

## Spiders of Fernando de Noronha Island. Part I: Linyphiidae

### Everton N. L. Rodrigues

Programa de Pós-Graduação em Biologia Animal,  
Instituto de Biociências, Universidade Federal do Rio Grande do Sul,  
Av. Bento Gonçalves 9500, Bloco IV, Prédio 43435,  
91501-970 Porto Alegre, RS, Brazil

### Antonio D. Brescovit

Laboratório de Artrópodes, Instituto Butantan,  
Av. Vital Brazil 1500, 05503-900 São Paulo, SP, Brazil

### Gilson C. C. Freitas and Simão D. Vasconcelos

Laboratório de Invertebrados Terrestres,  
Centro de Ciências Biológicas, Universidade Federal de Pernambuco,  
Av. Professor Moraes Rego, s/n., 50670-420 Recife, PE, Brazil

## Summary

*Lepthyphantes noronhensis* sp. n. from Fernando de Noronha Island, state of Pernambuco, is described and illustrated. *Meioneta galapagosensis* Baert, 1990 is recorded for the first time from Brazil and new illustrations and data on natural history are presented.

## Introduction

Although the Linyphiidae ranks among the most diverse of spider families, with over 4,300 species described in more than 570 genera (Platnick, 2007), there is a scarcity of taxonomic studies in the Neotropical region, which may have led to an underestimation of their occurrence in tropical countries.

The genus *Lepthyphantes* Menge, 1866 (*sensu lato*) comprises medium-sized spiders, without a trichobothrium on the fourth metatarsus, with numerous lateral and dorsal spines on femora, tibiae, patellae and metatarsi, tibia I with a single ventral spine near the base or 2–4 scattered ventral spines, a sickle-shaped embolus with tight sulcus and large carina, a large prominent lamella characteristica and the female epigynum with a long, narrow scape without a medial notch, usually curved or folded (Merrett, 1963; Roberts, 1987; Saaristo & Tanasevitch, 1996; Draney & Buckle, 2005). Additionally, males of some species have teeth on the paracymbium.

The genus includes 198 described species, most of which are Palearctic (Platnick, 2007). Only three species have been reported from the Neotropical region, namely *Lepthyphantes fernandesi* Berland, 1924 from Juan Fernandez Islands, Chile, *L. microserratus* Petrunkevitch, 1930 from Puerto Rico and *L. leprosus* (Ohlert, 1865) from Chile (Platnick, 2007). The last, according to Millidge (1991), has been introduced in South America. So far, no species belonging to this genus has been recorded from Brazil.

The genus *Meioneta* was proposed by Hull (1920) with type species *Meioneta rurestris* (C. L. Koch, 1839), originally described in the genus *Micryphantes*. The genus is widely distributed, with various species in Europe, Asia, North and Central America and Africa (Millidge, 1991). The same author described 25 species

from the Neotropical region, with type localities in Venezuela, Colombia, Peru, Chile and Brazil. Before this paper, five species had been recorded from the Neotropical region, *M. plagiata* (Banks, 1929) in Panama, and four species from Galápagos, Ecuador, by Baert (1990): *M. albomaculata*, *M. arida*, *M. galapagosensis* and *M. pinta*. Only two species are known to occur in Brazil: *M. adami* Millidge, 1991 in the state of Amazonas and *M. propinqua* Millidge, 1991 in the state of Mato Grosso.

The genus is characterised mainly by the size and shape of its lamella characteristica and terminal apophysis in males and epigyne and vulva structure in females; additionally, the relatively complex cymbium is a useful character for identifying species (Merrett, 1963; Saaristo, 1973; Millidge, 1991).

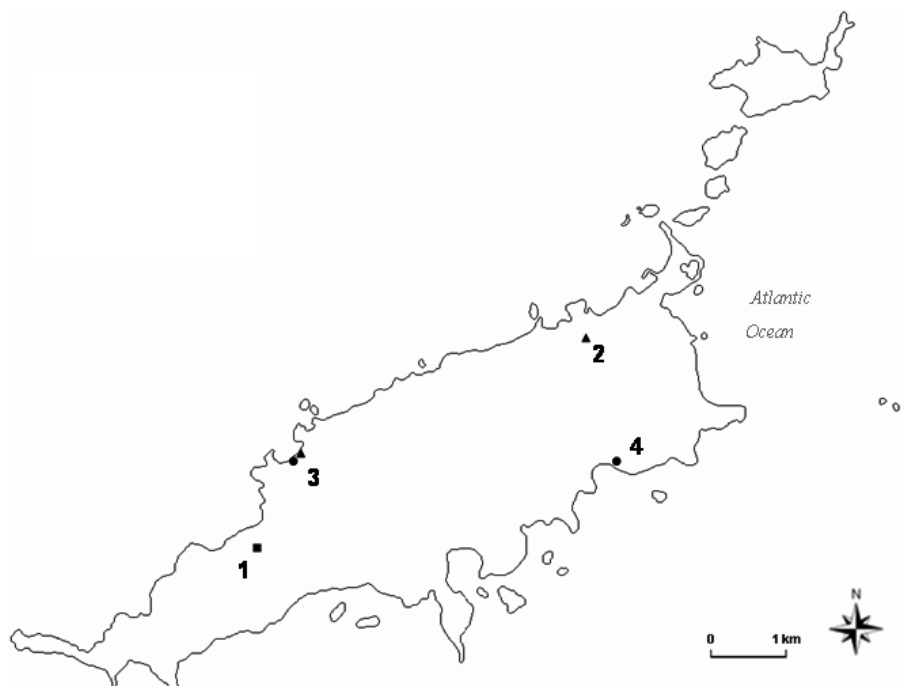
This is the first paper concerning the spiders of Fernando de Noronha Archipelago, a legally protected area in north-eastern Brazil. The archipelago is considered a World Natural Heritage Site by the United Nations (UNESCO, 2007), but has been strongly modified by human activities. Here, we describe a new species of *Lepthyphantes* (*sensu lato*), which is the first record of the genus in Brazil. Also, *Meioneta galapagosensis* Baert, 1990 is recorded for the first time in Brazil and new illustrations and data on its natural history are presented.

## Material and methods

Fernando de Noronha lies just off the rim of the continental shelf (3°50'S, 32°15'W), 345 km (215 mi) north-east of the nearest Brazilian mainland at Cabo São Roque. The total land area of the archipelago is 18.4 km<sup>2</sup>, of which 16.9 km<sup>2</sup> form Fernando de Noronha Island with a length of 10 km by 3.5 km at its greatest width. Several smaller islets extend from the north-east corner of the main island (Teixeira *et al.*, 2003). Fernando de Noronha is volcanic in origin, formed by a submarine mountain that rises abruptly 4,000 m from the ocean floor as a classical conical seamount, of which only the uppermost tip breaks the surface to form the archipelago (Cordani, 1970; Carleton & Olsen, 1999). The areas in which the linyphiids were collected are described below (Map 1).

1. *Preserved Area*: Situated within the Parque Nacional Marinho de Fernando de Noronha (PAR-NAMAR), a restricted access area controlled by the Instituto Brasileiro do Meio Ambiente (IBAMA)—Brazilian environmental agency. The vegetation shows a secondary stage of succession, and low diversity with predominance of *Ipomoea nil* (L.) Roth, *I. hederifolia* L. (Convolvulaceae) and *Cissus verticillata* (L.) Nicholson & Jarvis (Vitaceae), all creeping plants popularly known as jitiranas. The physiognomy varies greatly between the wet and dry seasons, reflecting the characteristics of a Seasonal Deciduous Forest.

2. *Urban Area*: Situated in the Vila dos Remédios, the economic and political centre of the island. This area is surrounded by buildings such as residences and both inhabited and abandoned construction sites. Garbage



Map 1: Collection areas on Fernando de Noronha Island, Pernambuco, Brazil (1=Preserved Area, 2=Urban Area, 3=Baia do Sancho, 4=Atalaia Beach). Circles=*M. galapagosensis*, triangles=*L. noronhensis*, square=Linyphiidae juveniles.

accumulates in this area and sometimes dead animals can be found. Two tracks pass through the area where the traps were placed. Domestic and larger animals (cows) are relatively common in this area.

3. *Baia do Sancho*: This bay is situated in an area with difficult access. A crack in a sea cliff leads to the bay by land, and ships bring tourists by sea to avoid the dangerous path. These access difficulties contribute to make this beach quite deserted, with very few tourists, and less impacted by tourism than other bays of the archipelago.

4. *Atalaia Beach*: Part of the PARNAMAR, a restricted area with access to the beach limited to only two hours a day, for small groups. The traps were placed in a shrub area. This beach often receives wreckage, objects and rubbish thrown in the ocean from ships.

Spiders were collected as part of a sampling project planned to compare the composition of ground-dwelling arthropod fauna from areas under different degrees of human exploitation. Spiders were collected with pitfall traps ( $n=190$ ) during 15 days in October 2005 (driest month) and 15 days in April 2006 (wettest month). Biological material was preserved in 80% alcohol. Specimens were deposited in the collections of the Koninklijk Belgisch Instituut voor Natuurwetenschappen, Brussel, Belgium (KBIN, L. Baert), Instituto Butantan, São Paulo, Brazil (IBSP, A. D. Brescovit) and Museu de Ciências Naturais, Fundação Zoobotânica do Rio Grande do Sul, Porto Alegre, Brazil (MCN, E. H. Buckup).

The trichobothrium position on metatarsus I was calculated following Millidge (1980). Descriptions follow Saaristo (1973), Millidge (1985, 1991) and Saaristo & Tanasevitch (1996). The study of reproductive structures of both male and female was performed by immersing the epigynum and the embolic division in

lactic acid. For expansion of the epigynum, the structure was immersed in 10% KOH for approximately two hours, and then immersed in filtered water. All measurements are in millimetres. Abundance distributions between seasons and areas were analysed by chi-square test ( $\alpha=0.05$ ). Abbreviations: AME=anterior median eyes, ALE=anterior lateral eyes, PLE=posterior lateral eyes, PME=posterior median eyes.

#### *Lepthyphantes noronhensis* Rodrigues, Brescovit & Freitas, sp. n. (Figs. 1–10)

*Type material*: Holotype ♂, BRAZIL, Pernambuco, Island of Fernando de Noronha (Urban Area), 19 April 2006, G. C. C. Freitas coll., collected in pitfall trap (IBSP 67699). Paratypes: 2♂ 2♀, 14–16 April 2006, collected with holotype (IBSP 67692, 67694); 1♂ 1♀, 19 April 2006, collected with holotype (MCN 42557, 42558).

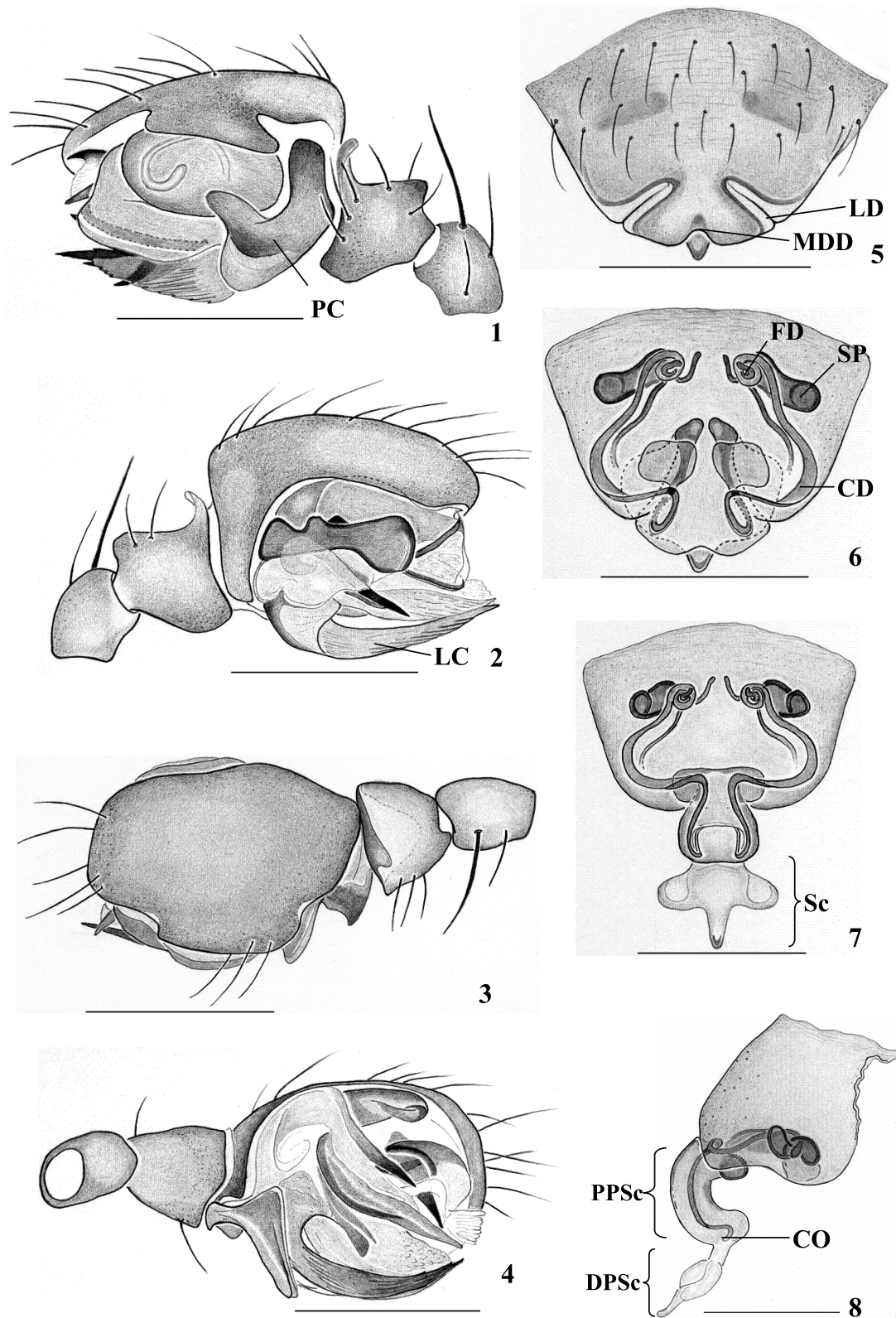
*Etymology*: The specific name refers to the type locality.

*Diagnosis*: The male palp of *Lepthyphantes noronhensis* sp. n. resembles that of *L. aelleni* Denis, 1957 (Bosmans, 2006: figs. 6–8) but differs in having a longer dorsal tibial apophysis, a lamella characteristic with a more sharply pointed apex (Figs. 1, 2) and paracymbium with a narrower base, and less developed distally (Fig. 1). The female epigynum resembles that of *L. brignolianus* Deltshév, 1979 (Deltshév, 1979: figs. 11–13) but is distinguished by the presence of a median distal depression, less developed scape and lateral depression (Fig. 5), and longer spermathecae (Figs. 6, 7).

*Description*: *Male* (holotype): Total length 1.32. Carapace length 0.62, width 0.50, height 0.35. Clypeus height 0.12. Sternum length 0.37, width 0.37. Abdomen length 0.67, width 0.47, height 0.44. Leg formula I/IV/II/III.

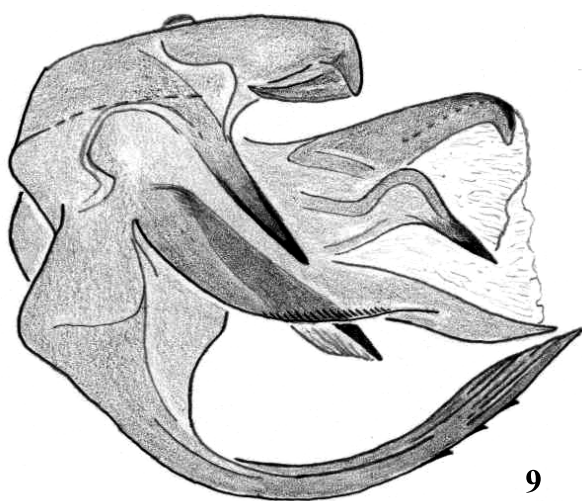
Leg lengths (I/II/III/IV): femora 0.61/0.55/0.46/0.58; patellae 0.13/0.11/0.11/0.11; tibiae 0.62/0.52/0.37/0.55; metatarsi 0.52/0.51/0.40/0.53; tarsi 0.38/0.37/0.30/0.35; total 2.26/2.06/1.64/2.12. Position of Tm I 0.32. Metatarsi I–III with trichobothrium, absent on IV. All tibiae with two dorsal spines. Carapace yellowish-brown,

anteriorly dark brown; ocular area darker, wider than long. Anterior eye row 0.26, posterior row 0.25. ALE, PLE and PME similar sized, ALE smaller. Chelicerae and endites pale brown. Sternum pale brown with dark brown margins. Legs pale yellow. Abdomen yellowish-brown. Palpus with tibial apophysis (Figs. 1, 2), patella

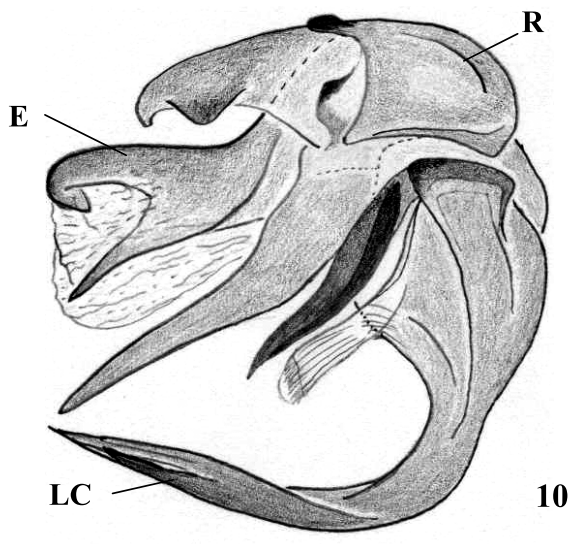


Figs. 1–8: *Leptyphantes noronhensis* sp. n. **1** Male palp, ectal; **2** Ditto, mesal; **3** Ditto, dorsal; **4** Ditto, ventral; **5** Epigynum, ventral; **6** Ditto, ventral, cleared; **7** Ditto, ventral, expanded; **8** Ditto, lateral, expanded. Abbreviations: CO=copulatory opening, CD=copulatory duct, FD=fertilisation duct, LD=lateral depression, MDD=distal median depression, PC=paracymbium, SP=spermatheca, Sc=scape, DPSc=distal portion of scape, PPSc=proximal portion of scape. Scale lines=0.2 mm.





9



10

Figs. 9–10: *Lepthyphantes noronhensis* sp. n., embolic division of male palp, cleared. **9** Ventro-mesal; **10** Dorso-mesal. Abbreviations: E=embolus, LC=lamella characteristica, R=radix. Scale lines=0.2 mm.

with long dorsal spine (Figs. 1–3), well developed paracymbium with posterior projection (Fig. 1), cymbium with sulcus near distal end (Figs. 1, 2), radix strongly sclerotised (Figs. 2, 9, 10).

**Female** (IBSP 67694, paratype): Total length 1.47. Carapace length 0.60, width 0.44, height 0.35. Clypeus height 0.11. Sternum length 0.35, width 0.35. Abdomen length 0.82, width 0.67, height 0.70. Leg formula I/IV/II/III. Leg lengths (I/II/III/IV): femora 0.55/0.47/0.44/0.50; patellae 0.15/0.15/0.12/0.15; tibiae 0.47/0.43/0.32/0.44; metatarsi 0.40/0.38/0.31/0.41; tarsi 0.47/0.36/0.27/0.36; total 2.04/1.79/1.46/1.86. Position of Tm I 0.30. Metatarsi I–III with trichobothrium, absent on IV. Tibiae I–IV with two dorsal spines. Carapace yellowish-brown with dark brown dotted striae; ocular area black, wider than long. Anterior eye row 0.23, posterior row 0.25. ALE larger than others, AME less developed than PME and PLE. Chelicerae dark brown. Sternum and endites also dark brown but darker than chelicerae.

Legs yellowish-brown, tibiae dark brown. Abdomen yellowish-brown, ventral area surrounding spinnerets reddish-brown. Epigynum with copulatory ducts long and sinuous, leading to spermathecae (Figs. 6–8); copulatory openings in proximal portion of scape (Fig. 8), fertilisation ducts originating on spermathecae (Figs. 6, 7).

**Other material examined:** BRAZIL: Pernambuco: Island of Fernando de Noronha, 3♂, 11–14 April 2006, G. C. C. Freitas coll., pitfall trap (IBSP 67693, 67697).

**Distribution:** Known only from the island of Fernando do Noronha, Fernando de Noronha Archipelago, Pernambuco, Brazil.

### *Meioneta galapagosensis* Baert, 1990 (Figs. 11–18)

*Meioneta galapagosensis* Baert, 1990: 134, figs. 23–27, holotype ♂, Santa Cruz, Caseta Tortuga, Galápagos Islands, Ecuador, 20 March 1982, L. Baert & J.-P. Maelfait coll., deposited in KBIN (examined material: 26♂ 7♀, Isabela, Volcán Sierra Negra, alt. 900 m, Galápagos Islands, Ecuador, 10 February–17 September 1986, S. Abedrabo coll., deposited in KBIN number 27726).

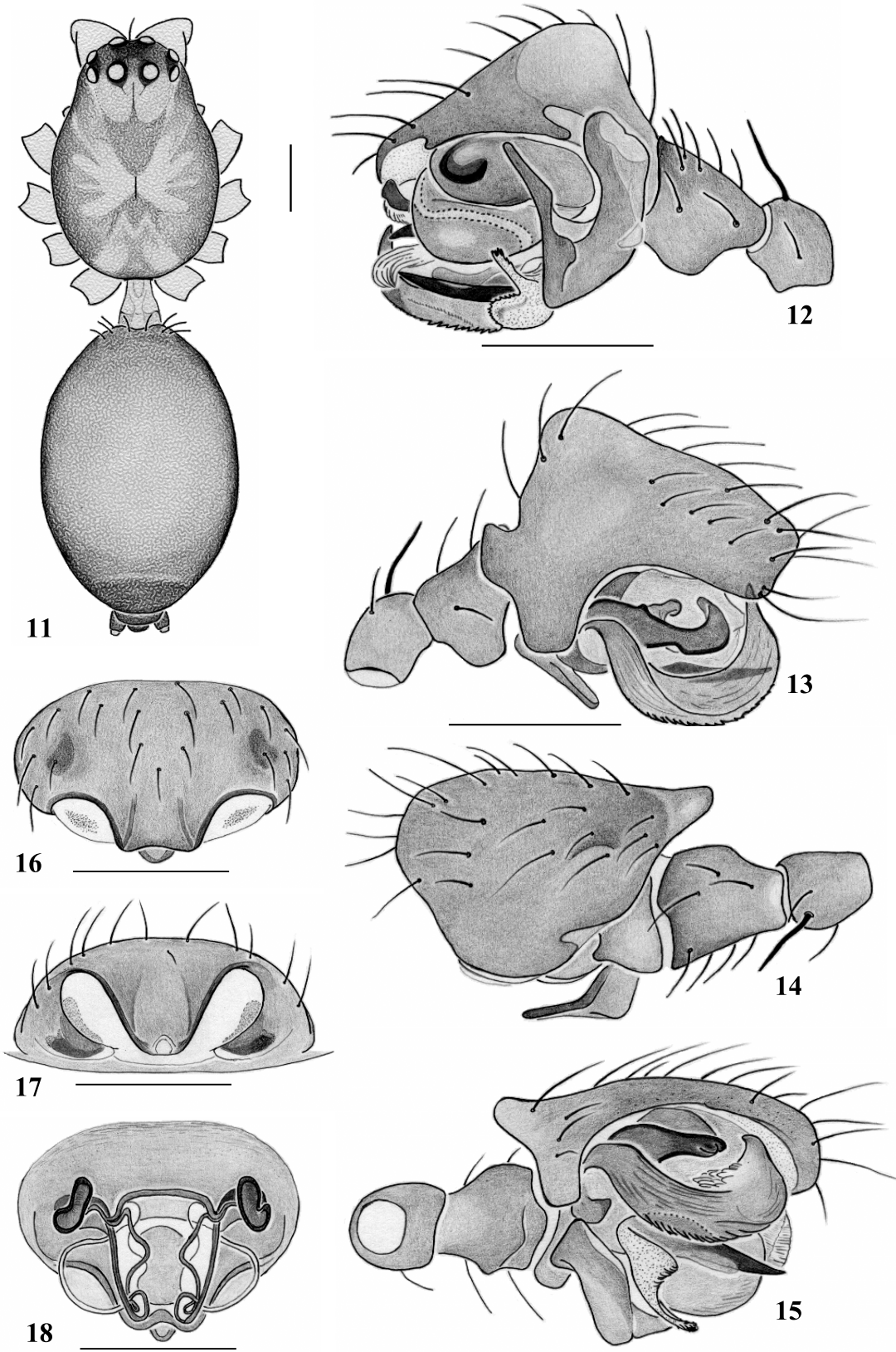
**Diagnosis:** The male palp of *Meioneta galapagosensis* Baert, 1990 resembles that of *M. castanea* Millidge, 1991 (Millidge, 1991: figs. 421–424), in having a relatively simple cymbium with a dorsal projection, lamella characteristica not prolonged and embolus with curved distal portion ending near the distal area of the cymbium, but differs in the lamella characteristica being ventrally elongated and serrated and by the presence of a mesal basal projection on the cymbium, overlapping the tibia. The female epigynum is similar to that of *M. castanea* (Millidge, 1991: fig. 425), but is distinguished by the median distal depression of the ventral plate being deeper and wider (Fig. 16).

**Description: Male:** Described by Baert (1990). Here we present illustrations of dorsal male habitus (Fig. 11) and mesal, ventral and dorsal views of male palp (Figs. 12–15). Total length 1.72. Carapace length 0.77, width 0.55, height 0.25. Clypeus height 0.10. Sternum length 0.40, width 0.37. Abdomen length 0.92, width 0.60, height 0.57. Leg formula I/IV/II/III. Leg lengths (I/II/III/IV): femora 0.72/0.62/0.44/0.65; patellae 0.20/0.17/0.15/0.17; tibiae 0.70/0.57/0.40/0.62; metatarsi 0.62/0.67/0.44/0.62; tarsi 0.42/0.40/0.30/0.37; total 2.69/2.43/1.73/2.43. Position of Tm I 0.33. Metatarsi I–III with trichobothrium, absent on IV. All tibiae with two dorsal spines. Carapace reddish-brown, with dark brown spots; ocular area darker, longer than wide. Anterior eye row 0.28, posterior row 0.28. AME and ALE less developed, PLE and PME similar sized. Chelicerae and endites reddish-brown. Sternum reddish-brown with dark brown edges. Legs brownish yellow. Abdomen grey, posterior area dark grey. Patella of palp with long dorsal spine (Figs. 12–14), lamella characteristica with serrated edge (Figs. 12, 13), radix strongly sclerotised (Figs. 13, 15).

**Female** (IBSP 67691): Described by Baert (1990). Here we present illustrations of the epigynum and vulva in ventral view (Figs. 16–18). Total length 1.79. Carapace length 0.67, width 0.50, height 0.22. Clypeus height 0.10. Sternum length 0.37, width 0.37. Abdomen length 1.02,

width 0.72, height 0.67. Leg formula I/IV/II/III. Leg lengths (I/II/III/IV): femora 0.70/0.60/0.47/0.70; patellae 0.17/0.15/0.17/0.15; tibiae 0.72/0.52/0.37/0.62; metatarsi 0.57/0.52/0.42/0.60; tarsi 0.27/0.22/0.27/0.32; total 2.43/2.01/1.70/2.39. Position of Tm I 0.26. All metatarsi with trichobothrium, except IV. Tibiae I–IV with two dorsal

spines. Carapace brown with dark brown dotted striae; ocular area black, wider than long. Anterior eye row 0.28, posterior row 0.30. ALE, PME and PLE similar sized, AME less developed. Chelicerae yellowish-brown, proximal area dark brown. Sternum and endites dark brown. Legs yellowish-brown. Tibia and tarsus of



Figs. 11–18: *Meioneta galapagosensis* Baert, 1990. **11** Male habitus, dorsal; **12** Male palp, ectal; **13** Ditto, mesal; **14** Ditto, dorsal; **15** Ditto, ventral; **16** Epigynum, ventral; **17** Ditto, posterior; **18** Ditto, ventral, cleared. Scale lines=0.2 mm.



palp dark brown. Abdomen dorsally grey, ventral area surrounding spinnerets and mid-ventrally dark grey. Epigynum with elongated spermathecae, copulatory ducts long and sinuous (Fig. 18).

*New record*: BRAZIL: Pernambuco: Fernando de Noronha Archipelago, Fernando de Noronha Island, 13♂ 1♀, 10–16 April 2006, G. C. C. Freitas coll., pitfall trap (IBSP 67691, 67698, 67701–67703, 67705); 2♂, same data and collector (MCN 42559, 42560).

*Distribution*: Brazil (Pernambuco) and Ecuador (Galápagos).

### Natural history

Out of 1,532 adult and 1,567 juvenile spiders collected in the survey, 105 specimens (46 juveniles and 59 adults) belonged to Linyphiidae. All adults identified belonged to two species: *Meioneta galapagosensis* (26♂ 6♀) and *Lepthyphantes noronhensis* (21♂ 6♀). There was no significant difference in the abundance ( $\chi^2=0.424$ ;  $p=0.5$ ) of the species. All specimens were caught during April, the wettest month.

The male/female ratio in *L. noronhensis* (3.5:1) and *M. galapagosensis* (4.3:1) showed a prevalence of males which may indicate the reproductive period for these species, with males actively searching for a mate. This is also supported by the finding that only juvenile linyphiids were captured in the dry season.

Both species were found in several locations throughout the island, including urban areas, showing a wide distribution and some sort of adaptation to the changes caused by human activities (Map 1). Fernando de Noronha, like the Galápagos Islands, has a volcanic origin (Simkin, 1984) and *M. galapagosensis* may have found optimal conditions in which to become established, competing with *L. noronhensis*, a local species.

The introduction of *M. galapagosensis* to the island of Fernando de Noronha seems to be most plausibly the result of human transportation by ship or airplane, since the nearest continental land is too distant (345 km) for successful ballooning to be likely. If *M. galapagosensis* is widely distributed in South America, it has not been detected because of the few studies involving the Neotropical linyphiid fauna.

Further studies on the spider fauna of the north-eastern coast of Brazil will greatly assist in understanding the distribution of species and the natural history of Fernando de Noronha's fauna.

### Acknowledgements

We thank Erica H. Buckup, curator of the arachnological collection of MCN, for loaning the material and

providing references; Léon Baert (Royal Belgian Institute of Natural Sciences, Belgium), for sending the specimens from Galápagos; Ricardo Ott, Peter Merrett and Cristina A. Rheims for review and comments on the manuscript; the directorate of MCN for permitting the first author to develop part of this work in its dependences; CAPES for the financial support to G. C. C. Freitas and CNPq to E. N. L. Rodrigues and A. D. Brescovit.

### References

- BAERT, L. L. 1990: Spiders of the Galápagos. Part V. Linyphiidae. *Bull. Br. arachnol. Soc.* **8**(5): 129–138.
- BOSMANS, R. 2006: Contribution to the knowledge of the Linyphiidae of the Maghreb. Part X. New data on *Lepthyphantes Menge (sensu lato)* species (Araneae, Linyphiidae). *Belg. J. Zool.* **136**(2): 173–191.
- CARLETON, M. D. & OLSON, S. L. 1999: Amerigo Vespucci and the rat of Fernando de Noronha: a new genus and species of Rodentia (Muridae: Sigmodontinae) from a volcanic island off Brazil's continental shelf. *Am. Mus. Novit.* **3256**: 1–59.
- CORDANI, U. G. 1970: Idade do vulcanismo do oceano Atlântico Sul. *Boln Inst. Geociências* **1**: 1–75.
- DELTSHEV, C. D. 1979: A contribution to the study of cave spiders (Araneae) in Greece. Four new species (Araneae, Nesticidae, Linyphiidae) from the islands of Crete and Thera. *Acta zool. Bulg.* **13**: 53–63.
- DRANEY, M. L. & BUCKLE, D. J. 2005: Linyphiidae. In D. Ubick, P. Paquin, P. E. Cushing & V. Roth (eds), *Spiders of North America: an identification manual*: 124–160. American Arachnological Society.
- HULL, J. E. 1920: The spider family Linyphiidae: an essay in taxonomy. *Vasculum* **6**: 7–11.
- MERRETT, P. 1963: The palpus of male spiders of the family Linyphiidae. *Proc. zool. Soc. Lond.* **140**: 347–467.
- MILLIDGE, A. F. 1980: The erigone spiders of North America. Part 1. Introduction and taxonomic background (Araneae: Linyphiidae). *J. Arachnol.* **8**: 97–107.
- MILLIDGE, A. F. 1985: Some linyphiid spiders from South America (Araneae, Linyphiidae). *Am. Mus. Novit.* **2836**: 1–78.
- MILLIDGE, A. F. 1991: Further linyphiid spiders (Araneae) from South America. *Bull. Am. Mus. nat. Hist.* **205**: 1–199.
- PLATNICK, N. I. 2007: *The world spider catalog, version 7.5*. <<http://research.amnh.org/entomology/spiders/catalog/index.html>>
- ROBERTS, M. J. 1987: *The spiders of Great Britain and Ireland, Volume 2: Linyphiidae and check list*. Harley Books, Colchester, England. 204 pp.
- SAARISTO, M. I. 1973: Taxonomical analysis of the type-species of *Agynera*, *Anomalaria*, *Meioneta*, *Aprolagus*, and *Syedrella* (Araneae, Linyphiidae). *Annls zool. fenn.* **10**: 451–466.
- SAARISTO, M. I. & TANASEVITCH, A. V. 1996: Redelimitation of the subfamily Micronetinae Hull, 1920 and the genus *Lepthyphantes Menge*, 1866 with description of some new genera (Aranei, Linyphiidae). *Ber. naturw.-med. Ver. Innsbruck* **83**: 163–186.
- SIMKIN, T. 1984: Galápagos geology. *Biol. J. Linn. Soc.* **21**: 61–75.
- TEIXEIRA, W., CORDANI, U. G., MENOR, E. A., TEIXEIRA, M. G. & LINSKER, R. 2003: *Arquipélago Fernando de Noronha: o paraíso do vulcão*. Terra Virgem, São Paulo. 167 pp.
- UNESCO 2007: *Brazilian Atlantic Islands: Fernando de Noronha and Atol das Rocas Reserves*. <<http://whc.unesco.org/en/list/1000>>