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SHORT COMMUNICATION

A teratologic spider with duplicated reproductive organs

Matias A. Izquierdo[1,2]: [1]Universidad Nacional de Córdoba, Facultad de Ciencias Exactas, Físicas y Naturales, Departamento de Diversidad Biológica y Ecología, Av. Vélez Sarsfield 299, Córdoba (5000), Argentina. [2]Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Instituto de Diversidad y Ecología Animal (IDEA), Laboratorio de Biología Reproductiva y Evolución, Av. Vélez Sarsfield 299, Córdoba (5000), Argentina. E-mail: matias_iz@outlook.com

Abstract. In general, malformations in spiders involve chelicerae, pedipalps, walking legs, and eyes, but those affecting female reproductive structures are not so frequent. A teratological case of a spider with a duplicated reproductive structure is described. The female specimen has the typical epigyne and a second one near the spinnerets. The second epigyne is less developed and seems to be non-functional. Similar malformations have been reported for Amaurobiidae and Salticidae, and here is presented for Gnaphosidae. Although it is widely known that temperature and humidity may induce abnormalities under experimental conditions, the causes behind teratological genitalia in wild females are unknown. This case opens the question of the origin of such a malformation and the ontogeny of female reproductive organs in spiders.

Keywords: Malformations, epigyne, Gnaphosidae

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According to Moore & Persaud (2008), teratology is a branch of science that studies the causes, mechanisms, and patterns of abnormal development. It also includes environmental agents or teratogens (see also Lewis 2018). In invertebrates, deformities have been reported for animals collected in natural environments, from beetles to opilionids, fairy shrimps, decapods, centipedes, mites, harvestmen, and spiders (Balazuc 1948; Frank 1981; Spanó et al. 2003; Asiain & Márques 2009, Eeva & Penttinen 2009; Leśniewska et al. 2009; Kozel & Novak 2013; Miličić et al. 2013; Chitimia-Dobler et al. 2017). Anomalies have also been experimentally induced by exposing embryos to teratogenic factors such as temperature (Napiórkowska et al. 2017 and reference therein), moisture (Buczek 1992), and cytotoxic substances (Buczek 1993a,b, Buczek et al. 2019).

In spiders, walking legs are generally the most affected body part, whereas other structures such as chelicerae and pedipalps are less susceptible to modifications. Experimentally, malformations have been reported for different parts of the body as well, such as spinnerets, pedicel, and book lungs (see Napiórkowska & Templin (2013) and reference therein). Malformations of walking legs are classified as oligomely (absence of legs), polymely (additional legs), heterosymely, (fusion of contiguous legs of the same side of the prosoma, or pedipalp and the contiguous walking leg), schistomely (bifurcation), and symely (fusion of walking legs located on the opposite side of the prosoma). Bicephaly and other complex anomalies have also been documented, as well as eye malformations (Kaston 1962, 1982; Jiménez & Llinas 2002; Napiórkowska et al. 2017). Deformities may also include changes in the central nervous system, for example, a fusion of ganglia in *Eratigena atrica* (C. L.Koch, 1843—as *Tegenaria atrica*) (Agelenidae) (Jacuński et al. 2005; Napiórkowska et al. 2017). Teratology in reproductive organs of spiders, however, are less common than other somatic malformations. Among them, those affecting male pedipalps seem to be more frequent than female genital anomalies (see Kaston 1963a).

Here, a teratological case of a spider with two epigynes is reported for *Almafuerte peripampasica* Grismado & Carrión, 2017 (Gnaphosidae). The epigyne is an external, sclerotized plate, placed ventrally on the second opisthosomal metamere (sternite) of adult females. It contains the copulatory openings that receive the male intromittent organs. Duplicated epigynes were reported for the first time by Muma (1943) for *Hogna carolinensis* (Walckenaer, 1805—as *Lycosa carolinensis*) (Lycosidae) but in this case, both organs were side by side. Later, Kaston (1963b) reported other conditions involving duplication in *Callobius canada* (Chamberlin & Ivie, 1947—under *Amaurobius canada*) (Amaurobiidae), and *Phidippus audax* (Hentz, 1845) (Salticidae) in which supernumerary spinnerets were also present.

The specimen reported here (Fig. 1A) shows a similar pattern to those studied by Kaston (1963a): a fully developed epigyne and a second one placed far behind, near the normal spinnerets (Fig. 1B). This second organ seems to be less developed and slightly asymmetric, judging by its size, and shape of internal ducts and spermathecae (Fig. 1D). Its position is coincident with the place where a tracheal spiracle should be present. No spiracle is developed, but unfortunately, the area is slightly collapsed, making it difficult to analyze. Aside from such anomaly, the rest of the body shows normal development, at least externally. The presence of a non-modified epigyne suggests that this spider was able to reproduce, although cases like this need to be tested.

Additionally, a larva, probably from a hunchbacked fly (Acroceridae), is also present internally in the left book lung (Fig. 1C, arrow). Spiders are the more frequent hosts of these flies, as has been studied and reported by several authors (Schlinger 1987; Barneche et al. 2013; Grismado & Ramírez 2013).

Given that the abnormal epigyne is placed at the position of the third opisthosomal segment, and that no tracheal spiracles are evident, it seems that this is a case of partial, homeotic transformation of the third opisthosomal segment into a second opisthosomal segment identity. The occurrence of these anomalies opens new questions on the ontogeny of reproductive organs and segments and the causes behind malformations in animals living in nature.

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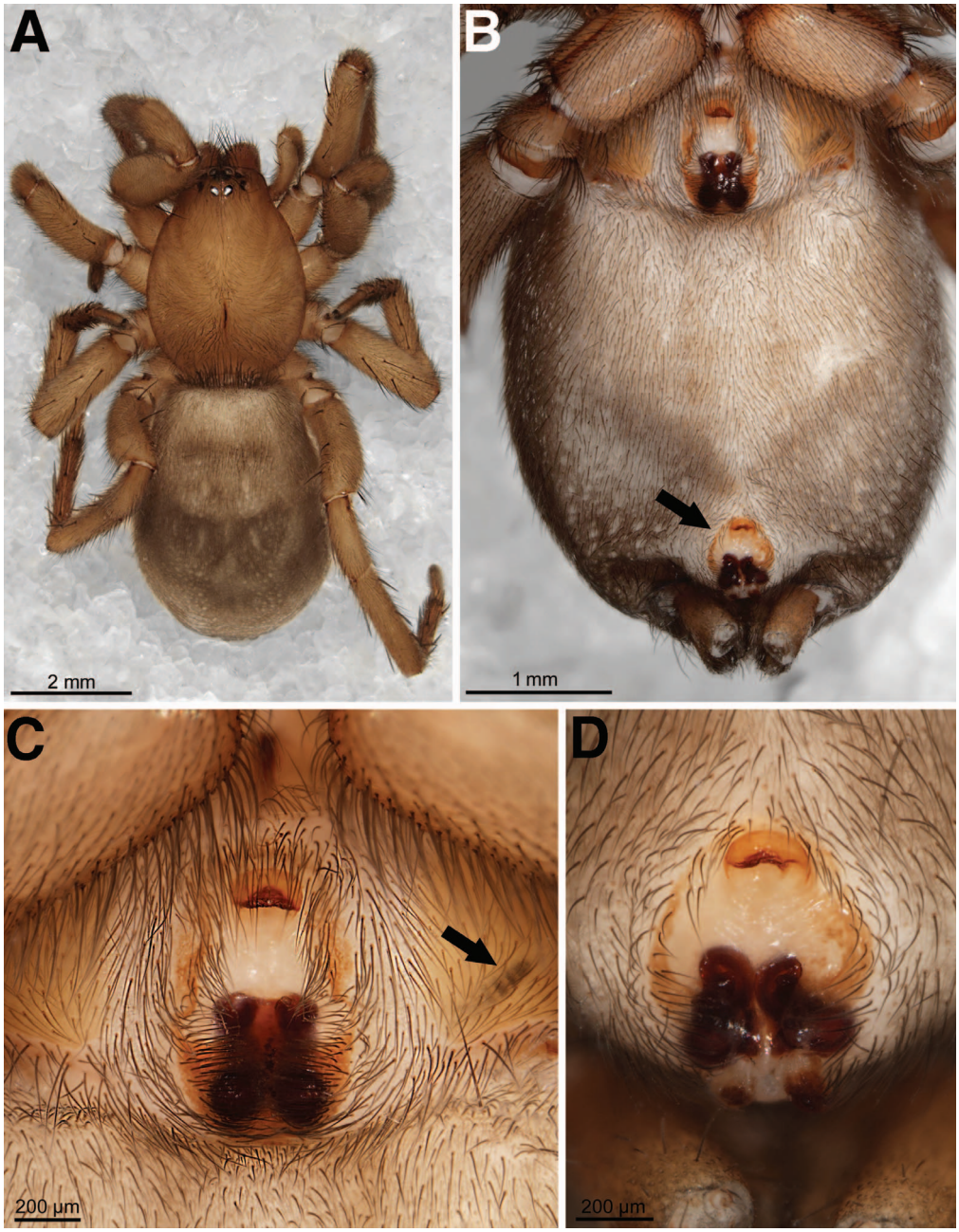

Figure 1.—*Almafuerte peripampasica,* female. A, prosoma and opisthosoma (dorsal view). B, opisthosoma (ventral view, arrow pointing to the duplicated epigyne). Note the difference in size and the slightly asymmetry. C, normal epigyne (arrow pointing to larva). D, duplicated epigyne. Specimen locality: Argentina: Córdoba: Parque Nacional Quebrada del Condorito, "sitio 2", -31.63481, -64.71087, alt. 1846m, M. Izquierdo, D. Abregú, C. Mattoni, col. Sep. 16, 2019, under stones. LABRE-Ar 498, voucher MAI-4754.

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