

First two cases of ocular anomalies in spiders (Araneae: Thomisidae, Scytodidae) from Ecuadorian Amazon canopy

Alicia Arzani¹, David R. Díaz-Guevara^{2,4} & William Galvis^{3,4,5}

¹Pontificia Universidad Católica del Ecuador, Quito, 170525 aliciarzani@gmail.com,

²Instituto Nacional de Biodiversidad INABIO, Quito, Ecuador. davidiazgue@gmail.com,

³Grupo de Investigación en Aracnología & Miriapodología (GAM-UN), Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogotá. ⁴Fundación Uru, Quito, Ecuador. ⁵Fundación Arañas Tropicales - ArachnoTrAC, Bogotá, Colombia. wlgalvisj@unal.edu.co

Summary: Two new cases of ocular anomalies in crab spiders (Thomisidae) and spitting spiders (Scytodidae) are reported herein, both species and specimens from Yasuní National Park Amazonian canopy, northeast Ecuador. These reports represent the first known cases of anomalies reported in canopy spider species.

Key words: Thomisidae, Scytodidae, teratology, eye anomalies, eye absence, Parque Nacional Yasuní

Primeros dos casos de anomalías oculares en arañas (Araneae: Thomisidae, Scytodidae) en el dosel de la Amazonía ecuatoriana

Resumen: Se reportan dos nuevos casos de anomalías oculares en arañas cangrejo (Thomisidae) y arañas escupidoras (Scytodidae), ambas especies y ejemplares provenientes del dosel del Parque Nacional Yasuní, en la Amazonía del noreste de Ecuador. Estos informes representan los primeros casos conocidos de anomalías reportadas en especies de arañas del dosel.

Palabras clave: Thomisidae, Scytodidae, teratología, anomalías oculares, ausencia de ojo, Parque Nacional Yasuní

Introduction

Teratology is the field of study that focuses on understanding the causes and patterns that lead to deformities, anomalies, and failures in the physical development of living beings (Taszakowski & Kaszyca-Taszakowska, 2020). These deformities can arise due to failed cell division, as well as being associated with significant variations in temperature, elevated levels of humidity, and exposure to chemical substances in the environment during the early developmental stage. Additionally, diseases and physical modifications can contribute to this phenomenon (Mitchell *et al.*, 2020).

Most anomalies documented in insects are often linked to the development and structure of their appendages, with the fusion of segments being the most common alteration (Guzmán-Vásquez *et al.*, 2020). Among insects, the order Coleoptera presented the highest number of cases described in this regard (Márquez & Sierra-Martínez, 2008). Within the class Arachnida, there are different types of abnormalities officially published for spiders and other groups, such as gynandromorphism, body part duplications, suppressions, malformations, intersexuality, anomalies in ocular development, pedipalps, legs, and spinnerets (Santiago-Blay, 1986; Chamé-Vázquez & Moreno-Mendoza, 2006; Galvis & Flórez, 2016; Chamé-Vázquez & Jiménez, 2020; Nadolny *et al.*, 2022).

Within spiders, ocular abnormalities are the most common reported, with a record of approximately 76 species in 22 families. Among them, Lycosidae (20%), Linyphiidae (12%), Tetragnathidae (8%), Amaurobiidae (7%), and Agelenidae (7%) are the most recurrent families exhibiting reduced or absent eyes (Jiménez & Llinas, 2022; Salceda-Sánchez *et al.*, 2023).

Based on the bibliographic review published by Jiménez and Llinas (2002), 27 ocular abnormalities in spiders are recognized, all of them consisting on the absence of one of both of the eyes present in the eye row (i.e. absence of posterior lateral eyes, absence of one posterior lateral eye, etc); absence of any of the eye rows (i.e. absence of posterior eye row, absence of anterior eye row); rotation of ocular area; duplication of corneas; duplication of posterior median eyes; fusion of anterior median eyes; total absence of eyes; presence of a horn; presence of more than eight eyes; opisthosomal eyes; and others described as non-specific anomalies.

Herein, we described two cases of ocular abnormalities in spiders collected in Amazonian canopy from Yasuní National Park, in the province of Orellana, Ecuador, at the former Onkone Gare Biological Station (0.65714°S, 76.4555°W). The first specimen from the

Thomisidae family (unknown genus) exhibits the absence of one posterior median eye; whereas the specimen of the Scytodidae family (genus *Scytodes*) displays a total absence of eyes. This article deals with, to our knowledge, the first records of ocular abnormalities in spiders found in the canopy, in this case within one of the world's most known hotspots of Amazonian biodiversity.

Materials and methods

The material under study was collected in 2006 from Yasuní National Park, Orellana Province, Ecuador, using a canopy misting technique developed by Erwin & Pimienta (2018). This method consists of applying a biodegradable insecticide (3% permethrin) using a thermal nebulizer (Golden Eagle Dyna-fog) to collect arthropod samples by using a three-meter-long nylon collection net. The material examined was deposited at the Arachnological Collection of the Instituto Nacional de Biodiversidad (MECN-AR).

Morphological measurements and photographic records of characters were made using a stereomicroscope (Olympus SZ61R) adapted to a digital camera (The Imaging Source DFK23UX236) installed the IC Measure v.2.0.0.161 software. The images were later stacked with the image stacking software Helicon Focus, in its free version.

Results And Discussion

Thomisidae Sundevall, 1833 (Figs 1a-c).

MATERIAL EXAMINED. 1 female from Ecuador, **Orellana:** Parque Nacional Yasuní, Onkone Gare Biological Station, 247 m, 0.65714°S, 76.4555°W, 20 jan 2006, Col. T. Erwin, M. Pimienta, A. Troya & M. Santacruz (#3122) (MECN-Ar 299).

DESCRIPTION: Adult female of an unconfirmed genus missing a posterior median eye (PME).

Scytodidae Blackwall, 1864 (Fig. 2).

MATERIAL EXAMINED. 1 juvenile from Ecuador, **Orellana:** Parque Nacional Yasuní, Onkone Gare Biological Station, 247 m, 0.65714°S, 76.4555°W, 20 jan 2006, Col. T. Erwin, M. Pimienta, A. Troya & M. Santacruz (#3139) (MECN-Ar 300).

DESCRIPTION: Juvenile specimen of the genus *Scytodes* Latreille, 1804 displaying a total absence of eyes. It is interesting to note this specimen could have roamed free for a while after hatching as it has a marked coloration pattern, unlike what can be seen in spiderlings.

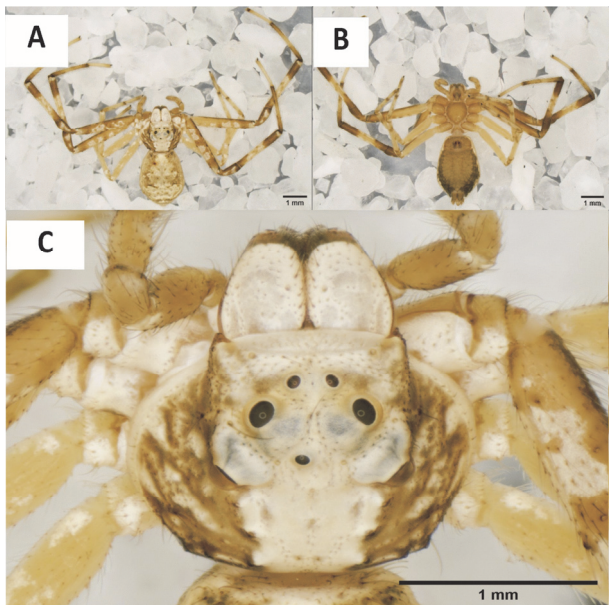


Figure 1. Crab spider (Thomisidae) from Ecuadorian Amazon canopy. **A** Female, habitus, dorsal view; **B** Same, ventral view; **C** Same, prosoma, dorsal view showing absence of posterior median eye.

Malformations in spiders, in general, involve chelicerae, pedipalps, walking legs, eyes, and in less proportion reproductive structures (Izquierdo, 2021). The reported crab spider (Thomisidae) (Figs 1a-b) lacks one posterior median eye (Fig. 1c), an anomaly which has nine worldwide records in families such as Amaurobiidae, Araneidae, Leptonetidae, Linyphiidae, Tetragnathidae, and Zodariidae (Denis, 1939; Kaston, 1962, 1982; all as cited in Jiménez & Llinas, 2002). There are three reported cases in crab spiders with ocular anomalies, specifically the absence of median eyes, reduction of one posterior lateral eye and ophistosomal eyes (Denis, 1939; Garb, 1999; both as cited in Jiménez & Llinas, 2002).

On the other hand, the spitting spider (Scytodidae: *Scytodes*) reported (Fig. 2) lacks the six eyes that characterize this family. Eye anomalies or absences has been reported in previous times in literature of the families Agelenidae, Linyphiidae, Sicariidae and Theridiidae (Denis, 1939; Kaston, 1982; both as cited in Jiménez & Llinas, 2002; Taucare-Ríos *et al.*, 2021). In other papers, authors has described eye-less spider species but not as anomalies: Ctenidae and Barychelidae (Bloom *et al.*, 2014), and Ochyroceratidae (Brescovit *et al.*, 2021).

The exact causes of eye teratologies are still unknown, however they could be linked to embryonic trauma, developmental issues, juvenile injury, or unusual environmental conditions during embryonic development (i.e. deliberate exposure to chemicals that are not common in the environment where they normally live) (Mitchell *et al.*, 2020).

It is important to note that both specimens reported here with eye malformations were collected in the same collection event as well as in the same locality. Since it is not common to find spiders with this type of malformation and even less that they have been collected at the same time and place, it is essential that such cases be published, especially in the Neotropical region. Understanding the causes of teratologies is important as it may enable us to predict, or detect, the effect of increasing chemical use and global climate change through embryology of spiders.

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Figure 2. Spitting spider (Scytodidae: *Scytodes* sp.) from Ecuadorian Amazon Canopy. Juvenile, dorsal view showing an ocular anomaly (total lack of eyes).

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