spiders from the first story than those from the second one and higher in the rainy season than in the dry season. The highest diversity of spiders was found in the urban zone with a garden, both in the rainy and dry seasons. Based on the Morisita–Horm index, the urban zone with a garden and the suburban zone were the most similar in terms of spider diversity. The species accumulation curves are still a useful tool to evaluate sampling quality and compare inventories of mega-diverse groups, such as spiders.

Keywords: Abundance; Anthropogenic; Ecology; Diversity; Urbanization

Resumen

Se estudió la diversidad de arañas antropogénicas de la ciudad de Chilpancingo, Guerrero, México, usando un método de recolecta sistematizado en 4 zonas de muestreo: urbana con jardín, urbana sin jardín, suburbana y rural. La riqueza total de especies fue de 63 morfoespecies, 49 géneros y 21 familias. Theridiidae fue la familia con la mayor diversidad (22 especies). La abundancia total de arañas fue de 4,120 individuos, con la mayor abundancia en la zona urbana con jardín (1,163 individuos). Las especies más abundantes fueron: *Physocyclus globosus* (1,998 individuos) (Pholcidae), *Oecobius navus* (1,388) (Oecobidae), *Nesticodes rufipes* (313) (Theridiidae), *Filistatoides* sp.1 (83) (Filistatidae), y *Dictyna jacalana* (52) (Dictynidae). La abundancia del primer piso de las 16 casas muestredas fue estadísticamente más alta que la del segundo.

* Corresponding author.
E-mail address: lat_mactans@yahoo.com.mx (A. Valdez-Mondragón).
Peer Review under the responsibility of Universidad Nacional Autónoma de México.

http://dx.doi.org/10.1016/j.rmb.2015.09.002

La riqueza de morfoespecies fue más alta en el primero que en el segundo piso. La diversidad más alta de arañas fue encontrada en la zona urbana con jardín, tanto en la temporada de lluvias como en la temporada seca. Basados en el índice de Morisita–Horn, la zona urbana con jardín y la zona suburbana tuvieron la más alta similitud en términos de diversidad de arañas. Las curvas de acumulación de especies siguen siendo una herramienta útil para evaluar la calidad del muestreo y comparar inventarios de grupos megadiversos, como es el caso de las arañas.

Palabras clave: Abundancia; Antropogénico; Ecología; Diversidad; Urbanización

Introduction

Synanthropic species are those able to adapt to a variety of human activities to ensure their growth, often extending their natural distribution into habitats such as houses, farms, gardens, roadsides, and garbage dumps (Di Castri, Hansen, & Debussche, 1990). Urbanization is associated with a variety of effects, such as pollution, drainage, watercourse diversion, and fragmentation and habitat loss may decrease, extinguish or allow the expansion of certain groups (McIntyre, 2000). However, arthropods in urban systems can be species rich, because of local conditions, and temperature, humidity and available resources determine their distribution in the urban environment, in some cases limiting their abundance (Melic, 1997; Robinson, 2005). Primarily, anthropogenic activities have favored certain habitats and colonization by particular groups of arthropods, promoting not only their abundance but also their diversity.

Despite the fact that accelerating urbanization is considered one of the main causes of biodiversity loss, it is unknown whether the changes caused by urbanization similarly affect biodiversity worldwide (Magura, Tóthmérész, Hornung, & Horváth, 2008). Thus, the study of arthropod populations in urban environments is important to determine the influence of urbanization on these organisms (Magura et al., 2008). One of the most diverse arthropod groups is spiders. They are distributed worldwide and have colonized every ecological environment, except the open ocean, the Arctic and Antarctica. There are even species found in semi-aquatic environments (Foelix, 2011; Robinson, 2005; Spagna, Crews, & Gillespie, 2010). Spiders comprise 45,618 species worldwide (World Spider Catalog, 2015), being the second most diverse order of arachnids after mites (Coddington & Colwell, 2001; Coddington & Levi, 1991; Francke, 2014). Many of them have successfully adapted to urban areas, because some aspects of their biology give them an advantage for transitioning from natural, wild or semi-wild habitats to urban environments, colonizing new habitats created by humans (Desales-Lara, Francke, & Sánchez-Nava, 2013; Durán-Barrón, Francke, & Pérez-Ortiz, 2009). Additionally, spiders are predators (Coddington & Levi, 1991; Foelix, 2011) that help stabilize insect populations (Foelix, 2011).

Studies of urban spiders have been conducted in various parts of the world. Guarisco (1999) recorded 74 species of synanthropic spiders in Kansas, United States. In Europe, Urák (2005) cited 2 invasive species in Romania, and Kostanjšek and Celestina (2008) recorded 4 species of urban spiders in Slovenia. There are several studies of synanthropic spiders from Brazil. Brazil et al. (2005) recorded 13 species and 17 morphospecies in 3 cities in Bahia with different degrees of urbanization, and Melo et al. (2010) recorded 170 species and morphospecies of spiders in the city of Salvador in the Brazilian Atlantic Forest, which is under pressure from urbanization. In the Caribbean, Armas (2003) recorded 31 species of spiders inside and outside of a single house in San Antonio de los Baños, Havana Province, Cuba.

In Mexico, Jiménez (1998) recorded 42 species of spiders for the interior and exterior of 32 houses in La Paz, Baja California Sur; Durán-Barrón et al. (2009) recorded 63 species of spiders associated with human housing in México City and State of Mexico, and Desales-Lara et al. (2013), recorded 28 species and 13 morphospecies of spiders in the municipality of Toluca, State of Mexico. The latter study used a systematized method to collect spiders inside houses considering 4 environments with different degrees of urbanization and demonstrated that spider diversity is higher in houses with gardens in an urban environment.

The goal of this work was to study the diversity of spiders in different degrees of urbanization in the city of Chilpancingo to answer the following questions: (1) Which of the species of spiders are found in the urban, suburban and rural zones? (2) What is the diversity and abundance of spiders in these zones? (3) Is there seasonal variation in the diversity and abundance of spiders? (4) Are there any differences in spider abundance between the first and the second levels of the houses?

Materials and methods

The city of Chilpancingo de los Bravo is the capital of the state of Guerrero, Mexico, located centrally between 17°33′00″ N, 99°30′04″ W, with an elevation of 1,253 m above sea level. The native vegetation type is deciduous tropical forest in the lowlands and *Quercus* sp. forest in highland zones with different levels of succession. There are 2 types of climate: climate (*A*)*C* (*w0*) (semi-warm humid with rain in summer), with an annual temperature between 18 °C and 22 °C, and a temperature for the coldest month greater than 18 °C; and climate *Aw1* (warm humid with rain in summer) with an average annual temperature greater than 22 °C and the temperature of the coldest month is greater than 18 °C (García, 2004).

Zone categorization was accomplished according to the law of Municipal Cadastre of Guerrero No. 676, issued in 2007, which divides the city into 3 zones: urban, suburban and rural. For this study, we categorized 4 sampling zones: urban with a garden, urban without a garden, suburban, and rural. We followed the systematized collecting method used by Desales-Lara et al. (2013), with some modifications. For each of the sampling