

## First report of the Asian jumping spider *Menemerus nigli* (Araneae: Salticidae: Chrysillini) in Brazil

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**Summary.** *Menemerus nigli* (Simon 1886) is reported from two sites in Rio de Janeiro, Brazil where it may have been recently introduced. Males, females and immatures are described and compared with the cosmopolitan *M. bivittatus*, also known from this area. Previously this species has been found only in south and southeast Asia, ranging from northern Pakistan to southern Thailand. Many specimens reported from Asia that have been identified as *M. fulvus* (L. Koch 1878) may actually represent *M. nigli*.

**Keywords.** *Menemerus bivittatus*, *Menemerus fulvus*, Rio de Janeiro

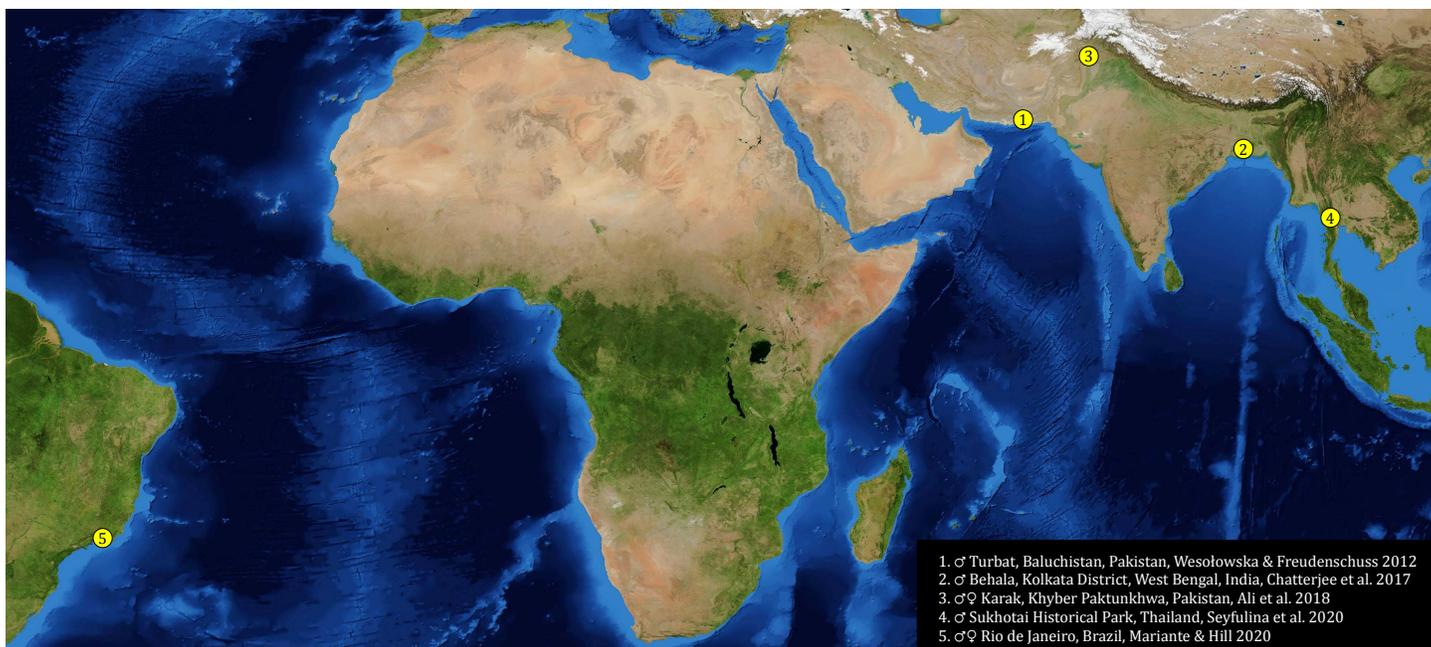
*Menemerus* Simon 1868 is a predominantly Afroeurasian chrysilline genus comprised of 67 known species; two of these, *M. bivittatus* (Dufour 1831) and *M. semilimbatus* (Hahn 1829), have a cosmopolitan distribution and are often found as synanthropes, living on man-made structures (Wesołowska 1999; Taucare-Rios & Edwards 2012; Edwards 2017; Huston 2017; WSC 2020). Here we report the discovery of *M. nigli* Wesołowska & Freudenschuss 2012, a species previously known only from south and southeast Asia, at two sites in Rio de Janeiro, Brazil (Figures 1-2). Our identification of *M. nigli* is based on published descriptions of the male and female (Wesołowska & Freudenschuss 2012; Chatterjee et al. 2017; Ali et al. 2018), as well as reviews of our documentation by those familiar with the taxonomy of this genus (W. Wesołowska, J. Prószyński, pers. comm.).

The adult male *Menemerus nigli* (Figures 3-9, 18) is similar to the female in color, but has a conspicuous fringe of white setae directed ventromedially on the medial side of each paturon. This fringe is also found on adult male *M. bivittatus*, also found in Brazil (Figure 22). Unlike the male *M. bivittatus*, the male *M. nigli* does not have a more-or-less linear tract of scales on the midline of the opisthosoma, but like the female has a more variegated pattern of scales on the dorsal opisthosoma that usually includes chevrons toward the rear. The white clypeal band of the male *M. bivittatus* is also much wider than that of *M. nigli*. The dorsal cymbium of the pedipalp of *M. nigli* is covered with long off-white setae. In *M. bivittatus* the dorsal cymbium is dark brown.

The pedipalp of the adult male *Menemerus nigli* has a relatively long cymbium and a large, curved embolus to the medial side of a prominent, sclerotized ventromedial lobe of the tegulum situated over the spermaphore loop (Figure 9). Unlike some *Menemerus*, the embolus has a single (not bifurcated) apex.

Many of the photographs of *M. fulvus* (L. Koch 1878) that have been posted on the internet (e.g., iNaturalist 2020), all from south and southeast Asia, may actually represent *M. nigli*. Unfortunately more recent drawings of the pedipalp of that species (e.g., Bohdanowitz & Prószyński 1987) bear little resemblance to the drawing presented with the original description (L. Koch 1878). As noted by

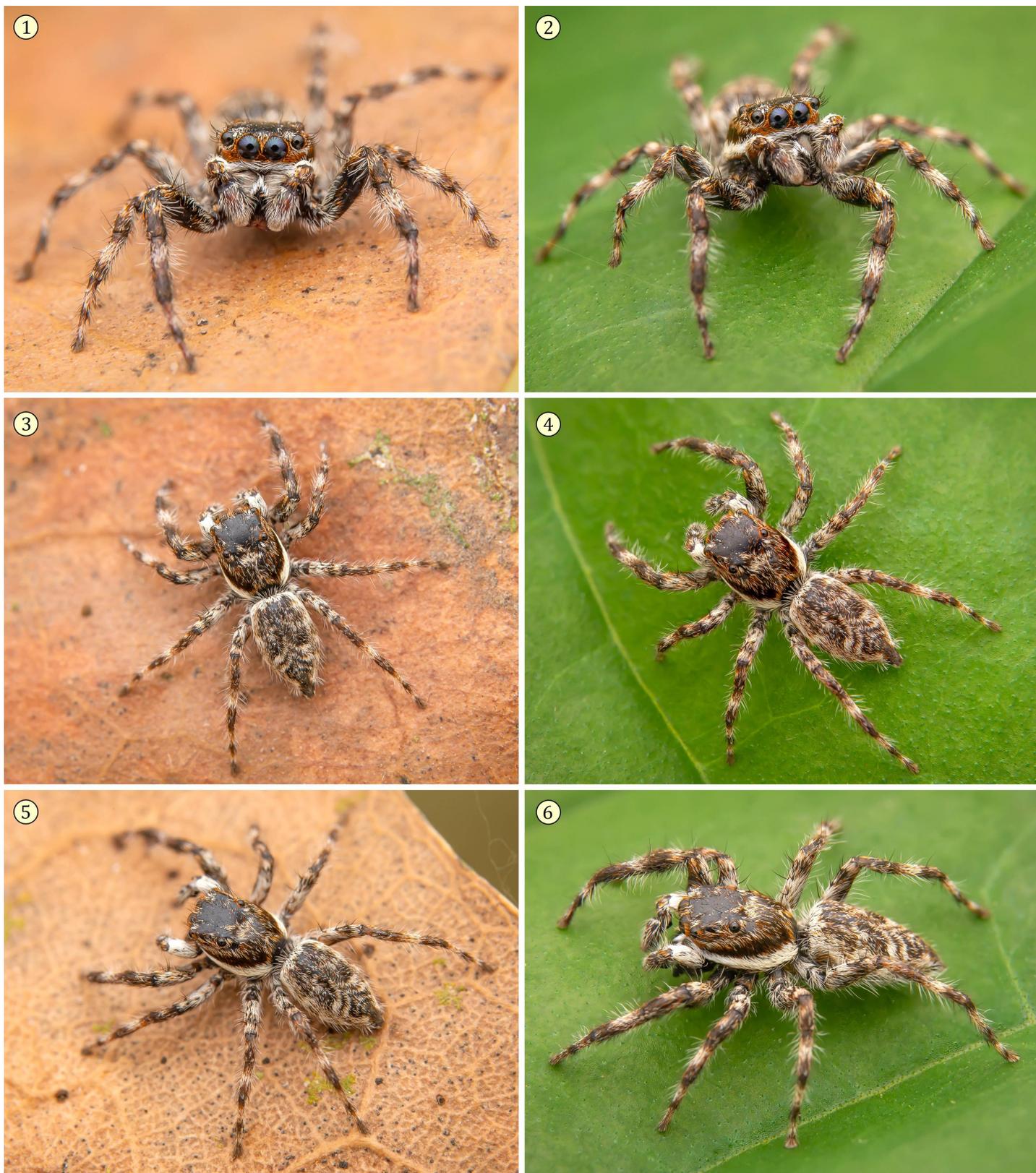
Wesołowska in her revision of the African *Menemerus* (1999), "the majority of species (except few widely distributed) are very poorly known, the descriptions in older publications are inadequate and not supplemented with figures. Numerous specimens in museum collections are misidentified or unidentified." Presently a revision of *Menemerus* that includes the Asiatic species is needed.



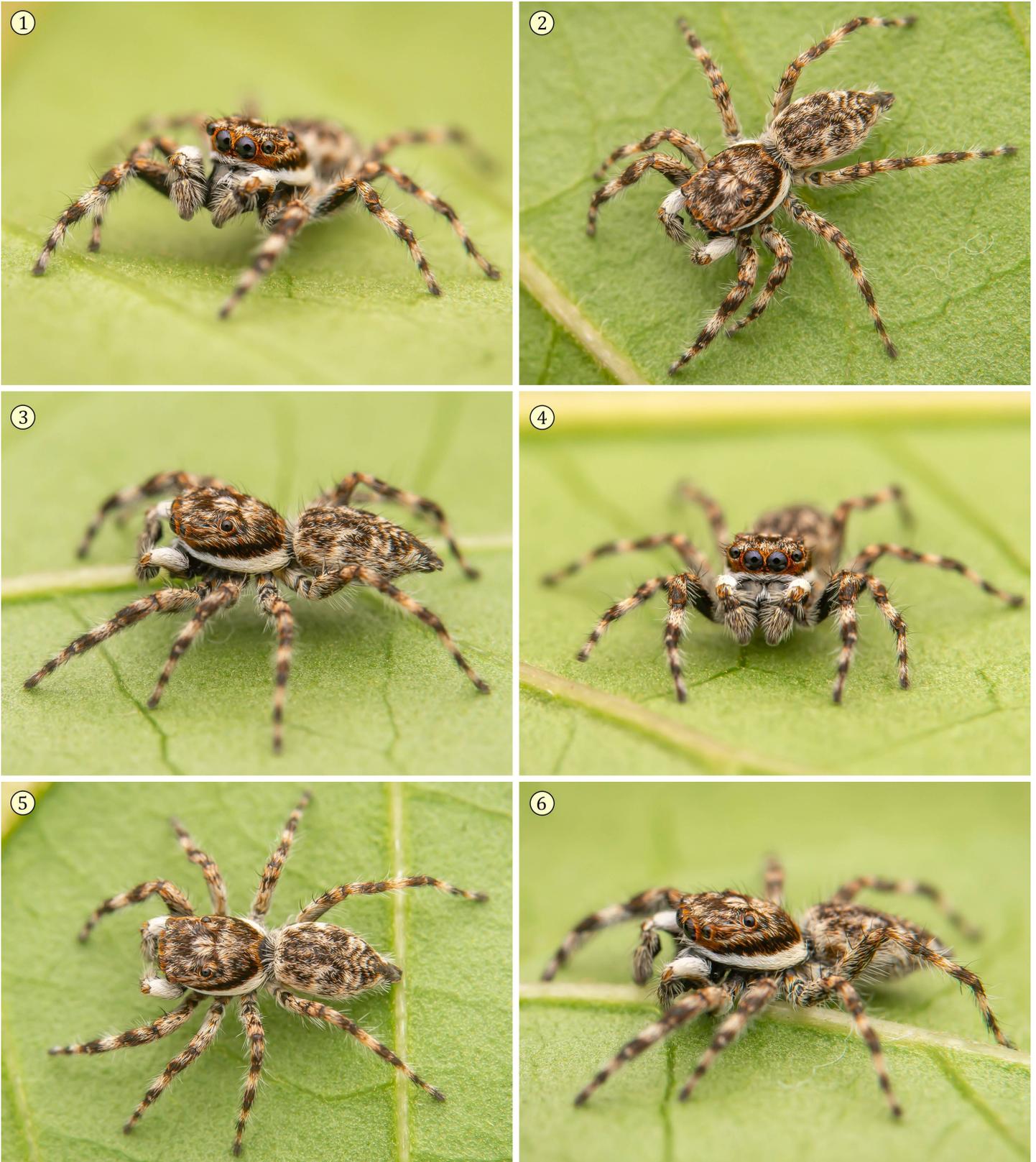
**Figure 1.** Known distribution of *Menemerus nigli*. The Brazilian sites (5, at lower left) are far removed from other localities where this species has been found in southern and southeastern Asia (1-4, at upper right).



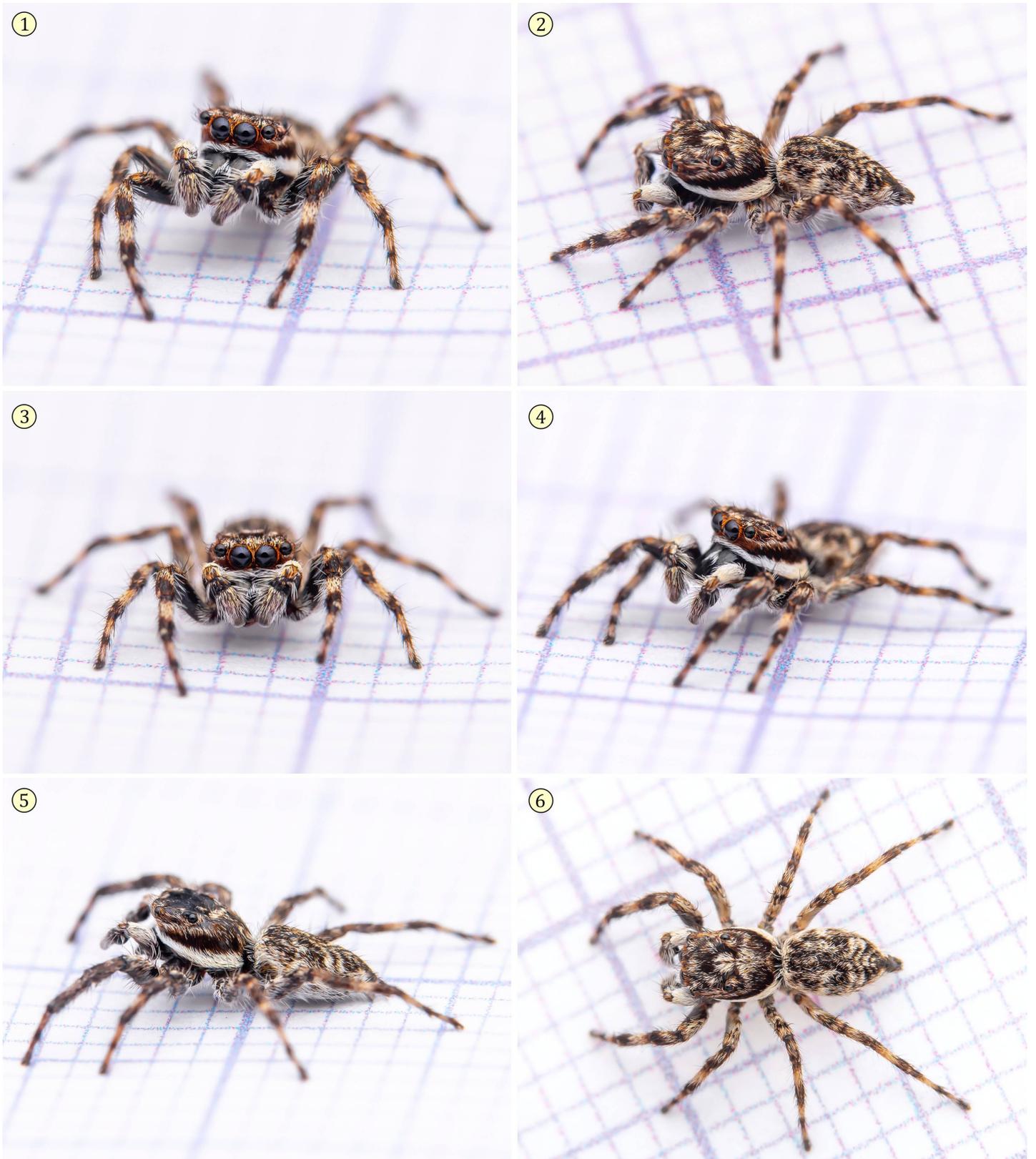
**Figure 2.** Location of the two urban sites where *Menemerus nigli* has been found based on our study sites (1) and another site (2) where this species has been observed. Both sites are on the western side of Guanabara Bay in Rio de Janeiro, Brazil.



**Figure 3.** Views of an adult male ( $\sigma$  #1) *Menemerus nigli* from site 1.2 in Rio de Janeiro, Brazil (FEB 2020).



**Figure 4.** Views of an adult male ( $\sigma$  #2) *Menemerus nigli* from site 1.1 in Rio de Janeiro, Brazil (FEB 2020).



**Figure 5.** More views of an adult male ( $\sigma$  #2) *Menemerus nigli* from site 1.1 in Rio de Janeiro, Brazil (FEB 2020). As in Figure 13, this spider was photographed on a 1 mm square grid.



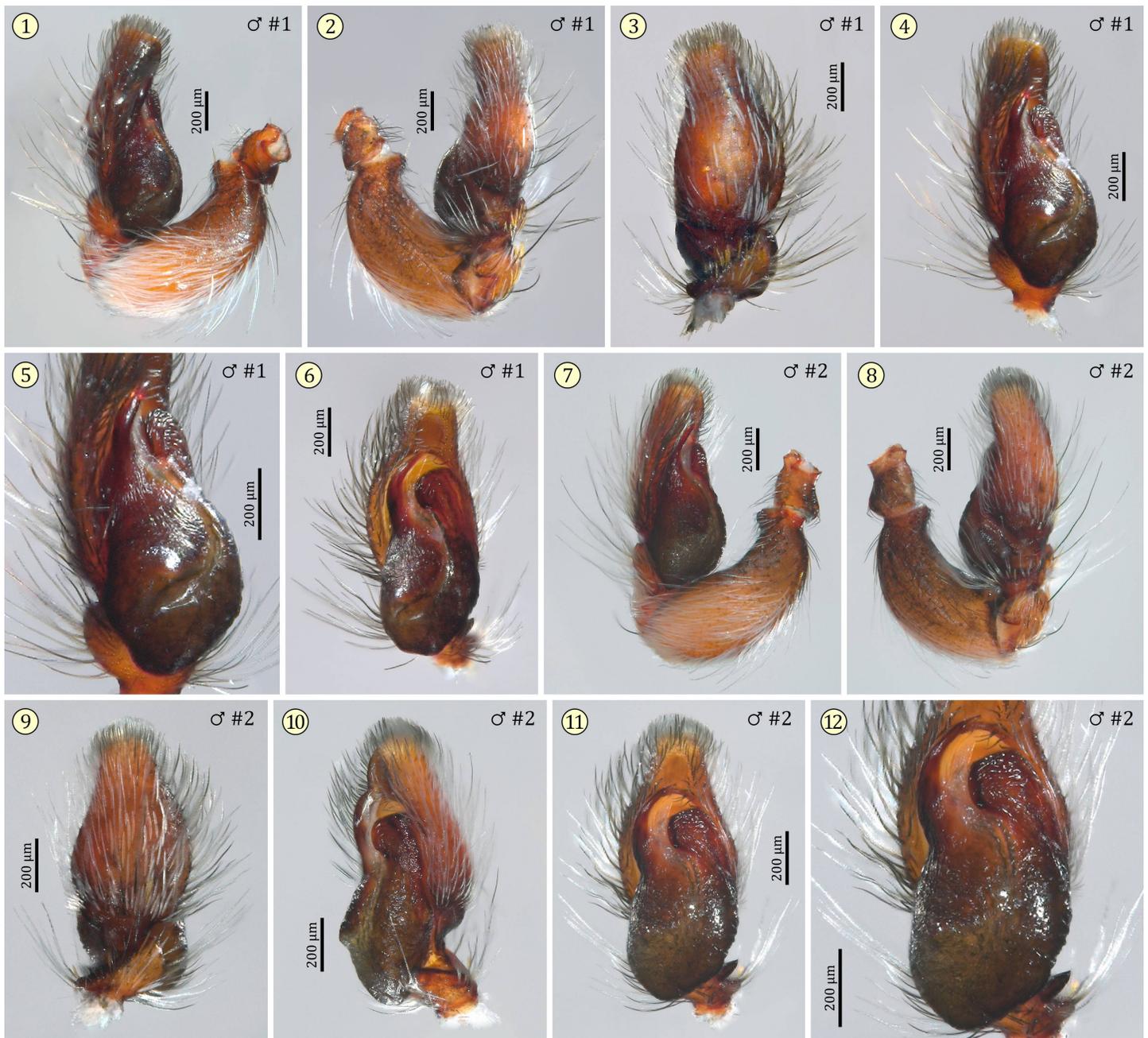
**Figure 6.** Detailed views of an adult male ( $\sigma$  #2) *Menemerus nigli* from Rio de Janeiro, Brazil. **1-2**, Note the long, off-white setae situated on the dorsum of each cymbium, and the relatively narrow line of white setae across the clypeus. **4**, Note the lack of a middorsal line and the presence of chevrons at the rear of the opisthosoma.



Figure 7. Views of adult male *Menemerus nigli* specimens from Rio de Janeiro in alcohol.



Figure 8. Detailed views of adult male *Menemerus nigli* specimens from Rio de Janeiro in alcohol.



**Figure 9.** Left (♂ #1) or right (♂ #2) pedipalp of two adult male *Menemerus nigli* from Rio de Janeiro, Brazil. Images from the right pedipalp were flipped horizontally (mirrored) to facilitate direct comparison according to our left pedipalp convention. Thus they represent the appearance of the left pedipalp.

Penultimate males (Figure 10) were similar to adult females but darker in appearance with fewer light-colored setae, but identifiable as males by the presence of club-shaped cymbium at the end of each pedipalp. They lacked the white setae on the medial side of each paturon as found in the adult male.



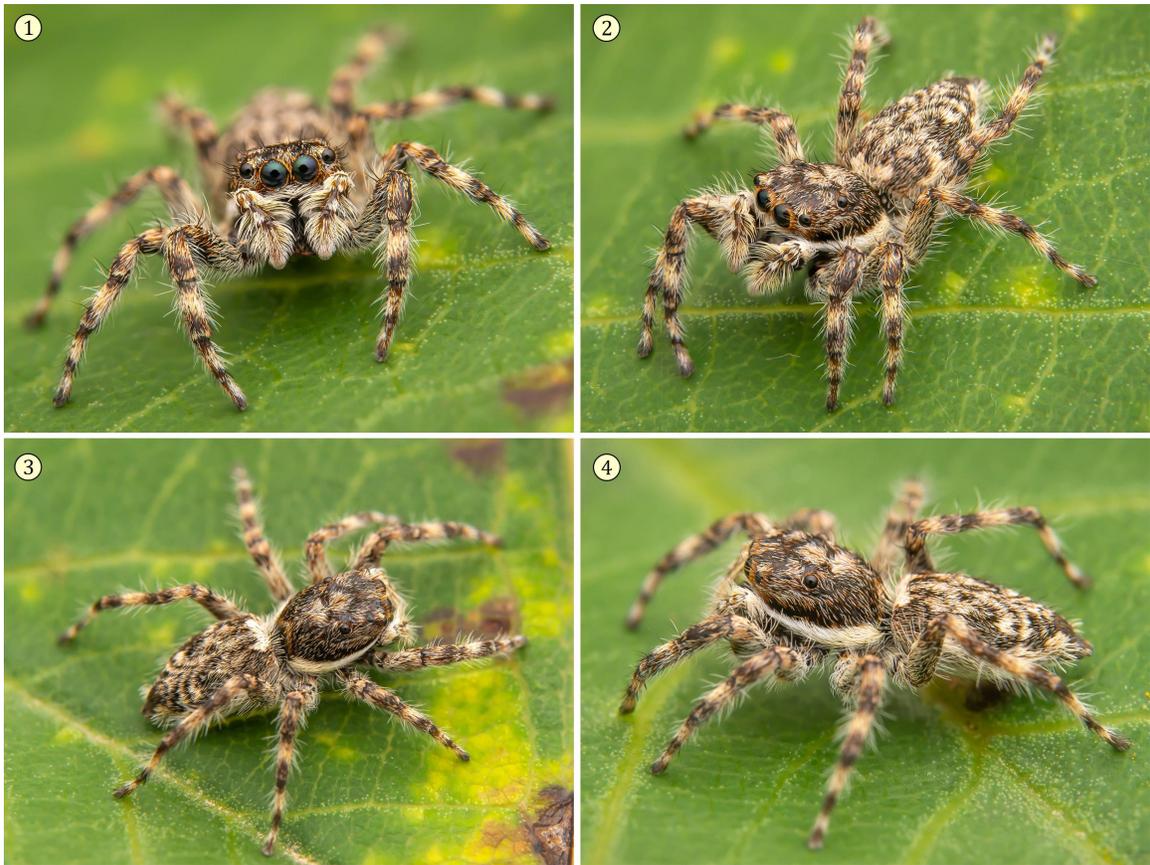
**Figure 10.** Views of a penultimate male *Menemerus nigli* from site 1.1 in Rio de Janeiro, Brazil (FEB 2020).

Adult female *Menemerus nigli* (Figures 11-18) were similar to penultimate in coloration, with shiny black chelicerae and lacking the white setae found on the medial side of each paturon of the adult male. Like males they have a band of white to off-white scales across the clypeus. In comparison, adult female *M. bivittatus* (Figure 23) have a solid cover of orange setae around the front eyes and covering the clypeus. Compared to *M. bivittatus*, adult female *M. nigli* have a more variegated (light or dark brown) rather than light brown array of dark setae on the dorsal opisthosoma, and lack dark lateral bands around the opisthosoma. The pedipalps of *M. bivittatus* females are also lighter in color rather than brown, with a more complete cover of white to off-white setae.

The epigynum of *M. nigli*, with wide atria open toward the front and a pair of posterior spermathecae (Figure 17), was first described by Ali et al. (2018).



**Figure 11.** Views of an adult female (♀ #3) *Menemerus nigli* from site 1.1 in Rio de Janeiro, Brazil (AUG 2019).



**Figure 12.** Adult female (♀ #1) *Menemerus nigli* from site 1.2 in Rio de Janeiro, Brazil (FEB 2020).



**Figure 13.** Adult female (♀ #2) *Menemerus nigli* from site 1.1 in Rio de Janeiro (FEB 2020).



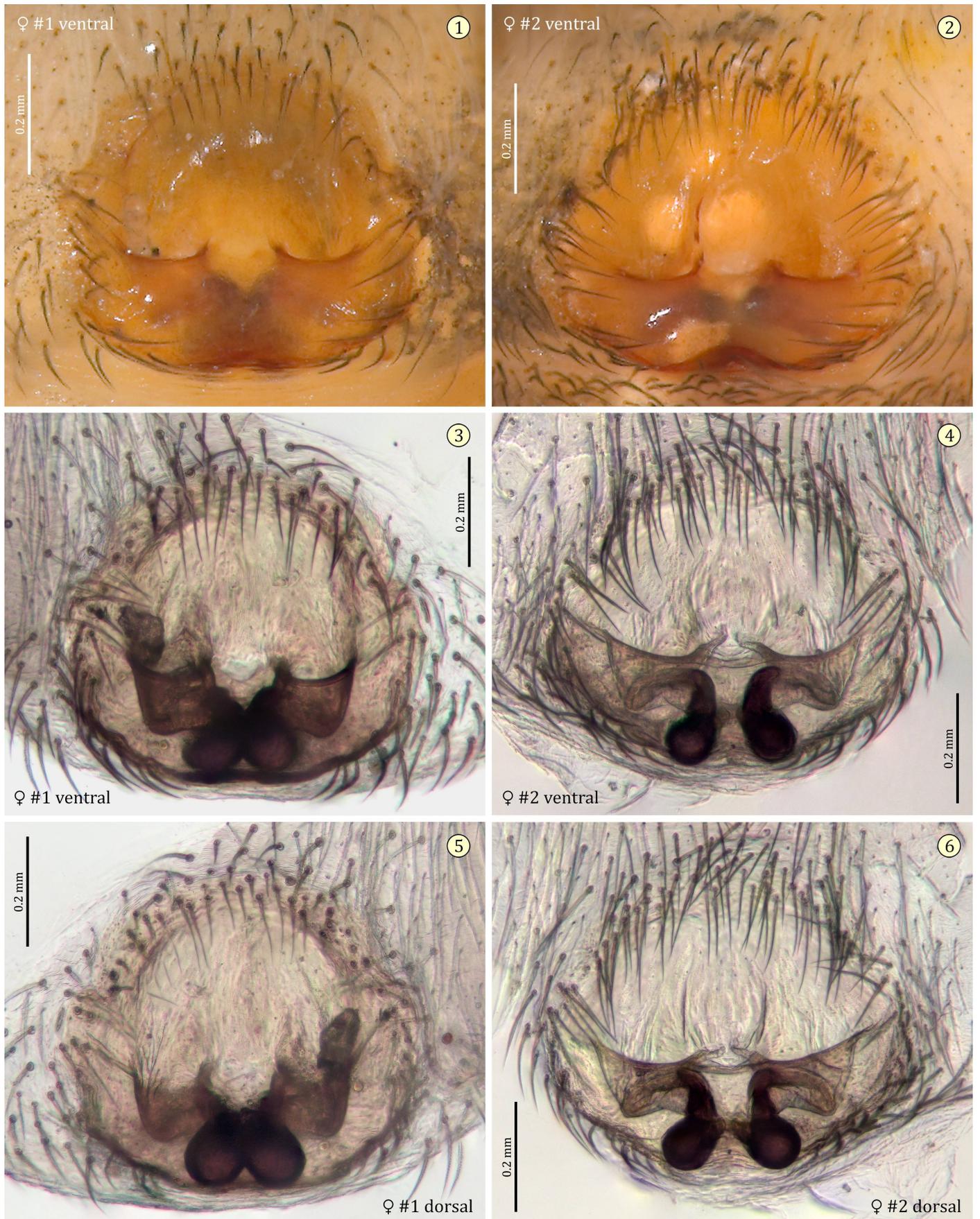
**Figure 14.** Detailed views of an adult female (♀ #1) *Menemerus nigli* from Rio de Janeiro, Brazil. **1-2,** Note the dark brown color of the pedipalps, orange scales around the AME, and the relatively narrow line of white to off-white setae across the clypeus. **4,** Note the lack of dark marginal bands and the presence of three chevrons at the rear of the opisthosoma.



**Figure 15.** Views of adult female *Menemerus nigli* specimens from Rio de Janeiro in alcohol.



**Figure 16.** Detailed views of adult female *Menemerus nigli* specimens from Rio de Janeiro in alcohol.



**Figure 17.** Epigynum of two female *Menemerus nigli* from Rio de Janeiro, Brazil. **1-2,** Specimens in alcohol, with anterior toward the top of the page. **3-4,** Ventral view of cleared epigynum. **5-6,** Dorsal view of cleared epigynum.



**Figure 18.** Ventral views of *Menemerus nigli* from Rio de Janeiro, Brazil. 1, Adult male. 2-4, Two adult females.

Our study sites (1.1 and 1.2, located 260 meters apart from each other) where *Menemerus nigli* was found in Rio de Janeiro are shown in Figures 19-20. Another observer found *Menemerus nigli* at a third site (site 2), 2.4 km apart from our sites (Figures 2, 21). Previously, in Asia, this species was found either on or under stones, or on an indoor wall (Wesołowska & Freudenschuss 2012; Chatterjee et al. 2017; Seyfulina et al. 2020). In Rio de Janeiro it was found only in a synanthropic context, living on the same kind of painted concrete or stucco exterior walls where the cosmopolitan *M. bivittatus* (Figures 20, 22-23) is often found. Previously, we reported the occurrence of the African salticid *Thyene coccineovittata* in a synanthropic context, but living on garden plants in Rio de Janeiro and nearby areas (Mariante & Hill 2019). These observations support the view that species that can adapt to anthropogenic habitats may be more successful in finding a niche when introduced to a remote place.

Intercontinental spider introductions are now taking place at high rate as a result of international trade (Kobelt & Nentwig 2008). Introduced spiders are also known to displace native species (Jakob et al. 2011; Houser et al. 2014). Each major biogeographical province has its own distinct fauna of salticid groups, and some of these may be the result of single-species introductions many millions of years ago. For example, the subtribe Freyina is an endemic Neotropical salticid clade (Edwards 2015; Maddison 2015) that may have evolved from a single species of Afrotropical origin, just as the caviomorph rodents of South America represent a monophyletic group that evolved from a single introduction from Africa (Lessa et al. 2014). A single introduction could greatly alter the neotropical fauna of the future.



**Figure 19.** Site 1.1 for *Menemerus nigli* in Rio de Janeiro, Brazil. 1-3, Views of exterior concrete wall covered with stucco and paint. 4, Female near crevice in wall. 5-6, Male on wall. 7-8, Female on wall.



**Figure 20.** Site 1.2 for *Menemerus bivittatus* and *M. nigli* in Rio de Janeiro, Brazil. 1-3, Painted walls of buildings near parking spaces. 4, 6-7, Three adult female *M. bivittatus* on wall. 5, Adult male *M. bivittatus* on wall.



**Figure 21.** Additional record of *Menemerus nigli* in the state of Rio de Janeiro (OCT 2017). This immature or female spider was found at site 2, on a wall of a house. Photography by Fernando Vinícius Gomes de Moraes, used with permission.

## Methods

Specimens collected and fixed in 80% alcohol will be deposited in the collection of the Laboratório de Diversidade de Aracnídeos at Federal University of Rio de Janeiro, curator R. Baptista (UFRJ 1634 and UFRJ 1636), along with the specimens from our previous study with *Thyene coccineovittata* (UFRJ 1633 and UFRJ 1635; Mariante & Hill 2019).

The stereo microscope used for ethanol preserved specimens (including non-cleared epigynum and pedipalps) was a ZEISS Axio Zoom.V16 (TM) equipped with an Axiocam HRm (TM) color camera. Each epigynum was dissected and cleared with 10% NaOH for 18 hours at room temperature, then photographed in a ZEISS Primo Star (TM) microscope equipped with an Axiocam 105 (TM) color camera. Stacking of several images of the cleared epigynum of the female, as well as some photographs of these spiders, was performed with Adobe® Photoshop® software. Stacking of male pedipalps was performed with Carl Zeiss ZEN software.

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Figure 22. Adult males, *Menemerus bivittatus* in Rio de Janeiro, Brazil.



Figure 23. Adult females, *Menemerus bivittatus* in Rio de Janeiro, Brazil.

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