Boletín de la Sociedad Zoológica del Uruguay, 2020
Vol. 29 (2): 167-170
ISSN 2393-6940
https://journal.szu.org.uy

NOTA

ATTACK ON SALTICIDAE: NEW RECORDS OF MANTISPIDS (NEUROPTERA: MANTISPIDAE) IN NEOTROPICAL JUMPING SPIDERS (ARANEAE: SALTICIDAE)

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ABSTRACT

Jumping spiders present natural enemies like insects of the subfamily Mantispinae. We report for the first time for Uruguay the salticids *Neonella minuta*, *Tullgrenella serrana* and the presence of Mantispinae larvae in this species and in *Sarinda* sp. In *T. serrana* we record the development of the parasitoid *Dicromantispa gracilis*.

Key words: Araneomorphae, larvae, parasitoidism, spider egg sacs.

RESUMEN

Ataque a Salticidae: nuevos registros de mantíspidos (Neuroptera: Mantispidae) en saltícidos (Araneae: Salticidae) neotropicales. Los saltícidos presentan enemigos naturales como los insectos de la subfamilia Manitspinae. Reportamos por primera vez para Uruguay los saltícidos *Neonella minuta* y *Tullgrenella serrana*, así como la presencia de larvas de Mantispinae en estas especies y en *Sarinda* sp. En *T. serrana* registramos el desarrollo del parasitoide *Dicromantispa gracilis*.

Palabras Clave: Araneomorphae, larvas, parasitoidismo, ootecas de arañas

Spiders present several natural enemies, like insects of the family Mantispidae Leach, 1815 (Neuroptera) (Redborg & MacLeod, 1985; Hoffman & Brushwein, 1989, Rice & Peck, 1991; Monserrat, 2014). This family is composed of four subfamilies: Calomantispinae Lambkin, 1986, Drepanicinae Lambkin, 1986, Mantispinae Leach, 1815 and Symphrasinae Lambkin, 1986, with 44 genera and 420 species (Monserrat, 2014), being Mantispinae the richest in species and most studied subfamily. The Mantispinae larvae are obligatory parasitoids of spiders since they need them to complete their development (Redborg, 1998). The larvae of Mantispinae species present three different instars where the morphology changes abruptly, the first one is campodeiform and the second and third ones are scarabaeiform (Redborg, 1998). Females lay large egg masses on posts, fences, and bushes, where spiders often roam (LaSalle, 1986; Rice, 1986). Once the larva emerges from the egg, they can perform two strategies to locate a spider egg sac: it moves until it finds an egg sac and penetrates it or is transported by the spider and gets into the egg sac when the spider builds it. Some mantispinae species facultatively can use either of these two mentioned strategies (Redborg & MacLeod, 1985; Redborg, 1998). In addition to feeding on the eggs, there are records where mantispid larva can also feed on spider hemolymph (Redborg & MacLeod, 1984; Hoffman & Brushwein 1989; Rice & Peck, 1991). When the spider female makes the egg sac, the larvae gets inside and feeds on the eggs, and once it is fed enough it begins to pupate, and then emerges as an adult (Redborg, 1998). This parasitoidism is registered for 30 spider families: Agelenidae, Anyphaenidae, Araneidae, Cheiracanthiidae, Clubionidae, Corinnidae, Ctenidae, Ctenizidae, Dictynidae, Dysderidae, Filistatidae, Gnaphosidae, Lycosidae, Mimetidae, Oecobiidae, Oxyopidae, Philodromidae, Pholcidae, Pisauridae, Salticidae, Scytodidae, Sicaridae, Sparassidae, Tetragnathidae, Theraphosidae, Theridiidae, Thomisidae, Trechaleidae, Uloboridae and Zoropsidae (Capocasale, 1971, Hoffman & Brushwein, 1989; Rice & Peck 1991; Brushwein *et al.* 1992; Redborg, 1998; Nunn, 2011; Monserrat, 2014; Trillo *et al.* 2015). Salticidae Blackwall, 1841 is currently the most diverse family within the order Araneae, with 646 genera and 6229 species (World Spider Catalog, 2020). This family is distributed worldwide (except in Antarctica), and is characterized by having larger middle eyes than the rest with a highly developed vision, with which they stalk and hunt their prey by jumping during the day (Jocqué & Dippenaar, 2006). In the Salticidae

Fig. 1. A-E. Jumping spiders with mantispid larvae: A, B. female of *Sarinda* sp.; C, D. female of *Neonella minuta*; E. female of *Tullgrenella serrana*. F. Pupa of *Dicromantispa gracilis* (Mantispidae). Red arrow indicates the mantispid larvae, in all cases attached near the pedicel. Scale bars: 1 mm. Figs B, D have the same scale that A, C respectively.

family the presence of mantispid larvae is registered for 18 genera: *Bagheera* Peckham & Peckham, 1896, *Eris* C. L. Koch, 1846, *Habronattus* F. O. Pickard-Cambridge, 1901, *Hentzia* Marx, 1883, *Lyssomanes* Hentz, 1845, *Metacyrba* F. O. Pickard-Cambridge, 1901, *Maevia* C. L. Koch, 1846, *Menemerus* Simon, 1868, *Metaphidippus* F. O. Pickard-Cambridge, 1901, *Mopsus* Karsch, 1878, *Peckhamia* Simon, 1900, *Phidippus* C. L. Koch, 1846, *Platycryptus* Hill, 1979, *Plexippus* C. L. Koch, 1846, *Psecas* C. L. Koch, 1850 *Salticus* Latreille, 1804, *Servaea* Simon, 1888, *Synageles* Simon, 1876 (Redborg & MacLeod, 1983; Austin, 1985; Downes, 1985; Hoffman & Brushwein, 1989; Rice & Peck, 1991; Brushwein *et al.* 1992; Rienks, 2000; Vieira & Romero, 2008; Hill, 2011; Snyman *et al*. 2020).

The aim of this study is to report for the first time parasitoidism in three species of neotropical jumping spiders by Mantispinae species.

A female of *Neonella minuta* Galiano, 1965 (Salticidae: Salticinae: Euophryini) was found in dry grasses and one female of the genus *Sarinda* Peckham & Peckham, 1892 walking on an external wall of a rural house, both collected in Melilla, Montevideo, Uruguay (34□43'53"S, 56□19'22"W). A female of *Tullgrenella serrana* Galiano, 1970 (Salticidae: Salticinae: Aelurillini: Freyina) was collected in Sierra de Ríos, Cerro Largo, Uruguay (32□10'55"S, 53□51'37"W) in a hill, under a rock. The presence of mantispid larvae on the spiders was verified in the field and later confirmed by examining the specimens under binocular magnifying glasses. *Tullgrenella serrana* and *Sarinda* sp. were kept under laboratory conditions in plastic petri dishes with a piece of cotton moistened in water and fed with *Drosophila melanogaster* Meigen, 1830 (Diptera: Drosophilidae) *ad libitum*. *Neonella minuta* was fed with springtails (Hexapoda: Collembola) and whiteflies (Homoptera: Aleyrodidae) *ad libitum*, due to its small size. The day of oviposition of the female of *T. serrana* and the day of hatching of the mantispid were recorded. We follow Machado & Rafael (2010) descriptions for the determination of the mantispid. Spiders and mantispids were preserved in 75% etanol and were deposited in the Entomological Collection of the Facultad de Ciencias, Universidad de la República, Montevideo, Uruguay. Photographs of the live specimens were taken with an Olympus Tough TG-4 camera and the photographs of preserved specimens in ethanol with a Nikon D3500 adapted to a stereo microscope.

The presence of *T. serrana* and *N.* minuta is registered for the first time for Uruguay. In turn, the association of *Dicromantispa gracilis* (Erichson, 1839) (Neuroptera: Mantispidae: Mantispinae) with *T. serrana*

is recorded for the first time.

The position of the mantispid larvae on *N. minuta*, *Sarinda* sp. and *T. serrana* was similar, being found attached to one side of the prosoma and with their mouthparts towards the pedicel region (Fig. 1A-E). Female of *T. serrana* made an egg sac and after 28 days (September 20, 2019 – October 18, 2019) a *D. gracilis* pupa emerged (Fig. 1F), leaving the egg sac completely empty.

This is the first record of parasitoidism of mantispids in three species of the Salticidae family, *N. minuta*, *Sarinda* sp. and *T. serrana*. We register that *T. serrana* is host of *D. gracilis* and previous studies in Uruguay indicate the occurrence of this species parasitizing egg sacs of Trechaleidae family, with records for the departments of Lavalleja, Paysandú and Treinta y Tres (Trillo *et al*., 2015), with the new records, we extended the range of distribution of the mantispid to the department of Cerro Largo. *Neonella minuta* and *Sarinda* sp. died before making the ootheca, so it was not possible to visualize the complete development to determine the mantispid species associated with them. It is known that larvae of parasitoids have a minimum requirement of nutrients in order to complete their development (Rice, 1985), this establishes a limit size of host to guarantee these necessary nutrients. It is possible, therefore, that small species such as *N. minuta* and *Sarinda* sp. are not viable hosts for the mantispid larva and this explains the premature death of the observed specimens. Confirming these assumptions would require other studies, such as knowing the species of mantispid that parasitizes these jumping spiders and the nutritional requirements that the larva require. Redborg (1998) mentions that mantispid larvae are generally located on or closely to the pedicel, since this region is inaccessible to the host spider. This Mantispinae larvae behavior was observed in the three spider species of this study.

Collection of live spiders in the field, their rearing and maintenance in the laboratory is crucial to understanding the life cycles of their parasitoids and how they develop. Future studies will be focused on the breeding and maintenance of different jumping spider species in order to detect associated parasitoids and to establish their developmental time.

We thank Cecilia Costa for helping with feeding and maintaining the spiders in the laboratory. We also thank two anonymous reviewers who with their comments helped to improve the final version of the manuscript.

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Fecha de Recepción: 11 de septiembre de 2020
Fecha de Aceptación: 18 de noviembre de 2020