

Noideattella and *Tolegnaro*, Two New Genera of Goblin Spiders from Madagascar, with Comments on the Gamasomorphoid and Silhouetteloid Oonopids (Araneae, Oonopidae)

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ABSTRACT

Two new genera of goblin spiders from Madagascar, *Noideattella*, new genus, and *Tolegnaro*, new genus, are described with 11 and two species respectively. *Noideattella* includes *N. assumptia*, new combination (transferred from *Silhouettella*), and 10 new species: *N. amboa*, *N. famafa*, *N. fantara*, *N. farihy*, *N. gamela*, *N. lakana*, *N. mamba*, *N. saka*, *N. tany*, and *N. tsiba*. *Tolegnaro* includes two new species: *T. sagani* and *T. kepleri*. A phylogenetic data matrix of 436 terminals and 341 morphological characters was extracted from the Goblin Spider Planetary Biodiversity Inventory (PBI) descriptive database. The monophyly of *Noideattella* and *Tolegnaro* was tested in a phylogenetic analysis of this matrix. In this analysis other oonopid genera recently revised were also recovered as monophyletic and with high support values. A key for all species described here is provided. *Noideattella* species can be differentiated by having the pars cephalica strongly elevated in lateral view, forming a posterior cone, tibia and metatarsi with spines, and abdomen completely covered by scuta. *Tolegnaro* species in addition present plumose seta around the pedicel area.

KEY WORDS: Phylogenetics, systematics, taxonomy, Arachnida.

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INTRODUCTION

The oonopid fauna of Madagascar is currently almost unknown; we describe some of the first oonopids from this island. As part of the Goblin Spider Planetary Biodiversity Inventory (<http://research.amnh.org/oonopidae/>) this and other studies are describing simultaneously several new species of Malagasy goblin spiders. Spiders, like other Madagascan organisms, exhibit remarkable richness and endemism (Griswold, 2003). Whereas there are only just over 525 spider species known from Madagascar (Platnick, 2010), the rate of new species discovery suggest that the total may be much higher. In a comprehensive study of the Madagascar spider fauna, Griswold (2003) found that 29% of the 207 genera and 85% of the 459 described species or subspecies known at that time are endemic to Madagascar. Notably, the spider fauna is not disharmonic (Carlquist, 1965) and contains most of the families found in Africa or Asia. The spider fauna known to Griswold (2003) showed a strong affinity to Africa (22 species and 19 genera shared exclusively by Africa and Madagascar), and much weaker affinity to Asia and the Indo-Pacific region. The California Academy of Sciences (CASC) Entomology Department has been carrying out a broad survey of Madagascar terrestrial arthropods since 1998. This survey, using traditional methods of hand collecting and mass collecting techniques including pitfall traps, flight traps, and extraction of arthropods from soil and litter environments with Winkler and Berlese funnels, has sampled more than 60 sites all over the island and produced more than 1,000,000 specimens. As of January 2010 more than 870,000 specimens from 24 orders of arachnids, insects, and myriapods have been sent on loan from CASC for study. The closest landmass to Madagascar that has a well-studied oonopid fauna is the Seychelles archipelago. Thirty-three species are recorded from these islands of which only *Noideattella assumptia* (Saaristo, 2001), new combination, also occurs in Madagascar (Platnick, 2010). This species was previously included in *Silhouettella* Benoit, 1979, the type species of which, *S. curieusei* Benoit, 1979, also occurs in the Seychelles (Simon, 1898; Benoit, 1979; Saaristo, 1999, 2001, 2002).

The genera described here are two of several that resemble *Silhouettella*. The oonopid fauna of Madagascar is exceptionally well represented by this “*Silhouettella* complex,” both in terms of species richness and abundance. A similar fauna was described by Saaristo (2001) from the adjacent Seychelles Islands, where 10 of the 33 known species are silhouetteloids (his *Lionneta* group). Our studies suggest that silhouetteloids are at least as well represented in the Malagasy fauna, currently numbering over 30 species (in various stages of analysis and description) of an estimated 100 total species. Absent from the Malagasy fauna, although represented on the Seychelles by five species, are representatives of the *Gamasomorpha* group. Although Saaristo later combined the two groups (in his unpublished notes), several characters support his earlier arrangement of two separate groups of species.

The most apparent difference between the two groups is the absence of leg spines in gamasomorphoids and their presence in silhouetteloids, where they are often strongly developed. However, this character is homoplastic because the type species of *Silhouettella* (*S. curieusei*) lacks leg spines, as do several undescribed species from Madagascar (fig. 371). More interestingly, there are some species that closely resemble *Gamasomorpha* in somatic characters, even having a flatter body form, but with genitalia closely resembling those of *Silhouettella*. This prompted a closer

examination of the two groups, using published images and those available on the PBI site. The similarity of their genitalia does suggest a close relationship: females of both groups have large rounded receptacula with well-developed posterior apodemes (A1 of Burger, 2010), and males have a bulb with a dorsal knob and a prolaterally curved embolar complex composed of elongate lamellae. These observations represent only comparisons of overall similarity that will require testing with phylogenetical methods to understand their homology and history.

Based on examination of 2421 adult specimens we provide descriptions of 12 new species and extend the geographic range of *N. assumptia* to Madagascar. The oonopid diversity of this island is just starting to be discovered and described. Taking into account the high level of endemism recognized for other Madagascar spider groups (Griswold, 2003) it is possible that *Noideatella* and *Tolegnaro* are also largely or wholly endemic to this island, but to test this conclusion it will be necessary to revise the largely unknown oonopid fauna inhabiting Eastern Africa.

METHODS

TAXONOMIC METHODS: A total of 2421 specimens were sorted in 13 morphospecies. Digital images were recorded with a Leica DFC500 camera attached to a Leica MZ16A stereomicroscope, and a Nikon DXM1200 digital camera attached to a Leica MZ16 stereomicroscope. The software Helicon Focus 4.70 was used for combining these digital images. Scanning electron microscope (SEM) images were taken with a LEO 1450VP at the California Academy of Sciences. All specimen vouchers are deposited at the California Academy of Sciences. Digestions of internal structures and mounting of specimens for SEM were done following the protocol of Álvarez-Padilla and Hormiga (2008). Specimen distributions can be accessed through the species pages of the Goblin Spider PBI website (<http://research.amnh.org/oonopidae/>). An additional kml file with distributions and illustrations for Google Earth will be e-mailed by the authors upon request. The species described here presented only minute variations in size, i.e., less than 0.1 mm in total length, between conspecific specimens. We feel that the information provided by the SEM images and cleared preparations is adequate to describe structures and diagnose taxa. The images provided here combined with M. Burger's diagrams (Burger et al., 2006; Burger, 2010) should be sufficient to understand the assembly of the female genital structures (supplementary images can be accessed at <http://research.amnh.org/oonopidae/>). The male genital structures, due to the minute size of these spiders, were studied with SEM. Leg spination nomenclature is as indicated: "tibiae: I, II p1-2-0; r1-2-0," meaning tibia I and II prolateral surface with one pair of proximal spines, two on their middle length and none apical (p1-2-0), retrolateral (r) surface spine formula 1-2-0.

The Planetary Biodiversity Inventory (PBI) goblin spider project team uses an innovative, internet-accessible descriptive database that was created by participant Xiping Wang to record and manage all observations and images of specimens. Each of the more than 45 participants can see each other's work, as it is being done, but each can change only the information added by themselves. More than 400 descriptive characters are standardized and their states are typified by images, facilitating uniformity and universality in the descriptive research of the project participants. The descriptive database produces automated descriptions that require only minor

editing; this process was used to produce the generic and species descriptions presented here.

The PBI descriptive database was designed to comprehensively serve the nearly 200 genera and more than 2000 species estimated to occur in the Oonopidae and was crafted to include characters and character states representative of the 75 described and approximately 125 undescribed genera of this family. The descriptive database contains 450 characters comprising 1616 states, enabling more than 727,200 comparisons across species. Descriptions produced by this database relate a species in question to all other known goblin spiders, described and undescribed, which has advantages and drawbacks. Descriptions are long and include comparisons to species well outside the taxonomic and geographic neighborhood of the species in question. We believe that the cost in description length is more than balanced by the breadth and lasting value of these descriptions. Some characters require SEM examination for verification: when a species was not examined with SEM it is noted that the character cannot be scored, e.g., “Tarsi I to IV superior claw teeth not examined in detail.” As of November 2010 over 1000 species descriptions, and more than 15,000 images, had been entered by project participants. As results reach the publication stage species pages are being made available on the public side of the goblin spider PBI project website.

DATA-MATRIX PROCESSING: The goblin spider PBI descriptive database also offers potential for phylogenetic analysis and we, led by author Álvarez-Padilla, have extracted and analyzed a phylogenetic matrix from the descriptive database. The characters and taxa available for our analyses have been coded and scored by the Goblin Spider Planetary Biodiversity Inventory project team. This phylogenetic data set was obtained through php scripts implemented in the PBI web site, which produced a TNT file (downloaded on 17 September 2010 from <http://research.amnh.org/oonopidae/>). This dataset contained 929 taxa (terminals) and 450 morphological characters. Taxonomic data sets need to be parsed into phylogenetic data sets by detecting taxa at different stages of coding and by reducing character redundancies (see next paragraph). The taxa-selection process was as follows: from the 929 original taxa 378 terminals were subtracted because they had 99.8% of missing data, i.e., these species were recently added to the taxonomic database and not yet scored. Taxa at different levels of completeness were filtered using a similarity matrix among the taxa and deactivating 115 terminals of the original 929 that had identity matches with other terminals. A phylogenetic analysis was performed with this data final data set of 436 terminals.

A total of 450 morphological characters were scored by PBI participants using the web interface (<http://research.amnh.org/oonopidae/>). Of these 450 characters a total of 340 informative characters were analyzed. Thirty-nine others were noninformative, e.g., they were scored for only one terminal, or they had not been scored, i.e., all “?”. Seventy-one characters were redundant between both sexes. Whereas all spiders are sexually dimorphic in their genitalia, some, but not all, are sexually dimorphic in their somatic characters. The PBI descriptive database scores for nongenital characters of each sex separately even in nondimorphic species, creating phylogenetically uninformative redundancy. The character vectors for all taxa between male and female specimens were compared in Excel with the formula =IF(X2=X3,0,IF(X2=”?”,0,IF(X3=”?”,0,1))), where X are character states to be compared. Of the two equivalent vectors, the character vector with more missing data was erased. In the phylogenetic analyses all multistate characters were

treated as nonadditive (Fitch, 1971). Parsimony analyses under equal weights were performed with TNT 1.1 (Goloboff et al., 2004). For the equal weights analyses 10 replicates of 1000 random additions of taxa were performed, with sectorial searches and tree-fusing algorithms and random seed of 1. The parameters for all algorithms were the program defaults. Jackknife support values (Farris et al., 1996) were calculated with 1000 replicates, with a probability of 36% of character removal and search parameters per replica of 20 random additions of taxa followed by TBR and sectorial searches. Specimens in the Material Revised sections identified as “PBI_OON number” without zeros. Complete PBI numbers “PBI_OON 000number” throughout the text.

ANATOMICAL AND MUSEUM ABBREVIATIONS USED IN TEXT AND FIGURES: For female genitalia we used the nomenclature of Burger et al. (2006) and Burger (2010) and for the male genitalia we used our own nomenclature.

Anatomical abbreviations: **ASc**, anterior sclerite; **BL**, book lung; **DL**, embolus dorsal lamella; **GAp**, globular appendix; **GO**, genital opening; **Pa**, papilla; **Re**, receptaculum; **SEM**, scanning electron microscopy; **TEM**, transmission electron microscopy; **TO**, tarsal organ; **UE**, uterus externus; **VL**, ventral lamella.

Institutional abbreviations: **CASC**, California Academy of Sciences, San Francisco; **FMNH**, Field Museum of Natural History, Chicago; **GWU**, George Washington University, Washington, DC; **MCZ**, Museum of Comparative Zoology, Harvard, Cambridge, MA; **MNHN**, Museum National d’Histoire Naturelle, Paris; **MRAC**, Royal Museum of Central Africa, Tervuren; **MZT**, Zoological Museum, University of Turku, Turku; **NHMB**, Natural History Museum, Bern; **USNM**, National Museum of Natural History, Washington, DC; **ZMUC**, Danish Natural History Museum, Copenhagen.

RESULTS AND DISCUSSION

CLADOGRAM DESCRIPTION: The parsimony analyses under equal weights returned more than 10,000 (overflowed) cladograms of 7418 steps (CI = 10, RI = 73). The minimum length was found only one time after 48 hours of analyses. The strict consensus collapsed 103 nodes mainly at the tips. The higher phylogenetic relationships of oonopids are resolved but with low jackknife support values (less than 51%); only 22 nodes obtained support values higher than 95%. Our phylogeny recovered some genera recently revised as monophyletic and with high jackknife support values (greater than 80%), e.g., *Cavisternum* Baehr, Harvey and Smith, 2010, with 89% jackknife (Baehr et al., 2010); *Brignolia* Dumitrescu and Georgescu, 1983, with 88% (Platnick et al., 2011); *Escaphiella* Platnick and Dupérré, 2009, with 99% (Platnick and Dupérré, 2009); and *Orchestina* with 78% (Henrard, in prep.). The cladogram was rooted with the orsolobids *Hickmanolobus ibisca* Baehr and Smith, 2008, and *H. linnaei* Baehr and Smith, 2008. On our cladogram the most basal oonopid is a single species of an undescribed genus from Manaus (Brazil) with the PBI name CRAAD CR007, followed by *Orchestina* Simon, 1882. Sister to *Orchestina* are all other oonopids organized in three clades: a small clade formed by three species (*Caecoonops apicotermis* Benoît, 1964, from Congo, *Calculus bicolor* Purcell, 1910, from South Africa, and *Xiombarg plaumanni* Brignoli, 1979, from Brazil) and two large clades that comprise the rest of the family. The first clade is composed mainly by nonsclerotized oonopids

with at least one independent origin of dorsal scuta; whereas, the second clade primarily includes oonopids with sclerotized dorsal scuta, and at least six reversals to a soft-bodied state. The sclerotized clade has three large subgroups, the most basal including *Noideattella* and *Tolegnaro*. At the base of the sclerotized clade there is a paraphyletic assemblage of seven species from Madagascar and *Silhouettella curieusei* from the Seychelles (fig. 371). All species are very similar in morphology and their phylogenetics and taxonomy in process of revision. As the complete cladogram for 436 terminals would cover several pages, we make it available electronically as supplementary material.

DIAGNOSES OF GAMASOMORPHOIDS AND SILHOUETTELOIDS: Differences between the two groups are evident in genitalic details. The *Gamasomorpha* male has an embolus complex that is fairly evenly curved and composed of three elongate, subequal divisions: a dorsal lamella, to which the embolus is attached, and a more basally originating ventral lamella (see Brignoli, 1974: figs. 3, 4; Tong and Li, 2007: figs. 34–36; and many figs. in Eichenberger et al., 2012). In silhouetteloids, the embolus complex is not evenly curved, but has a sharp angular bend, and the lamellae are typically divided into additional branches of unequal size (figs. 6, 27, 30, 66, 318, 338). The female genitalia of *Gamasomorpha* include a round to longitudinally elongate receptaculum, composed of transparent (weakly sclerotized to membranous) components, and with posterior apodemes (A1 of Berger) that are relatively short, typically less than receptaculum length (see Brignoli, 1974: fig. 2; Tong and Li, 2007: fig. 33; and many figs. in Eichenberger et al., 2012). In the silhouetteloids, however, the receptaculum is transversely oval in shape (wider than long), is more strongly sclerotized, and has larger posterior apodemes that are longer than the receptaculum (figs. 22, 71, 123, 333, 354). The two groups are geographically largely allopatric. The silhouetteloids range from east Africa to southern Europe, although most strongly represented in Madagascar and the Seychelles, whereas gamasomorphoids occur primarily in Asia and the New World.

PHYLOGENETIC RELATIONSHIPS OF NOIDEATELLA AND TOLEGNARO: *Noideattella* and *Tolegnaro* are putatively monophyletic and with 95% and 97% jackknife support values respectively. Monophyly demands synapomorphy but not autapomorphy; due to homoplasy in instances of character-state evolution, synapomorphies supporting each of these genera may not be unique. *Tolegnaro* and *Noideattella* are sister taxa, but this node, with low support values (less than 51%) (fig. 371), is supported by the following five synapomorphies common to all minimal length cladograms: clypeus margin slightly rebordered in males (char. 242, state 2) and females (19-2); the ancestral state of these characters is ambiguous between strongly rebordered or margin continuous with the cuticle coded as unmodified (figs. 192, 247, 361); sternum with infracoxal grooves and anterior and posterior openings present in males (284-1) and females (59-1) (figs. 16, 43, 327); and male endites distally excavated (314-1, figs. 13, 14, 129, 130, 323, 324). *Noideattella* and *Tolegnaro* are sister to a large clade that includes *Xyphinus* Simon, 1983, *Trilacuna* Tong and Li, 2007, *Neoxyphinus* Birabén, 1953, and *Zyngoonops* Benoit, 1977, among many other undescribed genera, some of which are from Africa. Basal to these species there is another paraphyletic assemblage of species similar to *Silhouettella* species from Madagascar. Both synapomorphic and diagnostic characters presented high levels of homoplasy and not a single character is unique to these genera; even the cephalic cone is homoplastic

in very few species such as: *Silhouettella curieusei* (not congeneric with these genera) and *Escaphiella viquezi* Platnick and Dupérré, 2009. We provide a polythetic diagnosis for these putatively monophyletic genera by providing several characters in the diagnosis, all of which must be present. The phylogenetic hypothesis presented here is preliminary at best because another several hundred taxa not included are currently being described and the sister taxa of both genera may not have been included in the analyses. Given the biogeographic affinities of Madagascar it is possible the sister groups of *Noideattella* and *Tollegnaro* are among the silhouetteloids from East Africa or India or other similar species from Madagascar (Griswold, 2003). In addition, molecular and more morphological characters need to be scored (e.g., female genital system). We think that despite all these problems, the recovery of taxa recently revised with high support values represents some signal in the data. This was the rationale followed to separate *Noideattella* and *Tollegnaro*, although they are sister taxa.

SYSTEMATICS

Family Oonopidae Simon, 1890

DIAGNOSIS: Dysderoid spiders: haplogynes, without AME, lacking basal cheliceral fusion and distal cheliceral lamellae, with the posterior respiratory system comprising a pair of tracheal spiracles just posterior to the book lung spiracles. Further, oonopids lack the inferior tarsal claw and are distinguished from Orsolobidae by the flat tarsal organ, converging endites, and, in most species, the absence of cheliceral teeth (Forster and Platnick, 1985; Jocqué and Dippenaar-Schoeman, 2006).

Noideattella, new genus

TYPE SPECIES: *Noideattella amboa*, new species.

ETYMOLOGY: This name is an arbitrary combination of letters and is feminine in gender.

DIAGNOSIS: *Noideattella* species must have the following five characters: carapace pars cephalica strongly elevated in lateral view forming a posterior cone (figs. 3, 12, 33, 41, 203); abdomen covered completely by sclerotized scuta (figs. 1, 2, 31, 32, 113, 114); tibia I and metatarsus II lateral surfaces with stout spines, femora lateral sides smooth (figs. 102–109), tibia I dorsal row of ridges absent; female internal genitalia with T-shaped anterior sclerite (figs. 22, 53, 152); embolus curved approximately 90° at half its length, and divided into two lamellae armed with several apophyses (figs. 27–30, 57–60, 137–140).

DESCRIPTION: Total length of males 1.3–2.1, of females 1.5–2.4. **Cephalothorax:** Six eyes, subequal in size and well developed (figs. 7, 67, 119, 207). Carapace without any pattern, broadly oval in dorsal view, anteriorly narrowed to between 0.5 to 0.75 times its maximum width, anterolateral corners without extension or projections, with rounded posterolateral corners, posterolateral edge with pair of pits, thorax without depressions, fovea absent, without radiating rows of pits (figs. 4, 11, 34, 42, 116, 132). Posterior margin not bulging below posterior rim, posterolateral surface without spikes, lateral margin slightly rebordered, without denticles, marginal setae light colored, needlelike, forming a continuous line of very small setae with enlarged

bases better observed with SEM (figs. 3, 12, 33, 41, 75, 79, 131). Nonmarginal pars cephalica setae sparse, light colored, needlelike, present in U-shaped row, nonmarginal pars thoracica setae few, light colored, needlelike (figs. 4, 11, 34, 42, 76, 187). Clypeus margin slightly rebordered, curved downward in front view, vertical in lateral view, high, ALE separated from edge of carapace by their radius or more, median projection absent; setae light colored, needlelike, clypeal setae larger than the setae covering nonmarginal areas of pars cephalica and thoracica (figs. 7, 18, 37, 95, 119, 192). Chilum absent. All eyes oval; posterior eye row recurved from above and from front; ALE separated by their radius to their diameter, ALE-PLE separated by less than ALE radius, PME touching throughout most of their length, PLE-PME separated by less than PME radius. Setae around ocular area enlarged, similar in size to clypeal setae (figs. 11, 34, 92, 174, 234). Sternum cuticle either finely or coarsely reticulated (figs. 16, 43, 117, 133, 145, 162). Sternum uniform, fused to carapace, median concavity absent, with radial furrows between coxae I–II, II–III, III–IV, radial furrow opposite coxae III absent, sickle-shaped structures absent, posterior margin not extending posteriorly of coxae IV, anterior corner unmodified, lateral margin with infracoxal grooves and anterior and posterior openings, distance between coxae approximately equal, extensions of precoxal triangles absent, lateral margins unmodified, without posterior hump; setae sparse, light colored, needlelike, originating from surface, without hair tufts; setae evenly scattered (figs. 5, 16, 35, 43, 145, 160, 205, 220). Mouthparts: Male endites same as sternum in sclerotization (figs. 5, 35, 65, 93). Male palpal patella shorter than femur and not swollen, male bulb spherical (figs. 6, 8, 36, 38, 66, 68). Chelicerae straight, anterior surface unmodified (figs. 17–19); promargin without teeth; fang without tooth-like projections, directed medially, without prominent basal process, tip unmodified; setae light colored, needlelike, evenly scattered (figs. 47–49, 191–193, 221–223, 247–249); paturon distal region unmodified, posterior surface unmodified, promargin unmodified, inner margin unmodified. Labium triangular, not fused to sternum, anterior margin indented at middle, same as sternum in sclerotization; with six or more setae on anterior margin, subdistal portion with unmodified setae (figs. 80, 186, 195). Endites anteromedian and posteromedian parts unmodified (figs. 5, 35, 65, 93), distally excavated, anteromedian tip unmodified, posteromedian part unmodified, same as sternum in sclerotization (figs. 14, 45, 129, 216). **Abdomen:** Abdomen without color pattern, dorsal scutum present, strongly sclerotized and covering entire surface (figs. 1, 31, 113). Both epigastric scuta strongly sclerotized and covering venter of abdomen (figs. 2, 32, 114). Interscutal membrane rows of small sclerotized platelets absent posteriorly; dorsum soft portions white, without color pattern (figs. 3, 33, 63, 91). Book lung covers without setae, anterolateral edge unmodified (figs. 62, 100, 114, 287). Posterior spiracles connected by groove (figs. 9, 39, 122, 209). Carapace and abdomen area around the pedicel without plumose setae (figs. 15, 169). Pedicel tube short, ribbed, scutopedicel region unmodified, scutum not extending far dorsal of pedicel, matted setae on anterior ventral abdomen in pedicel area absent, cuticular outgrowths near pedicel absent (figs. 33, 98, 100, 173, 203). Dorsal scutum strongly sclerotized, without color pattern, covering full length of abdomen, no soft tissue visible from above, not fused to epigastric scutum, anterior half without projecting denticles (figs. 1, 61, 113, 171). Epigastric scutum strongly sclerotized, surrounding pedicel, small lateral sclerites absent, not protruding, without long posterior extension, rounded posteriorly. Postepigastric scutum strongly

sclerotized, covering nearly full length of abdominal length, fused to epigastric scutum, anterior margin unmodified, without posteriorly directed lateral apodemes (figs. 2, 32, 114, 172, 232). Internal apodemes on epigastric scutum present in males (figs. 270, 272). Spinneret scutum present as an incomplete ring (fig. 112). Dorsum setae light colored, needlelike (figs. 84, 170). Epigastric area setae uniform, light colored, needlelike (figs. 20, 21, 73, 74, 155, 156). Postepigastric area setae light colored, needlelike. Spinneret scutum with fringe of needlelike setae. Without dense patch of setae anterior to spinnerets (figs. 32, 62, 99, 142). Interscutal membrane with setae, colulus represented only by setae (fig. 112). **Legs:** Spines always present on tibia and metatarsi I and II. Metatarsi always with two pair of spines, tibia spination variable (figs. 102, 103). Tibia IV prolateral distal spine present in some species. Femur IV without spines, not thickened, same size as femora I to III. Femur IV not thickened, same size as femora I to III, patella plus tibia I shorter than carapace, tibia I unmodified (figs. 102, 103, 106, 107), tibia I Emerit's glands absent, tibia IV specialized setae on ventral apex absent, tibia IV ventral scopula absent, metatarsi I and II mesoapical comb absent, metatarsi III and IV weak ventral scopula absent. Trichobothria on tibiae: I three, IV three, trichobothria base longitudinally narrowed, aperture internal texture gratelike, hood covered by numerous low, closely spaced ridges (fig. 44). Tarsal organ with number of sensilla variable (figs. 83, 167, 226). **Male genitalia:** Epigastric region region with sperm pore small, oval, rebordered (figs. 2, 20, 62, 99, 128, 155), furrow without Ω -shaped insertions, without setae (figs. 20, 50, 128, 183). Palp not strongly sclerotized, right and left palps symmetrical, embolus light colored, prolateral excavation absent; femur without posteriorly rounded lateral dilation, attaching to patella basally; patella shorter than femur, not enlarged, without prolateral row of ridges, setae unmodified; cymbium not fused with bulb, without stout setae; bulb 1 to 1.5 times as long as cymbium, stout, spherical (figs. 25, 26, 86, 87, 135, 136). Most sperm stored in bulb as no sperm duct observed in cleared preparations, interior of bulb more like sperm sac than sperm duct. Embolus formed by two primary lamellae curved approximately 90° (figs. 6, 8, 36, 38, 146, 148); these function for removal of sperm sacs from previous males, behavior recently documented (Burger and Carrera, 2011; Burger, 2010). Dorsal lamella (DL) of most species divided into two branches; ventral lamella (VL) divided into two or three branches (figs. 27–30, 57, 60, 137–140); dorsal lamella larger, firmly attached to tegulum, ventral lamella smaller, with membranous base (figs. 6, 68, 178, 264). **Female:** As in male except as noted. **Cephalothorax:** Mouthparts: Endites distally not excavated, cheliceral paturon inner margin lacks modified seta. Sternum anterior margin unmodified (figs. 130, 158, 215, 274). Palp spines absent; patella without prolateral row of ridges (figs. 82, 166), tarsus unmodified. **Abdomen:** Postepigastric scutum not fused to epigastric scutum, postepigastric scutum without lateral joints (figs. 20, 21, 50, 51, 127, 128). **Female genitalia:** Receptaculum (Re) wider than long, dorsal surface with several gland openings (figs. 24, 126, 300), united to posterior scutum by flexible section (figs. 22, 52, 125). Receptaculum with two lateral apodemes bearing anterior and posterior extensions (A1). A1 anterior extension aligned with apodemes A2, A1 posterior extension aligned with apodemes A3 (figs. 23, 53, 71, 181). Globular appendix (GAp) of variable shape, extends dorsally from receptaculum middle anterior surface, GAp aligned with T-shaped sclerite (ASc). ASc originates from posterior end of epigastric scutum (figs. 23, 54, 152, 214).

NOTE ON GENITALIC FUNCTION: The function of these sclerites has not been deduced in any of the species described here, because we did not observe the muscles in semithin sections; however, we can predict the function of these features given their similarities with *S. loricatula* (Burger et al., 2006). In the latter species the sac secretory glands (Pa) open through the sclerotized part of the receptaculum (figs. 124, 126). Lateral apodemes (A1), the epigastric scutum apodemes A2 and posterior scutum apodemes A3 open and close the epigastric furrow for sperm and secretory sac dumping and presumably during oviposition. The receptaculum median apodeme (GAp) and the epigastric scutum apodeme (ASc) lock the uterus externus during copulation, by contracting two muscles attached to the internal walls of apodemes A1 and the ASc (figs. 54, 153). The stalklike extension from the globular appendix to the receptaculum anterior end is absent, in contrast with *Silhouettella loricatula* (Burger, 2010: fig. 5B). The embolar ventral lamella expands slightly when boiled in lactic acid; probably the same movements occur during ejaculation (however, direct evidence has not been observed).

PHYLOGENETIC RELATIONSHIPS: *Noideattella* is supported by the following eight synapomorphies (but not necessarily autapomorphies) common to all cladograms (fig. 371): clypeus shape curved downward [ancestral state straight] (figs. 7, 37, 67, 119) in females (15-0) and males (238-0); sternum cuticle furrows with rows of small pits in females (49-2) and males (273-0) [ancestral state ambiguous] (figs. 16, 78, 189); change from rows of small pits to rows of large pits occurs inside *Noideattella* in a clade formed by *N. saka*, *N. lakana*, and *N. tsiba* (figs. 117, 133, 145, 162, 261, 277); tibia leg IV distal spine on prolateral surface present (fig. 168) in females (152-1) and males (379-1); male carapace posterior lateral edge with a pair of pits (227-1: figs. 132, 169); cymbium narrow in dorsal view (441-1: figs. 200, 278, 306).

SPECIES INCLUDED: *Noideattella assumptia*, new combination, and the following new species: *N. amboa*, *N. famafa*, *N. fantara*, *N. farihy*, *N. gamela*, *N. lakana*, *N. mamba*, *N. saka*, *N. tany*, and *N. tsiba*. All species epithets derive from common Malagasy nouns.

KEY TO NOIDEATTELLA AND TOLEGNARO SPECIES

- 1a. Metatarsi I and II with two pairs of lateral spines (fig. 103). Plumose setae absent around the carapace and abdomen area (figs. 3, 15, 33, 42) *Noideattella* 2
- 1b. Metatarsi I and II with one or zero pairs of lateral spines (fig. 364). Plumose setae present around the carapace and abdomen area (figs. 328, 329, 357) *Tolegnaro* 12
- 2a. Book lung covers small and round (figs. 2, 3, 142, 143, 232, 233) 3
- 2b. Book lung covers large and ovoid (figs. 173, 203) or long and narrow (figs. 32, 33).... 5
- 3a. Sternum surface coarsely reticulated and covered with large round pits distributed medially and in furrows (figs. 117, 134, 145, 162)..... *tsiba*
- 3b. Sternum microsculpture finely reticulate distributed medially and in furrows (figs. 5, 16, 235, 243)..... 4
- 4a. Abdomen cylindrical, epigastric scutum length about at half of the abdomen (figs. 232, 233) *fantara*

- 4b. Abdomen ovoid, epigastric scutum less than half the abdomen length
(figs. 2, 3) *amboa*
- 5a. Book lung covers very narrow and long (figs. 32, 33).....*assumptia*
- 5b. Book lung covers wide (figs. 63, 91, 115, 172, 203)..... 6
- 6a. Habitus color brown. Carapace surface of elevated portion of pars cephalica and
sides smooth (figs. 64, 92) 7
- 6b. Habitus color otherwise. Carapace surface of elevated portion of pars cephalica
and sides granulated (figs. 34, 113, 116, 174, 204)..... 8
- 7a. Male legs I and II metatarsi with spines (figs. 102, 103). Embolus ventral lamella
with a large flat curved apophysis at its base (figs. 66, 86)..... *gamela*
- 7b. Male leg I and II metatarsi without spines and armed with a median triangular
bump (figs. 108, 109). Embolus ventral lamella with a small curved apophysis at
its base (figs. 110, 111) *famafa*
- 8a. Sternum surface coarsely reticulated and covered with large round pits distributed
medially and in furrows (figs. 117, 261) 9
- 8b. Sternum smooth or microsculpture finely reticulate distributed medially and in
furrows (figs. 5, 16, 235, 243) 10
- 9a. Habitus color dark red-brown, body length 2.1 to 2.4 mm (figs. 257, 261).
Carapace pars cephalica strongly granulate (figs. 259, 260)..... *lakana*
- 9b. Habitus color orange-brown, body length 1.9 to 2.1 mm (figs. 113, 117). Carapace
pars cephalica moderately to strongly granulate (figs. 113, 116)..... *saka*
- 10a. Ocular area distinctly higher than the clypeus height (figs. 177, 291). Abdomen
ovoid, postepigastric scutum semicircular (figs. 171, 285)..... 11
- 10b. Ocular area equal or slightly higher than the clypeus height (figs. 207, 217).
Abdomen cylindrical, postepigastric scutum rectangular (figs. 201, 202)..... *tany*
- 11a. Sternum microsculpture finely reticulate distributed over entire sternum surface
(fig. 289, 303). Carapace surface of pars cephalica heavily granulated (figs. 288,
291, 302). Embolus ventral lamella with a large, flat, curved apophysis at its base
(figs. 292, 310) *farihy*
- 11b. Sternum microsculpture finely reticulate distributed medially and in furrows (figs.
175, 189). Carapace surface of pars cephalica dimly to fairly granulated (figs. 174,
188, 196). Embolus ventral lamella without such apophysis (figs. 176, 197)..... *mamba*
- 12a. Carapace surface smooth (figs. 316, 325). Sternum furrows smooth,
microsculpture absent (figs. 317, 327). Metatarsi I and II with one pair of spines,
tibia spine number variable. Paturon setate distal region unmodified (fig. 319) ... *sagani*
- 12b. Carapace side microsculpture finely reticulate (figs. 345, 361). Sternum
microsculpture finely reticulate only in furrows (figs. 346, 362). Metatarsi and
tibia I and II spines absent (fig. 364). Paturon distal region with curved seta in
males (figs. 348, 363) *kepleri*

Noideattella amboa, new species

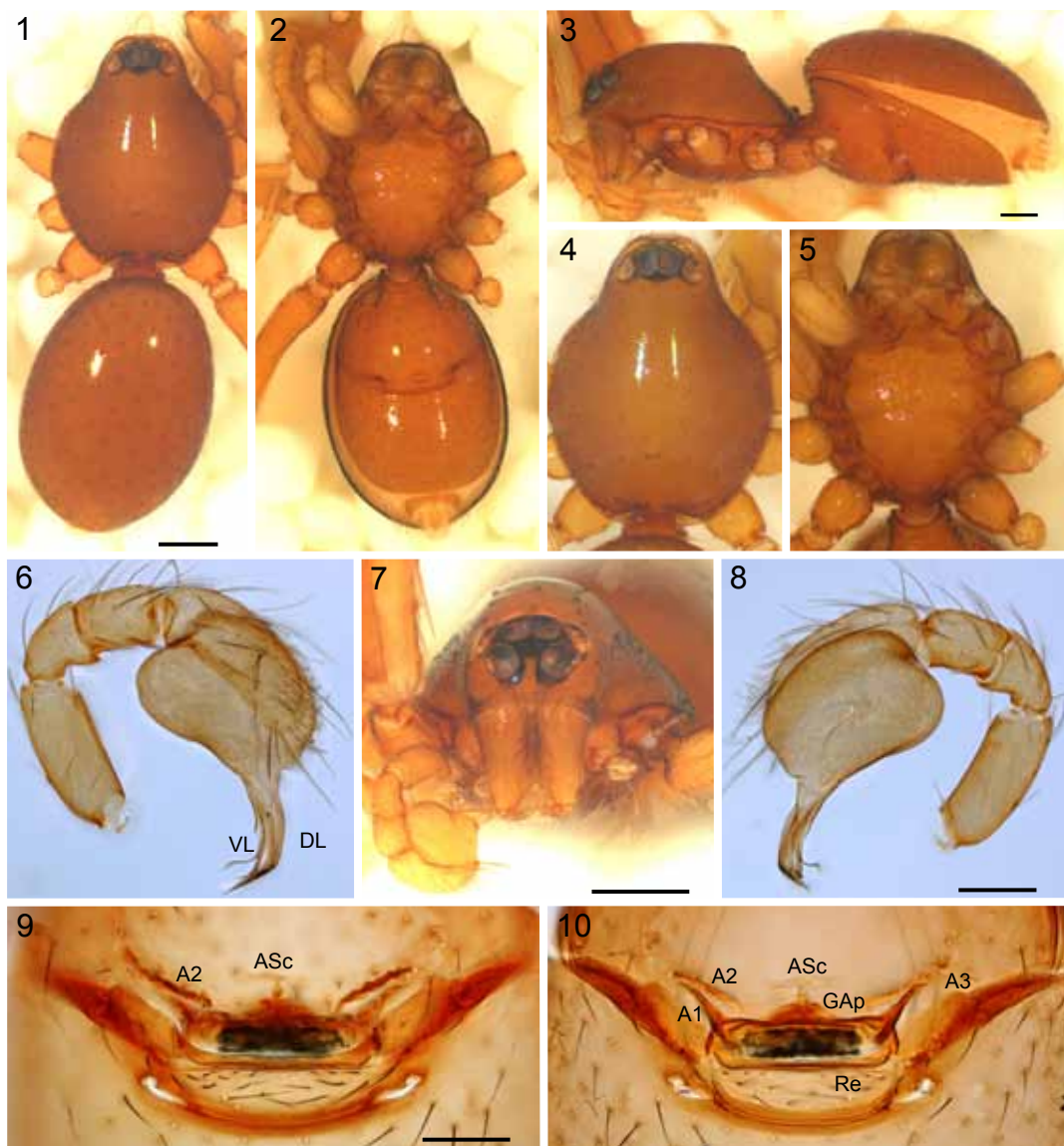
Figures 1–30, 372

Types: Male holotype and female allotype from Berlese and sifted leaf litter of a gallery forest at an elevation of 40 m at Reserve Prive Berenty, Forêt de Malaza, Mandrare River, 8.6 km 314° NW Ambosary, 25°0'28"S, 46°18'22"E, Toliara Province (6 February 2002, B.L. Fisher et al.) deposited in CASC (PBI_OON 00036156). The species epithet, a noun in apposition, is taken from the Malagasy word for *dog*.

Diagnosis: *N. amboa* can be differentiated from other *Noideattella* species by the following combination of characters: habitus dark red-brown, carapace pars cephalica and sides strongly granulate (figs. 4, 11, 12). Book lung covers small and round (figs. 2, 3). Sternum microsculpture finely reticulate distributed medially and in furrows (figs. 5, 16). Male paturon inner margin with modified seta of variable thickness (figs. 17–19).

Description: *Male* (PBI_OON 0002013): Total length 1.4. **Cephalothorax:** Carapace dark red-brown. Sternum longer than wide, dark red-brown, furrow with rows of small pits, anterior margin with interrupted transverse groove (figs. 4, 5, 7, 11, 12). Mouthparts: Chelicerae, endites, labium dark red-brown. **Abdomen:** Ovoid. Dorsal scutum dark red-brown, middle surface smooth, sides smooth. Postepigastric scutum dark red-brown, long, semicircular, covering nearly full length of abdomen (figs. 1, 2). Male genital opening slightly protruded, epigastric scutum apodemes small, contiguous with anterior book lung opening, not connected by furrow. Posterior spiracles connected by groove (figs. 10, 20). **Legs:** Pale orange, without color pattern. Leg spination (only surfaces bearing spines listed, all spines longer than segment width): tibiae: I, II p1-2-0; r1-2-0; IV p0-0-1; metatarsi: I, II p1-1-0; r1-1-0; IV p0-0-1. Tarsal organ with two sensilla visible. **Genitalia:** Epigastric region with sperm pore situated at level of anterior spiracles (fig. 20). Palp proximal segments pale orange; cymbium pale orange, with distal patch of setae; bulb pale orange. Embolus dorsal lamella with distal apophysis (figs. 27, 28), ventral lamella bifurcate (figs. 6, 8). Palp as in figures 25 and 26. *Female* (PBI_OON 0002013): Total length 1.6. As in male except as noted. Cheliceral paturon inner margin with scattered setae. **Legs:** Metatarsi III and IV ventral scopula absent. Leg spination: tibiae: I, II p1-2-0; r1-2-0; IV p0-0-1; metatarsi: I, II p1-1-0; r1-1-0; IV p0-0-1; leg IV: both spines considerably smaller than those of legs I, II; tibial spine same length as segment width, metatarsal spine longer. Trichobothria of metatarsus: I one, IV one. **Genitalia:** Genital opening slit shaped (fig. 21). Sperm sac papillae flat, extending less than half receptaculum length, concentrated in center. Apodemes A2 less than half receptaculum length (figs. 9, 10, 22), GAP process shaped like twisted tube (figs. 22, 23). Genitalia as in figures 9 and 10.

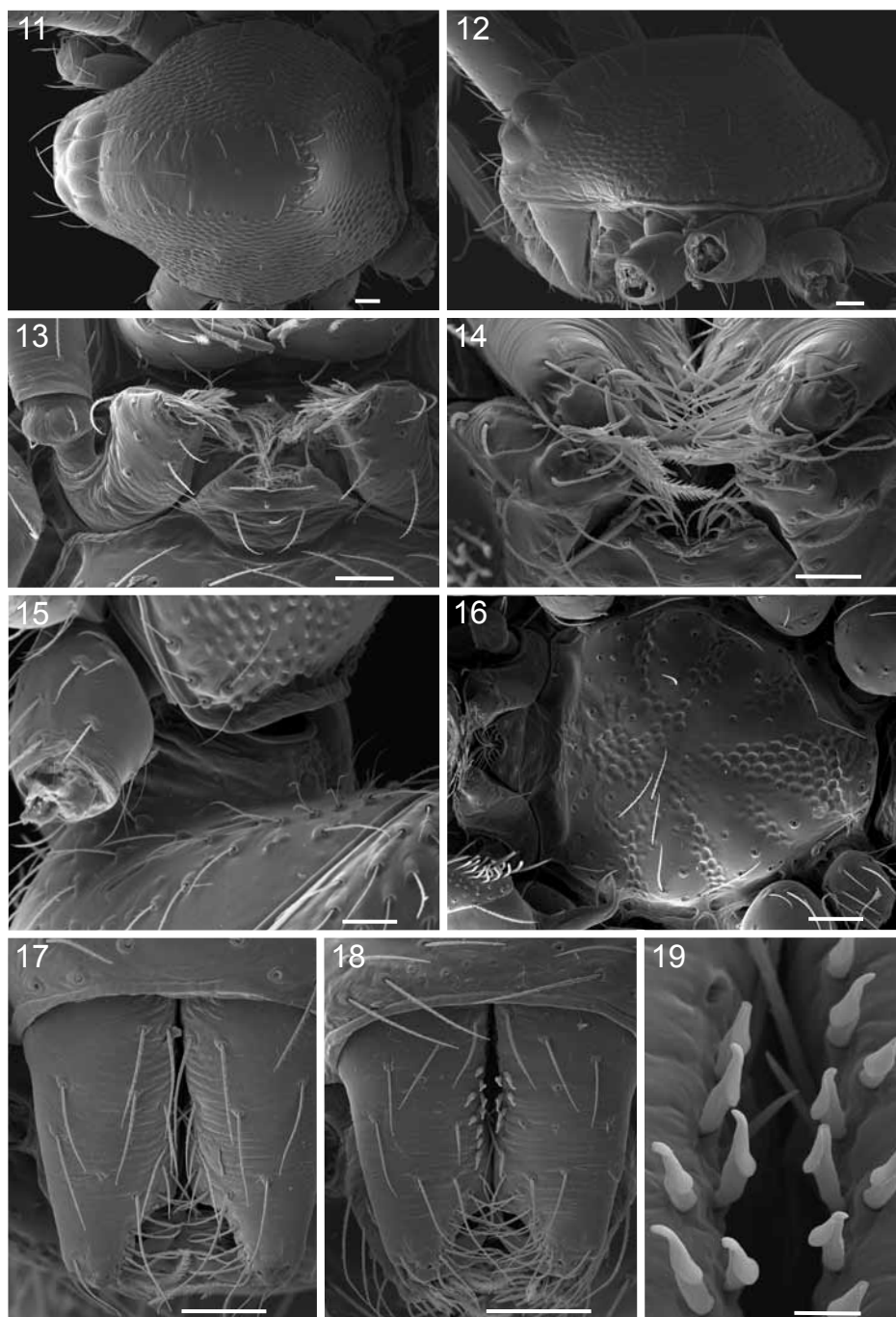
Variation: The book lung covers in some specimens are considerably reduced. Cheliceral paturon inner margin setae vary among specimens; some lack modified setae, while other specimens have a brush of modified seta (figs. 17, 18). Male leg I and II spines on tibia and metatarsus vary considerably with very few specimens lacking spines. Embolar dorsal and ventral lamella apophyses shape and number vary among individuals. Female leg I: the tibia spination varies from three to two spines at both sides; leg II spination varies widely with some specimens without spines on tibia. The number of spines on metatarsus (2 pairs) is constant.



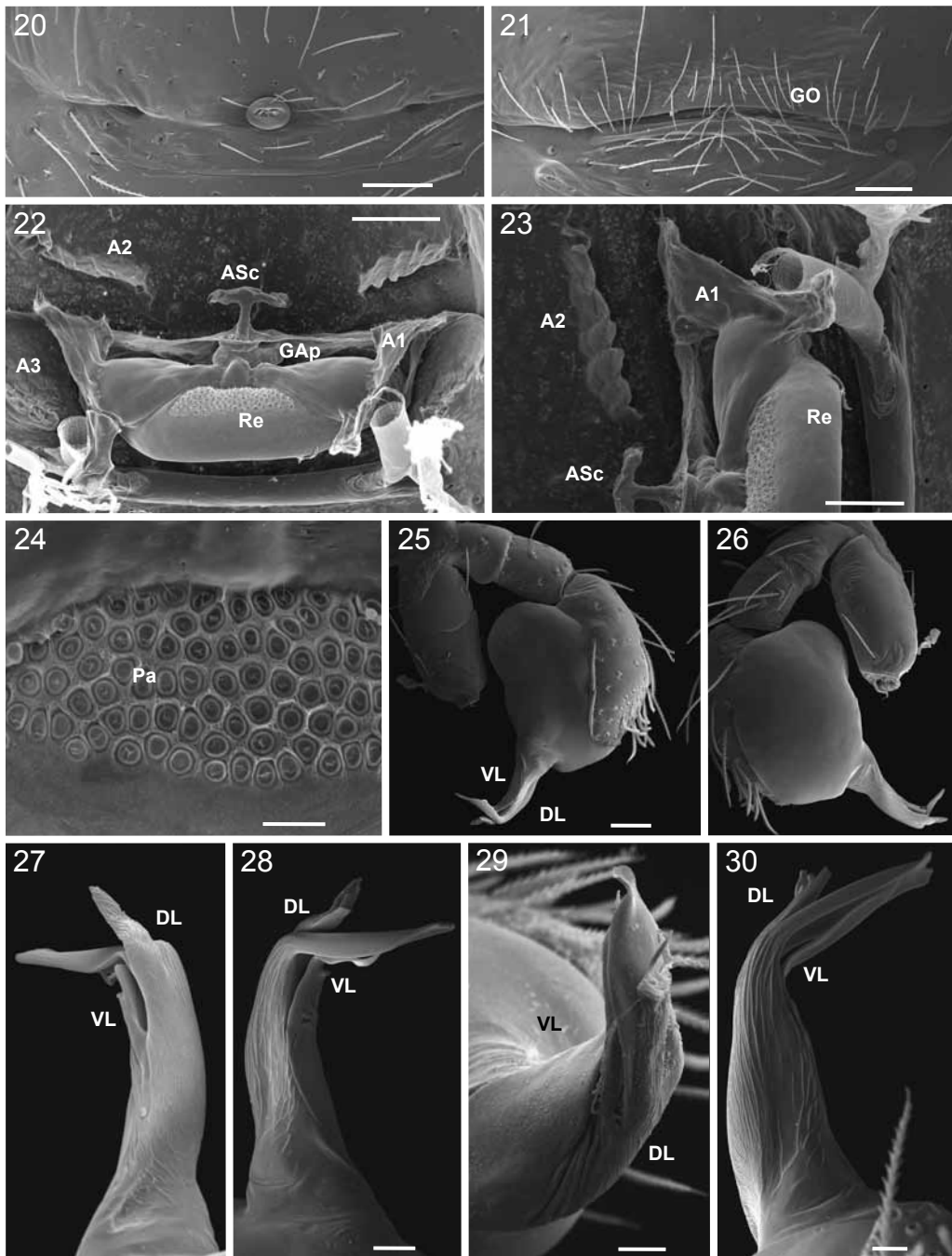
Figs. 1–10. *Noideattella amboa*, new species. 1. Habitus male, dorsal view. 2. Same, ventral view. 3. Same, lateral view. 4. Cephalothorax, dorsal view. 5. Same, ventral view. 6. Palp male, prolateral view. 7. Cephalothorax male, anterior view. 8. Palp male, retrolateral view. 9. Genitalia female, ventral view. 10. Same, dorsal view. Scale bars = 0.2 mm, except genitalia: 0.1 mm.

Female genital receptaculum sclerotized portion variable in shape, apodeme bases vary in shape either by covering most of the receptaculum or being considerably shorter. The T-shaped lateral extension also varies in length. Embolic lamellae vary in shape and number; in some specimens the prolateral surface of the embolus presents a small tooth (fig. 6).

MATERIAL EXAMINED: *N* = 542. **Madagascar:** *Fianarantsoa:* Forêt d'Analalava, 29.6 km 280° W Ranohira, tropical dry forest, 700 m, 22.59166°S, 45.12833°E, Feb. 01–05, 2003, Fisher, Griswold et al., 1 ♂ (CASC PBI_OON 3279); 4 ♀ (CASC PBI_OON 3303); 8 mixed (CASC PBI_OON 3313); 4 ♂ (CASC PBI_OON 3347); Parc National d'Isalo, Sahanafo River, 29.2 km 351° N Ranohira, gallery forest, 500 m, 22.31333°S, 45.29166°E, Feb. 10–13, 2003, C. Griswold, B. Fisher, et al., 8 mixed (CASC PBI_OON 3934). *Majunga:* Reserve forestiere Beanka, 50.7 km E Maintirano, tropical dry forest on tsingy, 140 m, 17.88027°S, 44.46888°E, Oct. 29 to Nov. 01, 2009, B.L. Fisher et al., 3 ♂ (CASC PBI_OON 36124). *Toliara:* 8.9 km NW Tolagnaro, rainforest, 100 m, 24.98138°S, 46.92555°E, Nov. 27–28, 2006, B.L. Fisher et al., 1 ♀ (CASC PBI_OON 3467); Antafoky, gallery forest, 60 m, 23.47916°S, 44.06611°E, Jan. 26, 2002, Frontier Project, 9 mixed (CASC PBI_OON 3863); Beza-Mahafaly, 27 km E Betioky, rainforest, 135 m, 23.65000°S, 44.63333°E, Apr. 23, 1997, B.L. Fisher, 21 mixed (CASC PBI_OON 3964); Bohibasia Forest, 59 km NE Sakaraha, tropical dry forest, 780 m, 22.46666°S, 41.83333°E, Jan. 13, 1996, B.L. Fisher, 11 mixed (CASC PBI_OON 3967); 4 ♂ (CASC PBI_OON 36283); 2 ♀ (CASC PBI_OON 36373); Fiherenana, degraded gallery forest, 50 m, 23.23527°S, 43.87083°E, Dec. 01–04, 2002, Frontier Project, 11 mixed (CASC PBI_OON 3299); Fiherenana, gallery forest, 100 m, 23.17694°S, 43.96083°E, Oct. 21–24, 2002, Frontier Project, 2 mixed (CASC PBI_OON 3304); Forêt Claseé d'Analavelona 29.2 km 343° NNW Mahaboboka, montane rainforest, 1100 m, 22.67500°S, 44.19000°E, Feb. 18–22, 2003, Fisher, Griswold et al., 3 mixed (CASC PBI_OON 3570); Forêt Clasee d'Analavelona 29.2 km 343° NNW Mahaboboka, montane rainforest, 1100 m, 22.67500°S, 44.19000°E, Feb. 21, 2003, Fisher-Griswold Arthropod Team, 1 ♀ (CASC PBI_OON 3952); 2 mixed (CASC PBI_OON 3953); 1 ♀ (CASC PBI_OON 3954); Forêt de Beroboka, 5.9 km 131° SE Ankidranoka, tropical dry forest, 80 m, 22.23305°S, 43.36638°E, Mar. 12–16, 2002, Fisher-Griswold Arthropod Team, 12 mixed (CASC PBI_OON 36233); Forêt de Mahavelo, Isantoria River, tropical dry forest, 110 m, 24.75833°S, 46.15722°E, Jan. 28 to Feb. 01, 2002, Fisher-Griswold Arthropod Team, 3 mixed (CASC PBI_OON 3551); 1 ♂ (CASC PBI_OON 3535); Forêt de Mite, 20.7 km 29° WNW Tongobory, gallery forest, 75 m, 23.52416°S, 44.12138°E, Feb. 7 to Mar. 03, 2002, Fisher-Griswold Arthropod Team, 38 mixed (CASC PBI_OON 3079); 2 mixed (CASC PBI_OON 3899); Forêt de Petriky, 12.5 km W Tolagnaro, littoral forest, 10 m, 25.06216°S, 46.86933°E, Nov. 22, 1998, Sylvian, B.L. Fisher, 38 mixed (CASC PBI_OON 2013); 1 ♂ (CASC PBI_OON 3861); Forêt de Tsinjoriaky, 6.2 km 84°E Tsifota, spiny forest thicket, 70 m, 22.80222°S, 43.42055°E, Mar. 06–10, 2002, Fisher-Griswold Arthropod Team, 4 mixed (CASC PBI_OON 3284); 12 ♀ (CASC PBI_OON 3309); 10 mixed (CASC PBI_OON 3360); Forêt Vohidava 88.9 km N Ambobasary, spiny forest thicket, 500 m, 24.24055°S, 46.28694°E, Dec. 06–08, 2006, Fisher-Griswold Arthropod Team, 6 mixed (CASC PBI_OON 3435); Fort Dauphin, Mt. Vasiha, primary forest, 100 m, Feb. 07, 1995, K. Emberton, 1 ♀ (MRAC MT. 220. 871 PBI_OON 9767); Mahafaly Plateau, 6.2 km 74° ENE Itampolo, spiny forest thicket, 80 m, 24.65361°S, 43.99666°E, Feb. 21–25, 2002, Fisher-Griswold Arthropod Team, 1 ♀ (CASC PBI_OON 3300); 6 mixed (CASC PBI_OON 3557); 1 ♂ (CASC PBI_OON 36388); Manderano, gallery forest, 75 m, 23.52416°S, 44.09277°E, May 29, 2002, Frontier Project, 2 mixed (CASC PBI_OON 3283); 2 ♀ (CASC PBI_OON 3310); Parc National d'Andohahela, Forêt d'Ambohibory, 1.7 km 61° ENE Tsimelaky, 36.1 km 308° NW Tolagnaro, tropical dry forest, 300 m, 24.93000°S, 46.64555°E, Jan. 16–20, 2002, Fisher-Griswold Arthropod Team, 1 ♀ (CASC PBI_OON 3274); 2 mixed (CASC PBI_OON 3550); 21 mixed (CASC PBI_OON 3553); 2 ♂ (CASC PBI_OON 36274); 8 ♂ (CASC PBI_OON 36384); Parc National d'Andohahela, 36.7 km 341° NNW Tolagnaro, tropical dry forest, 900 m, 24.76388°S, 46.75166°E, Jan. 21–25, 2002, Fisher-Griswold Arthropod Team, 1 ♂ (CASC PBI_OON 36281); Parc National d'Andohahela, Forêt de Manantalinjo, 33.6 km 63° ENE Amboasary, 7.6 km 99° E Hazofotsy, spiny forest thicket, 150 m, 24.81694°S, 46.61000°E, Jan. 12–16, 2002, Fisher-Griswold Arthropod Team, 14 mixed (CASC PBI_OON 3946); 8 ♂ (CASC PBI_OON 36400); Parc National de Tsimanampetsotsa, 6.7 km 130° SE Efoetse, 23 km 175° S Beheloka, spiny forest thicket, 25 m, 24.10055°S, 43.76000°E, Mar. 18–22, 2002, Fisher-Griswold Arthropod Team, 16 mixed (CASC PBI_OON 3239); Parc National de Tsimanampetsotsa, Forêt de Bemanateza, 20.7 km 81° E



Figs. 11–19. *Noideattella amboa*, new species. 11. Cephalothorax male, dorsal view. 12. Same, lateral view. 13. Endites female, ventral view. 14. Endites male, ventral view. 15. Pedicel male, lateral view. 16. Cephalothorax male, ventral view. 17. Chelicerae male, anterior view. 18. Chelicerae male with modified setae, anterior view (variations). 19. Cheliceral modified setae male, anterior view. Scale bars = 50 μ m, except 18: 10 μ m.



Figs. 20–30. *Noideattella amboa*, new species. **20.** Epigastric region male, ventral view. **21.** Same female, ventral view. **22.** Genitalia female, dorsal view. **23.** Same, lateral view. **24.** Receptaculum papillae field, anterior view (variations). **25.** Palp male, prolateral view. **26.** Palp male, retrolateral view. **27.** Embolus, retrolateral view. **28.** Embolus, prolateral view. **29.** Embolus, ventral view. **30.** Embolus, dorsal view. Scale bars = 50 μ m, except 24, 27–30: 10 μ m.

Efoetse, 23.0 km 131° SE Beheloka, spiny forest thicket, 90 m, 23.99222°S, 43.88055°E, Mar. 22–26, 2002, Fisher-Griswold Arthropod Team, 1 ♀ (CASC PBI_OON 3935); Parc National de Zombitse, 19.8 km 84° E Sakaraha, dry forest on sandy soil, 770 m, 22.84333°S, 44.71000°E, Feb. 05–09, 2003, Fisher-Griswold Arthropod Team, 4 mixed (CASC PBI_OON 3931); Ranobe, spiny forest thicket, 30 m, 23.03944°S, 43.61027°E, Feb. 17–21, 2003, Frontier Project, 6 mixed (CASC PBI_OON 3939); 1 ♂ (CASC PBI_OON 36272); 1 ♂ (CASC PBI_OON 36273); Reserve Prive Berenty, Forêt de Bealoka, Mandrare River, 14.6 km 329° NW Amboasary, gallery forest, 35 m, 24.95694°S, 46.27138°E, Feb. 03–08, 2002, Fisher-Griswold Arthropod Team, 98 mixed (CASC PBI_OON 3043); 1 ♂ (CASC PBI_OON 3583); 2 ♀ (CASC PBI_OON 3945); Reserve Prive Berenty, Forêt de Malaza, Mandrare River, 8.6 km 314° NW Amboasary, gallery forest, 40 m, 25.00777°S, 46.30611°E, Feb. 06, 2002, Fisher-Griswold Arthropod Team, 58 mixed (CASC PBI_OON 3556); Reserve Speciale de Cap Sainte Marie, 12.3 km 262° W Marovato, spiny forest thicket, 200 m, 25.58166°S, 45.16833°E, Feb. 11–15, 2002, Fisher-Griswold Arthropod Team, 2 ♀ (CASC PBI_OON 3278); 2 ♀ (CASC PBI_OON 3306); 17 mixed (CASC PBI_OON 3307); 1 ♀ (CASC PBI_OON 3311); 1 ♂ (CASC PBI_OON 3561); 5 ♂ (CASC PBI_OON 36385); Reserve Speciale de Cap Sainte Marie, 14.9 km 261°W Marovato, spiny forest thicket, 160 m, 25.59444°S, 45.14694°E, Feb. 13–19, 2002, Fisher-Griswold Arthropod Team, 20 mixed (CASC PBI_OON 3581); S.F. Mandena, 8.4 km NNE Tolagnaro, littoral forest, 20 m, 24.95233°S, 47.00100°E, Nov. 20, 1998, Fisher-Griswold Arthropod Team, 1 ♂ (CASC PBI_OON 2217); Sept Lacs, spiny forest thicket, 160 m, 23.52472°S, 44.15916°E, Mar. 10, 2002, Frontier Project, 1 ♀ (CASC PBI_OON 3322); Sous-pref. Amboasary: Reserve Berenty, 10 km NW d'Amboasary, valles de la riviere Mandrare, parcelle no. 3, under rocks and ground debris, Dec. 04, 1989, B. Hauser, 1 ♀ (NHMB Mad-89/47 PBI_OON 36142); Southern Isoky-Vohimena Forest, tropical dry forest, 730 m, 22.68333°S, 44.83333°E, Jan. 21, 1996, Sylvian, B.L. Fisher et al., 3 ♀ (CASC PBI_OON 3966). *Tulear*: 18 km NNW Betroka, 825 m, 23.16333°S, 44.96861°E, Dec. 09–14, 1994, M. Ivie and A. Pollock, 2 mixed (CASC PBI_OON 3968); 18 km NNW Betroka, 825 m, 23.16333°S, 44.96861°E, Dec. 09–14, 1994, M. Ivie and A. Pollock, 3 ♀ (CASC PBI_OON 36284).

Noideattella assumptia (Saaristo, 2001), new combination

Figures 31–60, 372

Silhouettella assumptia Saaristo, 2001: 319, figs. 32A, 33A, 34A, 35–39 (paratypes examined from Seychelles, Aldabra, Assumption Atoll, 14 July 1984, USSR Zool. Expedition, deposited in MZT, PBI_OON 35298).

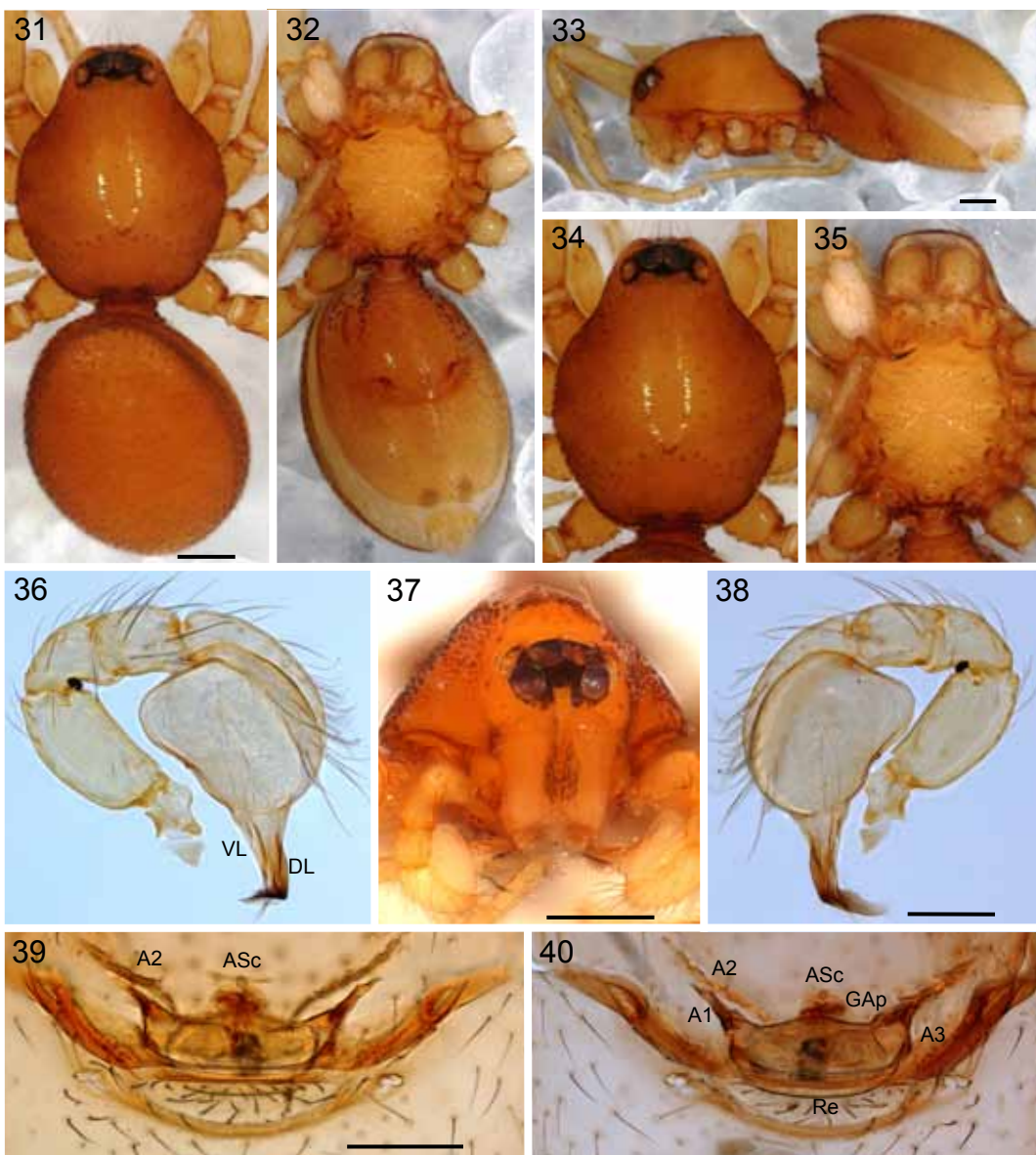
DIAGNOSIS: *N. assumptia* can be differentiated from other *Noideattella* species by the following combination of characters: habitus orange-brown; carapace pars cephalica and sides strongly granulate (figs. 34, 41, 42), book lung covers large and very narrow (figs. 32, 33); sternum microsculpture surface finely reticulate distributed medially and in furrows (figs. 35, 43); female epigastric scutum A2 apodeme bases longer than $\frac{2}{3}$ the genital opening length (figs. 39, 53).

DESCRIPTION: *Male* (PBI_OON 3248): Total length 1.3. **Cephalothorax:** Carapace orange-brown. Sternum as long as wide, orange-brown, furrow with rows of small pits, anterior margin with interrupted transverse groove (figs. 35, 43, 45). Mouthparts: Chelicerae, endites, and labium orange-brown. **Abdomen:** ovoid. Dorsal scutum orange-brown, middle surface reticulate, sides reticulate. Postepigastric scutum orange-brown, long, semicircular, covering nearly full length of abdomen (figs. 31–33). Male genital opening slightly protruded, epigastric scutum apodemes small, contiguous with anterior book lung openings, connected by a furrow. Posterior spiracles connected by a groove (fig. 50). **Legs:** Pale orange, without color pattern.

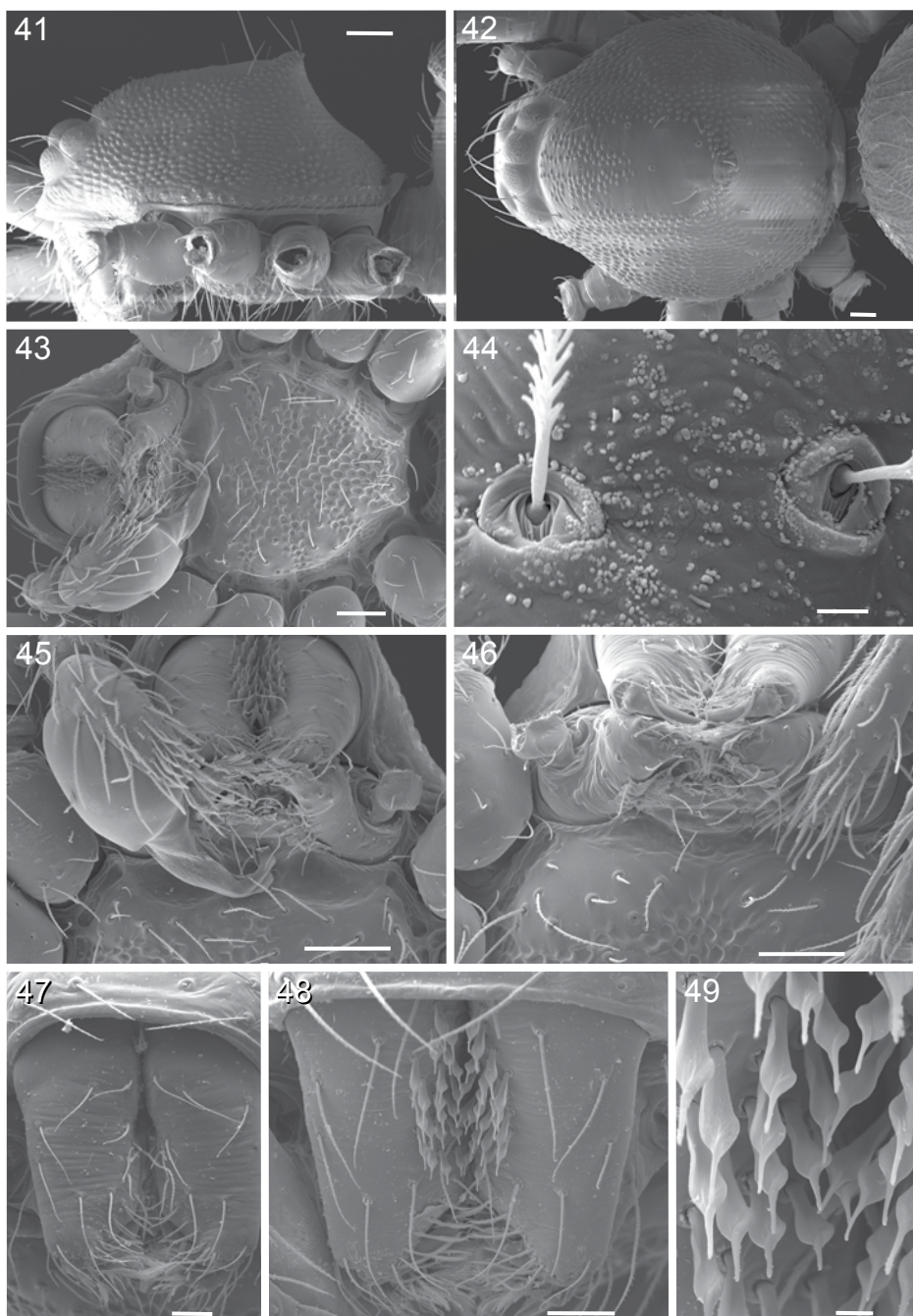
Leg spination (only surfaces bearing spines listed, all spines longer than segment width): tibiae: I p2-1-1; r2-1-0; II p2-2-1; r2-1-0; metatarsi: I, II p1-1-0; r1-1-0. Tarsal organ with four sensilla visible. **Genitalia:** Epigastric region with sperm pore situated at level of anterior spiracles (fig. 50). Palp proximal segments yellow; cymbium yellow, with distal patch of setae; bulb yellow (figs. 36–38). Embolus dorsal lamella with at least two distal apophyses (figs. 57–60), ventral lamella bifurcate (figs. 56, 59). Palp as in figures 55 and 56. *Female* (PBI_OON 3248): Total length 1.5. As in male except as noted. **Abdomen:** Postepigastric scutum not fused to epigastric scutum. Spinneret scutum with fringe of needlelike setae. **Legs:** Metatarsi III and IV weak ventral scopula present. Leg spination (only surfaces bearing spines listed, all spines longer than segment width): tibiae: I p2-1-1; r2-1-0; II p2-2-1; r2-1-0; metatarsi: I, II p1-1-0; r1-1-0. Trichobothria of metatarsus: I one, IV one. Tarsal organ number of sensilla variable, leg four has two sensilla, other tarsal organ sensilla vary from three to two. **Genitalia:** Genital opening slit shaped (fig. 51). Sperm sac secretory glands openings flat, concentrated around GAP process, GAP process shaped like twisted tube (fig. 54). Genitalia as in figures 39 and 40.

VARIATION: Male paturon inner margin setae vary among specimens; some lack modified setae, while other specimens have a brush of modified seta (figs. 37, 47–49). Male leg II spination varies from three to four spines on the prolateral side of tibiae. Shape and number of embolar dorsal and ventral lamella apophyses shape varies among individuals.

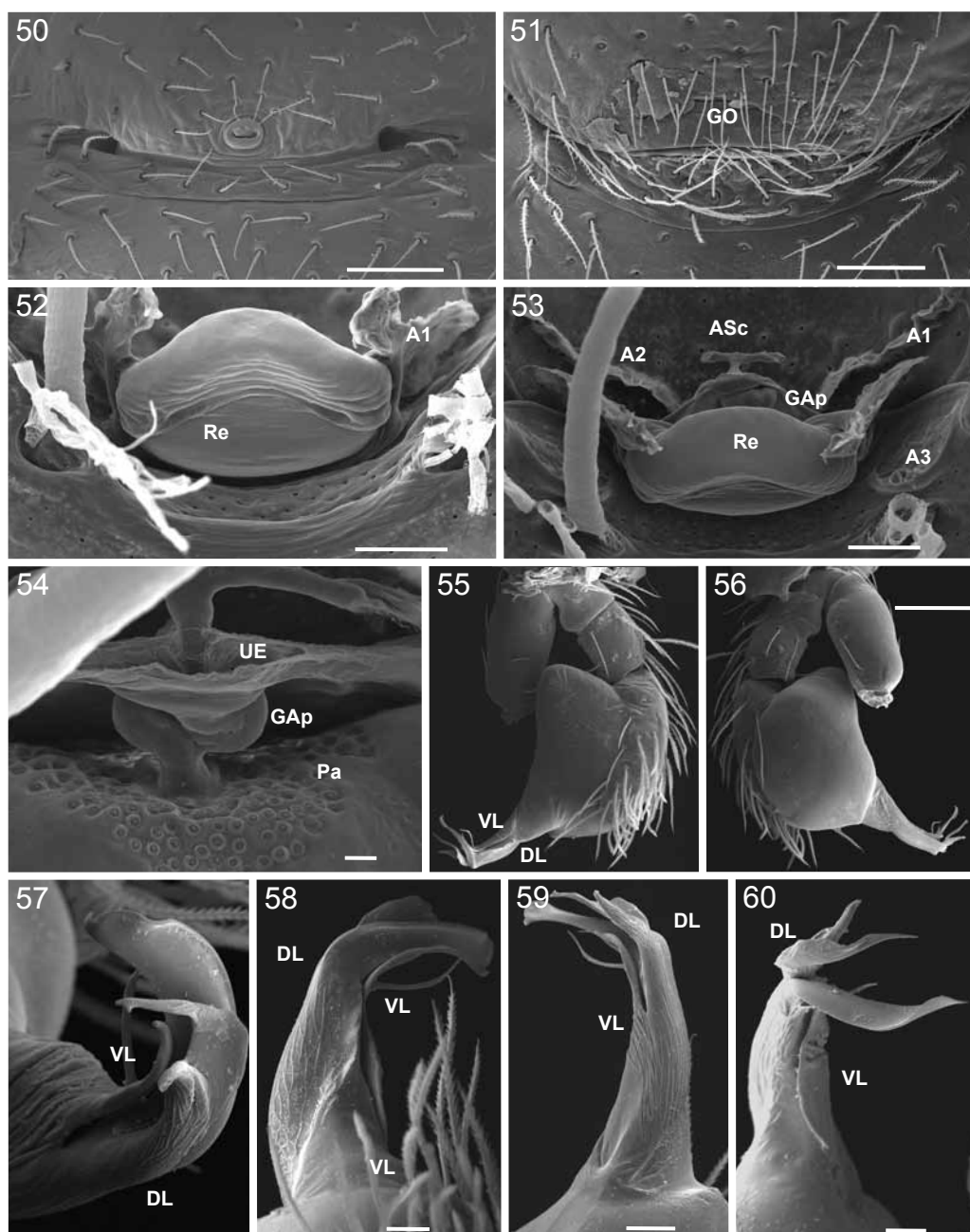
MATERIAL EXAMINED: *N* = 250. **Madagascar:** *Antsiranana:* Forêt Bekaraoka, 6.8 km 60° ENE Daraina, tropical dry forest, 150 m, S13.00277°, E49.01166°, Dec. 07, 2003, Fisher-Griswold Arthropod Team, 5 ♂ (CASC PBI_OON 3958); Forêt d'Ampondrabe, 26.3 km 10° NNE Daraina, tropical dry forest, 175 m, S12.97000°, E49.70000°, Dec. 10, 2003, Fisher-Griswold Arthropod team, 13 mixed (CASC PBI_OON 3579); Forêt d'Ampombofofo, littoral forest, 25 m, S12.09944°, E49.33861°, Nov. 21–22, 2007, Fisher-Griswold Arthropod team, 1 ♂ (CASC PBI_OON 36093); Forêt d'Orangea, 3.6 km 128° SE Ramena, littoral forest, 90 m, S12.25888°, E49.37472°, Feb. 22–28, 2001, Fisher-Griswold Arthropod team, 30 mixed (CASC PBI_OON 3248); 1 ♂ (CASC PBI_OON 3250); 3 ♀ (CASC PBI_OON 3301); 1 ♀ (CASC PBI_OON 3932); Forêt di'Andavakoera, 21.4 km 356° N Betsiaka, rainforest, 425 m, S13.00194°, E49.00361°, Dec. 15, 2003, Fisher-Griswold Arthropod team, 2 mixed (CASC PBI_OON 3956); Montagne des Français, 7.2 km 142° SE Antsiranana (=Diego Suarez), tropical dry forest, 180 m, S12.32277°, E49.33805°, Feb. 22–28, 2001, Fisher-Griswold Arthropod team, 6 mixed (CASC PBI_OON 3264); 5 mixed (CASC PBI_OON 3273); 1 ♀ (CASC PBI_OON 3930); Nosy Be, Lokobe Forest, S13.41633°, E48.30736°, Aug. 11–14, 1992, V. Roth, B. Roth, 1 ♂ (CASC PBI_OON 3949); Parc National Montagne d'Ambre, 3.6 km 235° SW Joffreville, tropical dry forest, 925 m, S12.53444°, E49.17944°, Jan. 20–26, 2001, Fisher-Griswold Arthropod Team, 1 ♂ (CASC PBI_OON 3268); Reserve Analamerana, 16.7 km 123° SW Anivorano Nord, tropical dry forest, 225 m, S12.67138°, E49.37388°, Dec. 03, 2004, Fisher-Griswold Arthropod team, 9 mixed (CASC PBI_OON 35275); 5 mixed (CASC PBI_OON 35264); Reserve Speciale d'Ambre, 3.5 km 235° SW Sakaramy, 325 m, S12.46888°, E49.24222°, Jan. 26–31, 2001, L.J. Boutin, 2 mixed (CASC PBI_OON 3261); Reserve Speciale d'Ambre, 3.5 km 235° SW Sakaramy, tropical dry forest, 325 m, S12.46888°, E49.24222°, Jan. 26–31, 2001, Fisher-Griswold Arthropod Team, 18 mixed (CASC PBI_OON 3263); 18 mixed (CASC PBI_OON 3276); 4 ♀ (CASC PBI_OON 3963); 2 mixed (CASC PBI_OON 36270); Reserve Speciale de l'Ankarana, 22.9 km 224° SW Anivorano Nord, tropical dry forest, 80 m, S12.90888°, E49.10972°, Feb. 10–16, 2001, Fisher-Griswold Arthropod Team, 1 ♀ (CASC PBI_OON 3285); 1 ♀ (CASC PBI_OON 3933); 16 mixed (CASC PBI_OON 3957); 4 ♀ (CASC PBI_OON 3960); 5 mixed (CASC PBI_OON 36234); Reserve Speciale l'Ankarana, 13.6 km 192° SSW Anivorano Nord, tropical dry forest, 210 m, S12.86361°, E49.22583°, Feb. 16–20, 2001, Fisher-Griswold Arthropod Team, 1 ♂ (CASC PBI_OON 3241); 24 mixed (CASC PBI_OON 3242); Reserve Speciale l'Ankarana, 22.9 km 224° SW Anivorano Nord, Camp Anglaise, 80 m, S12.90888°, E49.10972°, Feb. 10–16, 2001, L.J. Boutin, 1 ♀ (CASC PBI_OON 3297). **Seychelles:** Aldabra, Assumption Atoll, July 14, 1984, USSR Zool. Expedition, 2 mixed, paratypes (MZT PBI_OON 35298).



Figs. 31–40. *Noideattella assumptia* (Saaristo, 2001). 31. Habitus male, dorsal view. 32. Same, ventral view. 33. Same, lateral view. 34. Cephalothorax, dorsal view. 35. Same, ventral view. 36. Palp male, prolateral view. 37. Cephalothorax male, anterior view. 38. Palp male, retrolateral view. 39. Genitalia female, ventral view. 40. Same, ventral dorsal. Scale bars = 0.2 mm, except genitalia: 0.1 mm.



Figs. 41–49. *Noideattella assumptia* (Saaristo, 2001). **41.** Cephalothorax male, lateral view. **42.** Same, dorsal view. **43.** Same, ventral view. **44.** Trichobothria tibia 1 female, dorsal view. **45.** Endites male, ventral view. **46.** Endites female, ventral view. **47.** Chelicerae male, anterior view. **48.** Chelicerae male with modified setae, anterior view (variations). **49.** Cheliceral modified setae male, anterior view. Scale bars = 50 μ m, except 44, 49: 10 μ m.



Figs. 50–60. *Noideattella assumptia* (Saaristo, 2001). 50. Epigastric region male, ventral view. 51. Same female, ventral view. 52. Genitalia female, posterior view. 53. Same, dorsal view. 54. Genitalia female uterus externus locking mechanisms. 55. Palp male, prolateral view. 56. Same, retrolateral view. 57. Embolus, ventral view. 58. Embolus, dorsal view. 59. Embolus, retrolateral view. 60. Embolus, prolateral view. Scale bars = 50 μm , except 24, 28, 29: 10 μm .

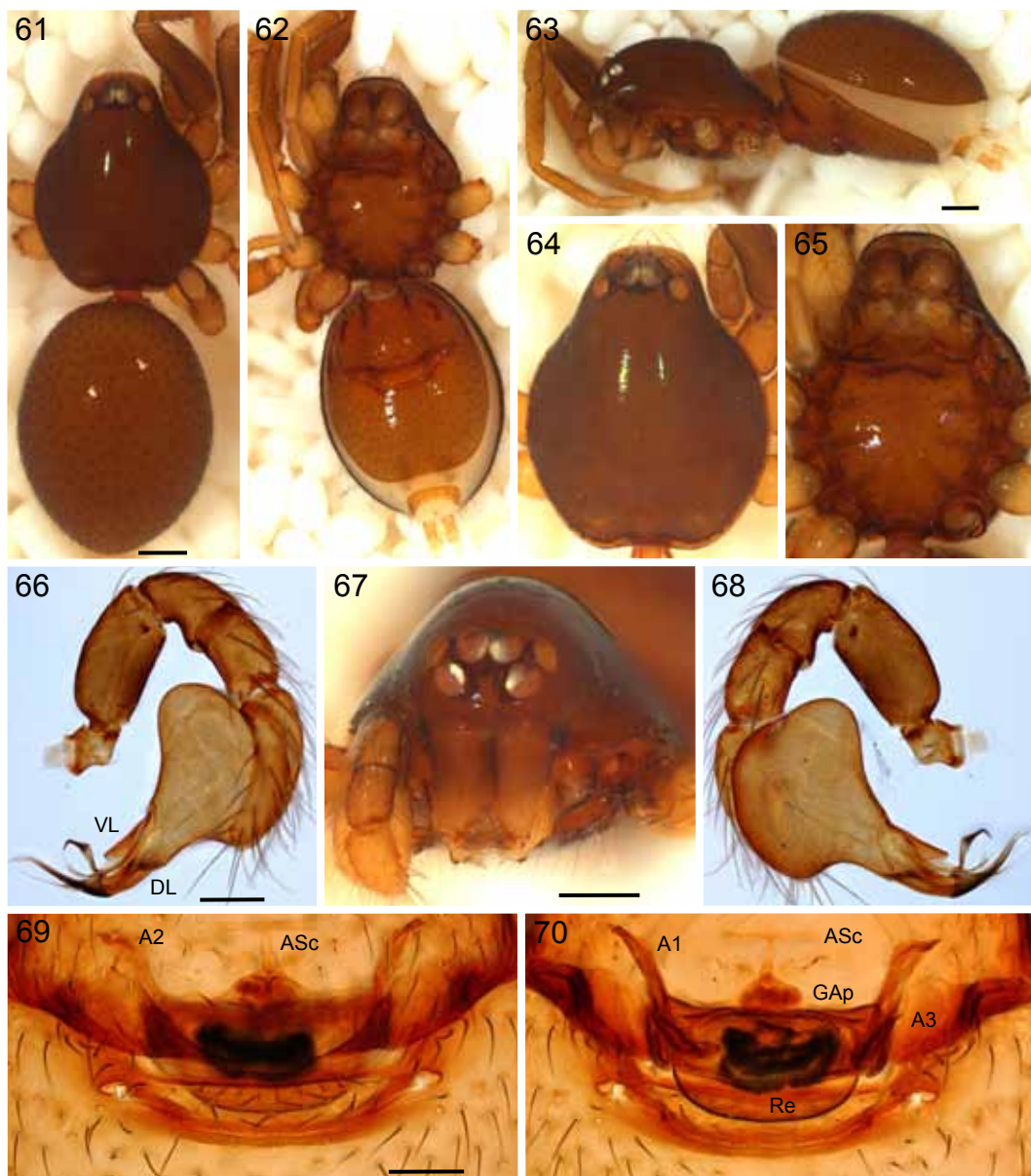
Noideattella gamela, new species

Figures 61–88, 99–105, 373

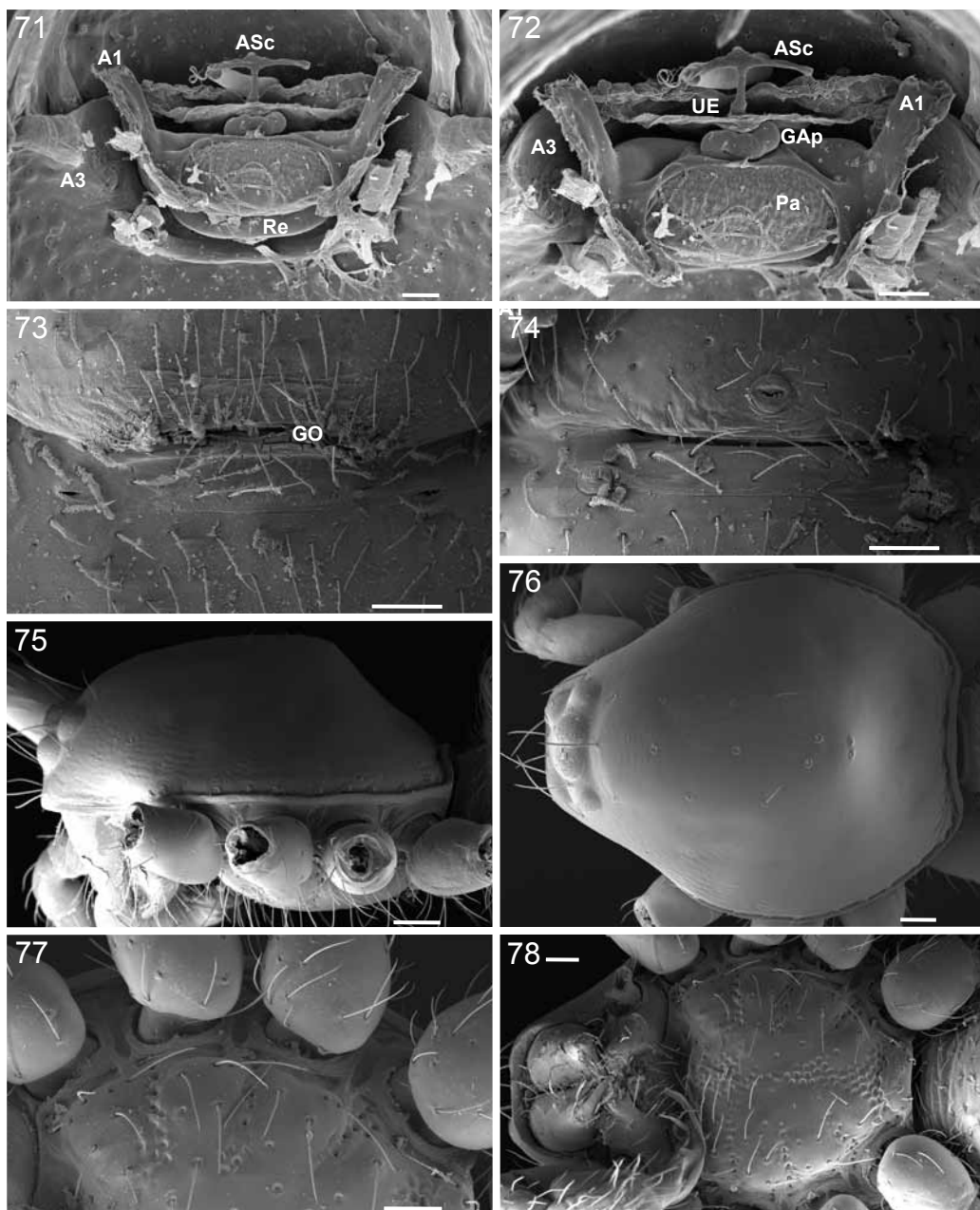
Types: Male holotype and female allotype from Berlese and sifted leaf litter of a montane rainforest at an elevation of 1075 m at Ambatovy, 18°51'3"S, 48°19'17"E, Toamasina (21 March 2004, Malagasy ant team) deposited in CASC (PBI_OON 00036157). The species epithet, a noun in apposition, is taken for the Malagasy word for *bucket*.

Diagnosis: *N. gamela* can be differentiated from other *Noideattella* species by the following combination of characters: habitus color dark brown; carapace pars cephalica and sides smooth (figs. 64, 76) or with very weak granulate texture (visible only with SEM: figs. 75, 79); sternum microsculpture finely reticulate distributed medially and in furrows (figs. 65, 77, 78). Book lung covers large and ovoid (figs. 62, 100); male leg I and II metatarsi with two pairs of spines (figs. 102, 103); embolus ventral lamella with a flat curved apophysis (figs. 66, 68). The female of this species and *N. famafa* are morphologically identical and only present differences in phenology, with adults of *N. gamela* found from November to March, whereas *N. famafa* females are found in September.

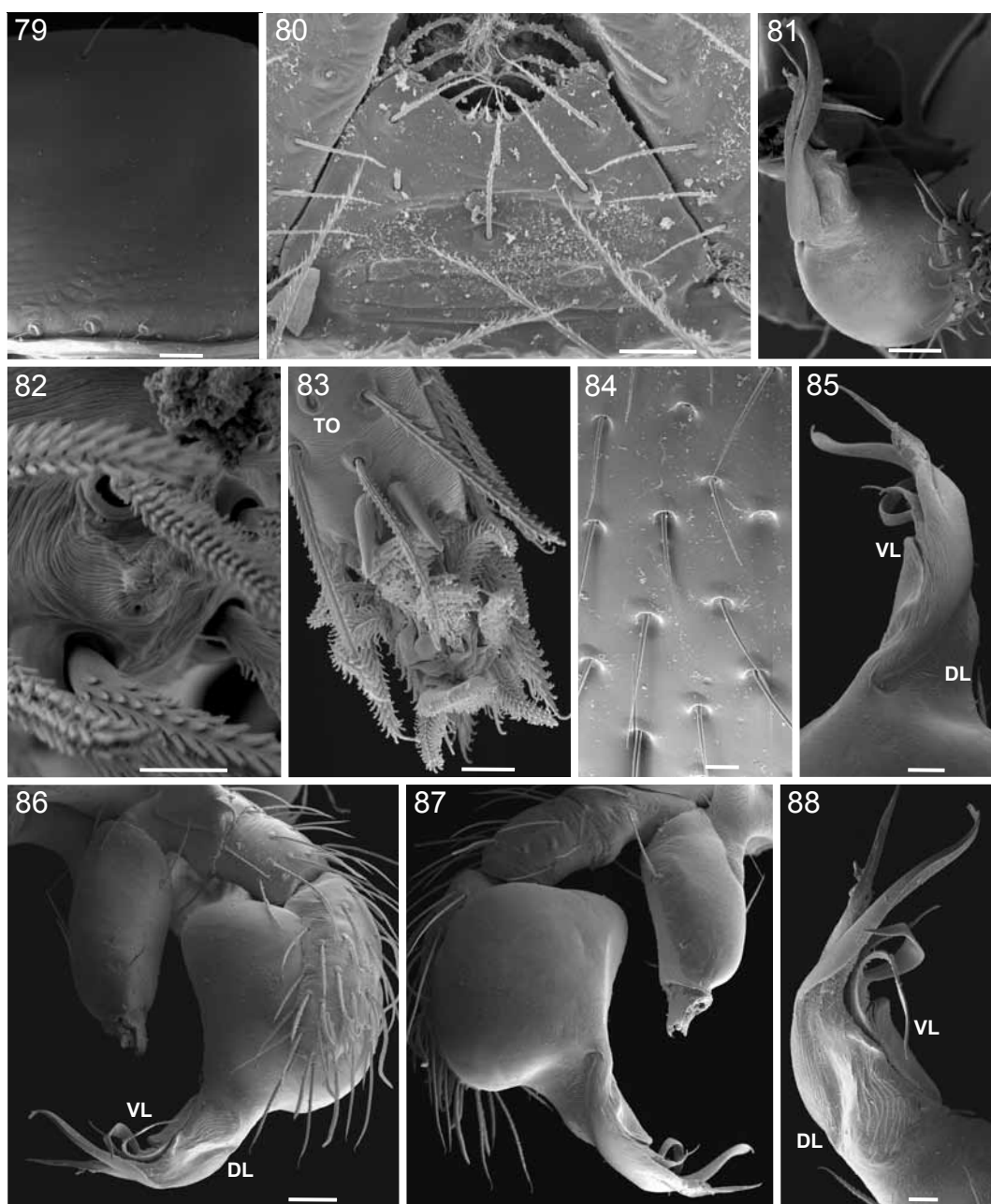
Description: *Male:* Total length 2.5. **Cephalothorax:** Sternum as long as wide, brown, without pits, anterior margin with continuous transverse groove (figs. 65, 77, 78). Mouthparts: Chelicerae, endites, and labium brown. Cheliceral paturon inner margin lacks modified seta, with scattered setae (fig. 67). **Abdomen:** ovoid. Pedicel with a line of denser setae around the pedicel (fig. 100). Dorsal scutum brown, middle surface smooth, sides smooth. Postepigastric scutum brown, long, semicircular, covering nearly full length of abdomen (figs. 62, 63, 99). Male genital opening slightly protruded, epigastric scutum apodemes not easily visible, contiguous with the anterior book lung opening and inside a deep furrow. Posterior spiracles connected by a groove (figs. 74, 99). **Legs:** Dark red-brown, femora and basal half of tibiae darkened (figs. 102–105). Leg spination (only surfaces bearing spines listed, all spines longer than segment width): tibiae: I p0-1-1; r1-1-1; II p1-1-0; r1-1-0; IV p0-0-1; metatarsi: I, II p1-1-0; r1-1-0. Trichobothria on tibiae: I three, IV three, trichobothria base longitudinally narrowed, aperture internal texture gratelike, hood covered by numerous low, closely spaced ridges. Tarsal organ with two sensilla visible. **Genitalia:** Epigastric region with sperm pore situated in front of anterior spiracles (fig. 74). Palp proximal segments pale brown; cymbium pale brown, with distal patch of setae; bulb pale brown (figs. 66, 68). Embolus dorsal lamella with at least two distal apophyses (fig. 85), ventral lamella with three apophyses (fig. 88). Palp as in figures 81, 86, and 87. *Female* (PBI_OON 0003295): Total length 2.4. As in male except as noted. **Abdomen:** Pedicel surrounded by line of denser setae. **Legs:** Tibia I Emerit's glands present, metatarsi III and IV weak ventral scopula absent, tibiae Emerit's glands very shallow and difficult to see. Leg spination (only surfaces bearing spines listed, all spines longer than segment width): tibiae: I, II p2-1-1; r1-1-1; IV p0-0-1; metatarsi: I, II p1-1-0; r1-1-0. Trichobothria absent from metatarsi I and IV. **Genitalia:** Genital opening slit shaped (fig. 73). Sperm sac secretory gland openings flat, extending all over receptaculum posterior surface, GAP process shaped as a twisted tube (figs. 71, 72). Genitalia as in figures 69 and 70.



Figs. 61–70. *Noideattella gamela*, new species. **61.** Habitus male, dorsal view. **62.** Same, ventral view. **63.** Same, lateral view. **64.** Cephalothorax, dorsal view. **65.** Same, ventral view. **66.** Palp male, prolateral view. **67.** Cephalothorax male, anterior view. **68.** Palp male, retrolateral view. **69.** Genitalia female, ventral view. **70.** Same, dorsal view. Scale bars = 0.2 mm, except genitalia: 0.1 mm.



Figs. 71–78. *Noideattella gamela*, new species. 71. Genitalia female, dorsal view. 72. Same, anterodorsal view. 73. Epigastric region female, ventral view. 74. Same male, ventral view. 75. Cephalothorax male, lateral view. 76. Same, dorsal view. 77. Infracoxal grooves male, ventral view. 78. Cephalothorax male, ventral view. Scale bars = 50 μ m.



Figs. 79–88. *Noideattella gamela*, new species. 79. Cephalothorax pars thoracica male, lateral view. 80. Labium female. 81. Palp male, apical view. 82. Palp tarsus female, apical view. 83. Claws and tarsal organ leg 1 female. 84. Abdomen setae male, dorsal view. 85. Embolus, retrolateral view. 86. Palp male, prolateral view. 87. Same, retrolateral view. 88. Embolus, prolateral view. Scale bars = 10 μm , except 148, 153–154: 50 μm .

VARIATION: The coloration varies from brown to red-brown among specimens. Female leg I: spine number varies from two to three on the prolateral side, leg II: tibial spine number varies from two to one on the prolateral side, even within the same specimen (PBI_OON 00003293). Female spines on tibia retrolateral side of legs I and II vary from two to one. Male leg II tibial spine number varies from three to four on the prolateral surface.

MATERIAL EXAMINED: *N* = 18. **Madagascar:** *Antananarivo:* 3 km 41° NE Andranomay, 11.5 km 147° SSE Anjozorobe, montane rainforest, 1300 m, S18.47333°, E47.96000°, Dec. 05–13, 2000, Fisher-Griswold Arthropod Team, 2 ♀ (CASC PBI_OON 3923). *Antsiranana:* Marojejy Reserve, 8.4 km NNW Manantenina, 700 m, S14.43333°, E49.75000°, Nov. 10–16, 1993, J. Coddington, S. Larcher, C. Griswold, R. Andriamasimanana, N. Scharff, 1 ♀ (CASC PBI_OON 3466); Parc National de Marojejy, Antranohofa, 26.6 km 31° NNE Andapa, 10.7 km 318° NW Manantenina, montane rainforest, 1325 m, S14.00722°, E49.01222°, Nov. 18, 2003, Fisher-Griswold Arthropod team, 1 ♀ (CASC PBI_OON 3562). *Fianarantsoa:* Ranomafana National Park, Talakely, mixed tropical forest, 900 m, S21.41735°, E47.69916°, Jan. 07–17, 2001, D.H. and K.M. Kavanaugh, R.L. Brett, E. Elsom, F. Vargas, 1 ♀ (CASC PBI_OON 3959). *Toamasina:* Ambatovy, montane rainforest, 1075 m, S18.85083°, E48.32139°, Mar. 21, 2004, Malagasy ant team, 1 ♂ (CASC PBI_OON 3573); Montagne d'Anjanaharibe, 18.0 km 21° NNE Ambinanitelo, rainforest, 470 m, S15.18833°, E49.61500°, Mar. 08–12, 2003, Fisher-Griswold Arthropod Team, 1 ♂ (CASC PBI_OON 3531); Montagne d'Anjanaharibe, 19.5 km 27° NNE Ambinanitelo, montane rainforest, 1100 m, S15.17833°, E49.63500°, Mar. 12–16, 2003, Fisher-Griswold Arthropod Team, 2 mixed (CASC PBI_OON 3568); Parc National Masoala, Ambohitsitondroina, Mt, Ambanizana, rainforest, 900 m, S15.57166°, E50.00583°, Feb. 26, 2003, D. Andriamalala, D. Silva, et al., 1 ♀ (CASC PBI_OON 3293); Parc National Masoala, Ambohitsitondroina, Mt, Ambanizana, rainforest, 700 m, S15.56941°, E50.00341°, Mar. 01, 2003, D. Andriamalala, D. Silva, et al., 1 ♀ (CASC PBI_OON 3294); 2 mixed (CASC PBI_OON 3295); Reserve Analamazaotra, Parc National Andasibe, 23 road km E Moramanga, rainforest, 960 m, S18.94394°, E48.41755°, Jan. 16–18, 2003, C. Griswold, D. Silva, D. Andriamalala, 1 ♂ (CASC PBI_OON 3335); Torotorofotsy, montane rainforest, 1070 m, S18.87083°, E48.34750°, Mar. 24, 2004, Malagasy ant team, 2 mixed (CASC PBI_OON 3549).

Noideattella famafa, new species

Figures 89–98, 106–112, 373

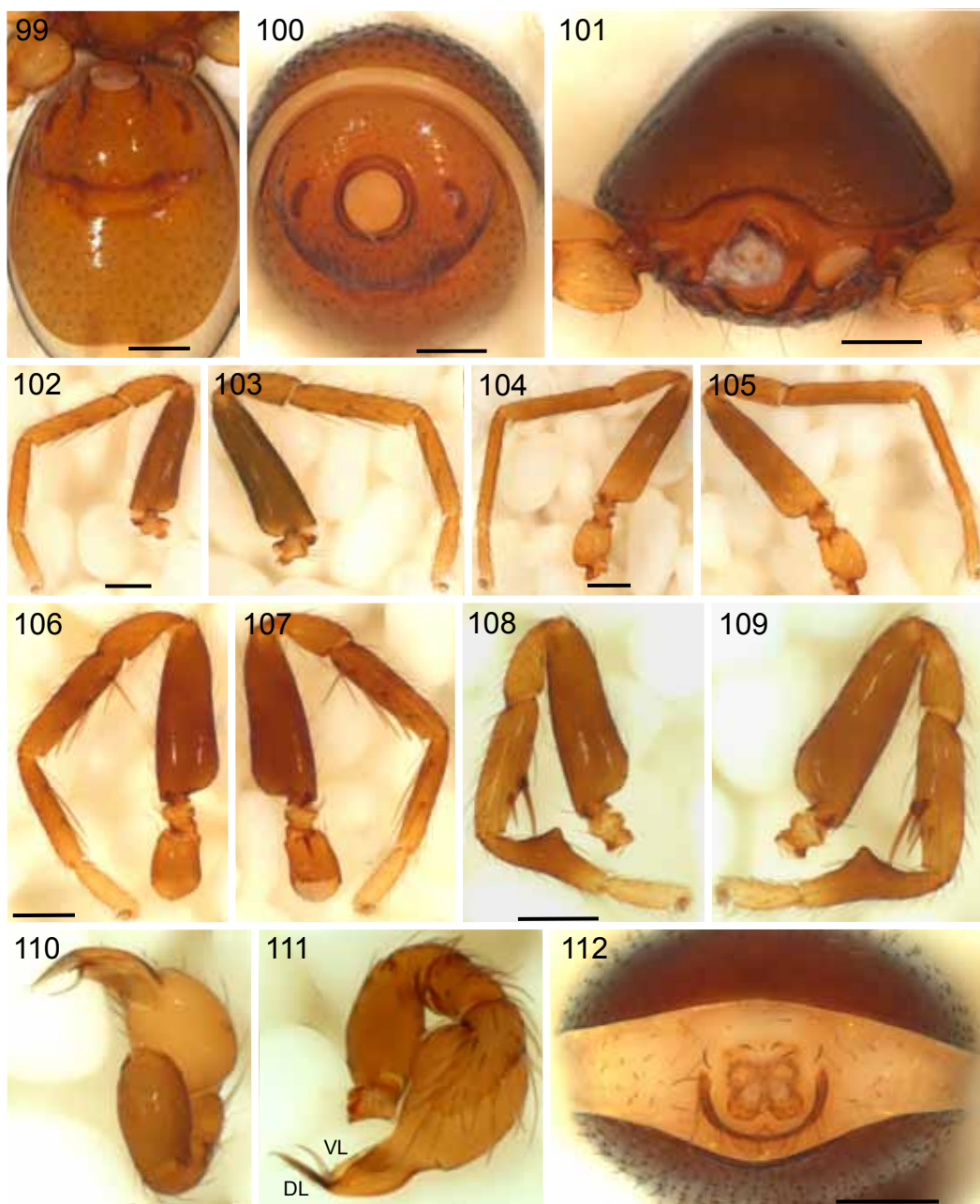
TYPES: Male holotype from general collecting of a low canopy remnant forest at an elevation of 1300 m at Station Forrestiere Angavokely, 22 km E Antananarivo 18°55.6'S, 47°45'E, Antananarivo (8 September 2001, D. Andriamalala, T. Andriambinintsoa, J.J. Rafanomezantsoa, D. Ubick) deposited in CASC (PBI_OON 00003260). The species epithet, a noun in apposition, is taken for the Malagasy word for *broom*.

DIAGNOSIS: Spiders of *N. famafa* can be differentiated from other *Noideattella* species by the following combination of characters: habitus color dark brown; carapace surface of elevated portion of pars cephalica smooth (figs. 91, 92, 95); sternum microsculpture finely reticulate distributed medially and in furrows (fig. 93); book lung covers large and ovoid (fig. 98); male leg I and II metatarsi without spines, and each armed with a median triangular bump (figs. 106–109); embolus ventral lamella with a flat curved apophysis, smaller than that in *N. gamela* (figs. 94–96). The female specimens of this species and of *N. gamela* are morphologically identical and only present differences in phenology, with *N. famafa* adults found in September.

DESCRIPTION: *Male* (PBI_OON 0003260): Total length 1.8. **Cephalothorax:** Carapace brown, sides finely reticulate. Sternum as long as wide, brown, furrow with rows of small pits,



Figs. 89–98. *Noideattella famafa*, new species. **89.** Habitus male, dorsal view. **90.** Same, ventral view. **91.** Same, lateral view. **92.** Cephalothorax, dorsal view. **93.** Same, ventral view. **94.** Palp male, retrolateral view. **95.** Cephalothorax male, anterior view. **96.** Palp male, prolateral view. **97.** Genitalia female, ventral view. **98.** Abdomen female, lateral view. Scale bars = 0.2 mm, except genitalia: 0.1 mm.



Figs. 99–112. *Noideattella gamela* (figs. 99–105) and *N. famafa* (106–112) new species. **99.** Abdomen male, ventral view. **100.** Same, anterior view. **101.** Cephalothorax male, posterior view. **102.** Leg I male, retrolateral view. **103.** Same, prolateral view. **104.** Leg IV male, retrolateral view. **105.** Same, prolateral view. **106.** Leg I female, retrolateral view. **107.** Same, prolateral view. **108.** Leg I male, retrolateral view. **109.** Same prolateral view. **110.** Palp male, ventral view. **111.** Same dorsal view. **112.** Abdomen female, posterior view. Scale bars = 0.2 mm, except palps: 0.1 mm.

anterior margin with continuous transverse groove (fig. 93). Mouthparts: Chelicerae, endites, and labium brown, paturon inner margins lack modified seta, with scattered setae (fig. 95). **Abdomen:** ovoid. Dorsal scutum brown, middle surface and sides smooth. Postepigastric scutum brown, long, semicircular, covering nearly full length of abdomen (figs. 89–91). **Legs:** Dark red-brown, femora, basal half of tibiae darkened. Leg spination (only surfaces bearing spines listed, all spines longer than segment width): tibiae: I p0-0-2; r0-0-2; IV p0-0-1 (leg I: metatarsus ventral surface protruded). **Genitalia:** Epigastric region with sperm pore situated at level of anterior spiracles. Palp proximal segments pale orange; cymbium pale orange, with distal patch of setae; bulb pale orange. Embolus dorsal and ventral lamella with at least one apophysis each. Palp as in figures 110 and 111. *Female* (PBI_OON 0003938): Total length 2.0. As in male except as noted. **Legs:** Metatarsi III and IV weak ventral scopula absent. Leg spination (only surfaces bearing spines listed, all spines longer than segment width): tibiae: I, II p2-1-1; r1-1-1; IV p0-0-1; metatarsi: I, II p1-1-0; r1-1-0 (leg IV: spine on tibia IV smaller than those in tibia I and II). **Genitalia:** Genital opening slit shaped (figs. 97, 98).

MATERIAL EXAMINED: *N* = 3. **Madagascar:** *Antananarivo:* Station Forrestiere Angavokely, 22 km E Antananarivo, low canopy remnant forest, 1300 m, 18.92666°S, 47.75000°E, Sept. 08, 2001, D. Andriamalala, T. Andriambinintsoa, J.J. Rafanomezantsoa, D. Ubick, 2 ♀ (CASC PBI_OON 3938).

Noideattella saka, new species

Figures 113–140, 374

TYPES: Male holotype and female allotype from Berlese and sifted leaf litter of a rainforest at an elevation of 1580 m at Reserve Speciale Manongarivo: 17.3 km 218° SW Antanamabo, 14°1.3'S, 48°25.1'E, Antsiranana Province (27 October 1998, B.L. Fisher) deposited in CASC (PBI_OON 00036158). The species epithet, a noun in apposition, is taken from the Malagasy word for *cat*.

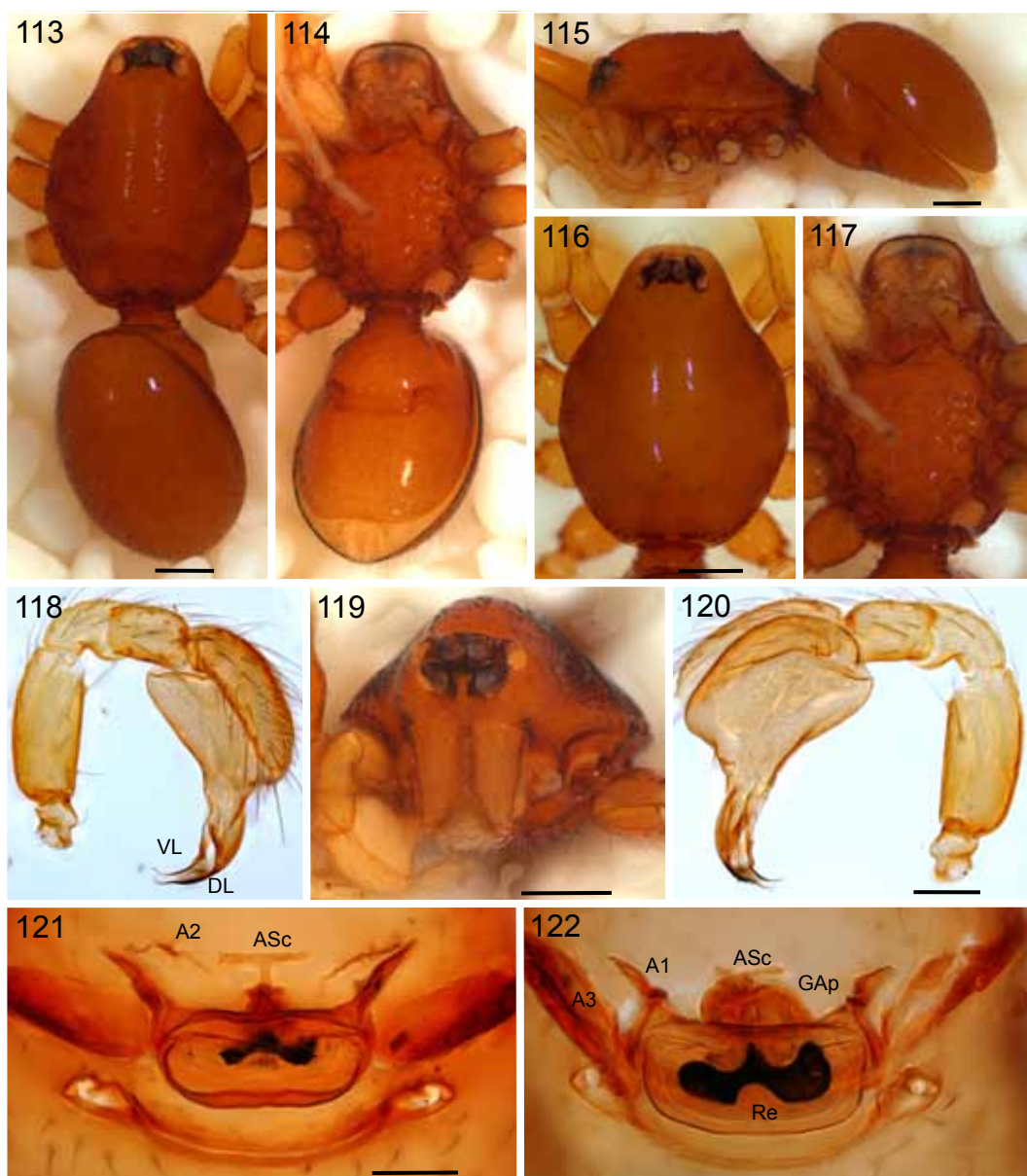
DIAGNOSIS: *N. saka* can be differentiated from other *Noideattella* species by the following combination of characters: habitus color orange-brown; sternum furrows with row of large pits, surface coarsely reticulate, microsculpture medially and in furrows (figs. 117, 133, 134); carapace pars cephalica and sides moderately to strongly granulate (figs. 115, 116, 131, 132); book lung covers large and elliptical (figs. 114, 115); leg femora bases orange-brown, other leg segments yellow.

DESCRIPTION: *Male* (PBI_OON 0003237): Total length 1.9. **Cephalothorax:** Carapace orange-brown. Sternum longer than wide, orange-brown, anterior margin with continuous transverse groove (fig. 129). Mouthparts: Chelicerae, endites, and labium orange-brown. Chelical paturon inner margins with scattered setae and without modified setae (fig. 119). **Abdomen:** Ovoid. Dorsal scutum orange-brown, middle surface smooth, sides smooth. Postepigastric scutum orange-brown, long, semicircular. Male genital opening slightly protruded, epigastric scutum apodemes small, contiguous with the anterior book lung opening, not connected by a furrow. Posterior spiracles connected by a groove (fig. 128). **Legs:** Yellow, femora and basal half of tibiae darkened. Leg spination (only surfaces bearing spines listed, all spines longer than segment width): tibiae: I, II p2-1-1; r2-1-1; IV p0-0-1; metatarsi: I, II p1-1-0; r1-1-0. l. Trichobothria

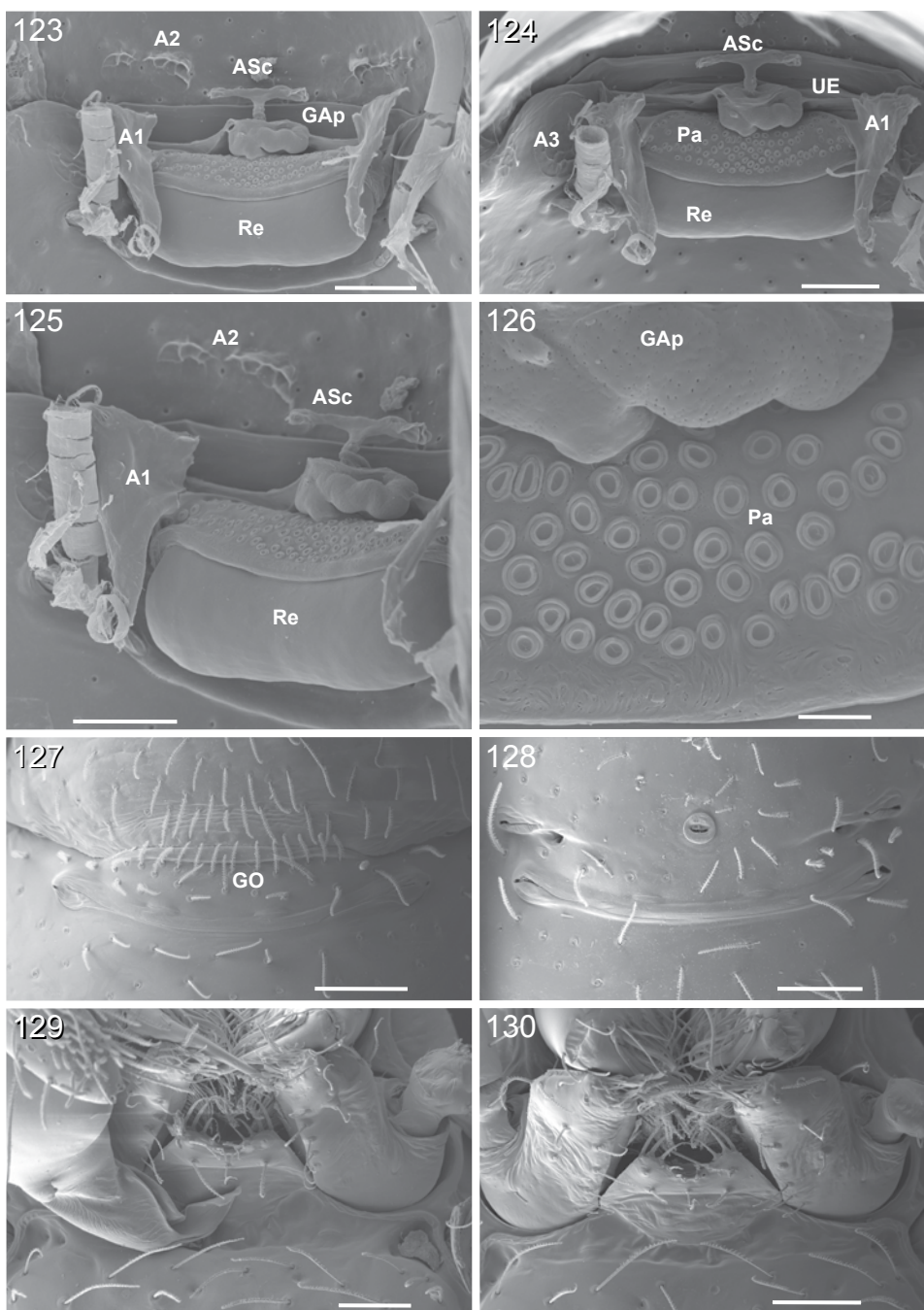
on tibiae: I three, IV three, trichobothria base longitudinally narrowed, aperture internal texture gratelike, hood covered by numerous low, closely spaced ridges. Tarsal organ with two sensilla visible. **Genitalia:** Epigastric region with sperm pore situated at level of anterior spiracles (fig. 128). Palp proximal segments pale orange; cymbium pale orange, with distal patch of setae; bulb pale orange (figs. 118, 120). Embolus dorsal and ventral lamellae with one apophysis each (figs. 137–140). Palp as in figures 135 and 136. **Female** (PBI_OON 0003237): Total length 2.1. As in male except as noted. **Cephalothorax:** Carapace pars cephalica and sides moderately to strongly granulate. Mouthparts: Cheliceral paturon inner margin lacks modified setae. **Legs:** Metatarsi III and IV weak ventral scopula absent. Leg spination (only surfaces bearing spines listed, all spines longer than segment width): tibiae: I, II p2-1-1; r2-1-1; IV p0-0-1; metatarsi: I, II p1-1-0; r1-1-0. Trichobothria of metatarsus: I one, IV one. **Genitalia:** Genital opening slit shaped (fig. 127). Sperm sac secretory gland openings flat, extending over the receptaculum surface, GAP process shaped as a twisted tube (figs. 123–126). Genitalia as in figures 121 and 122.

VARIATION: The carapace pars cephalica granulation varies in males: in most specimens cuticle is strongly granulate while in some the granulation is concentrated only at the sides. The distal modified setae on the paturon tip are larger in some specimens. Male leg I: tibial spines vary from five to four on the prolateral surface; leg II: tibial spine number varies from two to four on the prolateral surface and three to four on the retrolateral side. Shape and number of the embolar dorsal and ventral lamellae varies among individuals. Female leg I: tibial spine number varies from four to five; leg II: tibial spine number varies from four to five on the prolateral surface and three to four on the retrolateral side.

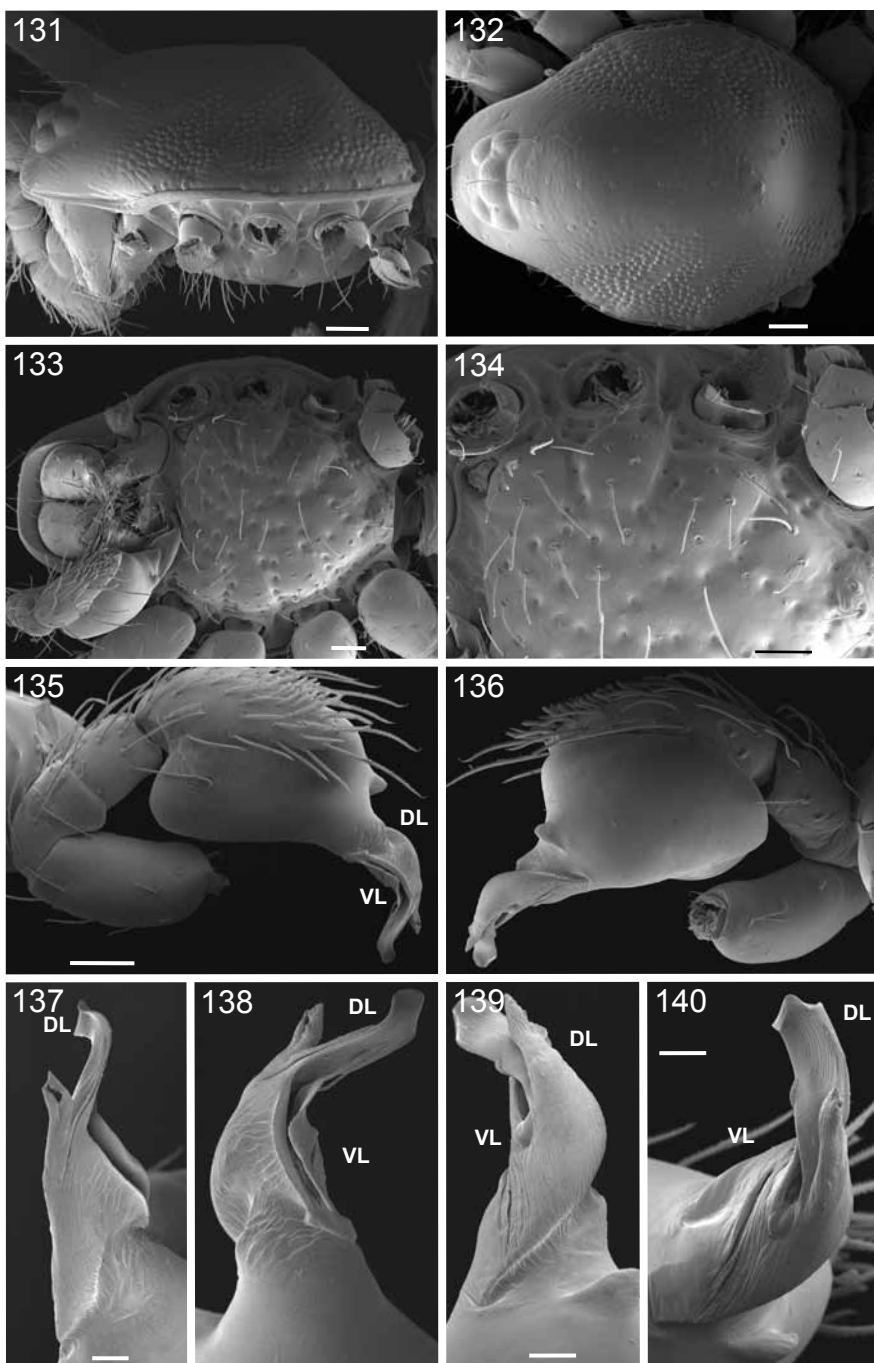
MATERIAL EXAMINED: *N* = 358. **Madagascar:** *Antananarivo:* 3 km 41° NE Andranomay, 11.5 km 147° SSE Anjozorobe, montane rainforest, 1300 m, 18.47333°S, 47.96000°E, Dec. 05–13, 2000, Fisher-Griswold Arthropod Team, 1 ♀ (CASC PBI_OON 3942); Reserve Speciale d'Ambohitantly, Forêt d'Ambohitantly, 20.9 km 72° NE d'Ankazobe, montane rainforest, 1410 m, 18.22527°S, 47.28694°E, Apr. 17–22, 2001, Fisher-Griswold Arthropod Team, 1 ♀ (CASC PBI_OON 3280); 2 ♂ (CASC PBI_OON 3289); 1 ♀ (CASC PBI_OON 3936); 3 mixed (CASC PBI_OON 3962); Reserve Speciale d'Ambohitantly, Forêt d'Ambohitantly, 24.1 km 59° NE d'Ankazobe, montane rainforest, 1620 m, 18.00277°S, 47.00444°E, Apr. 17–22, 2001, Fisher-Griswold Arthropod Team, 5 mixed (CASC PBI_OON 3266). *Antsiranana:* Ampasindava, Forêt d'Ambilanivy, 3.9 km 181° S Ambaliha, rainforest, 600 m, 13.79861°S, 48.16166°E, Mar. 04–09, 2001, Fisher-Griswold Arthropod Team, 1 ♀ (CASC PBI_OON 3536); 1 ♀ (CASC PBI_OON 3937); Forêt Ambanitaza, 26.1 km from Antalaha, rainforest, 240 m, 14.67944°S, 50.18361°E, Nov. 26, 2004, Fisher-Griswold Arthropod Team, 1 ♀ (CASC PBI_OON 35279); 8 mixed (CASC PBI_OON 35279); Forêt Ambato, 26.6 km 33° NE Ambanja, rainforest, 150 m, -13.46444°, 48.55166°, Dec. 08, 2004, B.L. Fisher, 2 mixed (CASC PBI_OON 35272); Forêt Analabe, 30.0 km 72° ENE Daraina, littoral forest, 30 m, 13.08333°S, 49.90833°E, Nov. 27, 2003, Fisher-Griswold Arthropod Team, 2 ♀ (CASC PBI_OON 3552); 11 mixed (CASC PBI_OON 3852); Forêt Bekaraoka, 6.8 km 60° ENE Daraina, tropical dry forest, 150 m, 13.00277°S, 49.01166°E, Dec. 07, 2003, Fisher-Griswold Arthropod Team, 1 ♀ (CASC PBI_OON 3576); Forêt d'Antsahabe, 11.4 km 275° W Daraina, tropical dry forest, 550 m, 13.00333°S, 49.00916°E, Dec. 12, 2003, Fisher-Griswold Arthropod Team, 1 ♂ (CASC PBI_OON 3897); Forêt d'Orangea, 3.6 km 128° SE Ramena, remnant dry forest, 90 m, 12.25888°S, 49.37472°E, Feb. 22–28, 2001, L.J. Boutin, 1 ♀ (CASC PBI_OON 3922); Forêt d'Orangea, 3.6 km 128° SE Ramena, littoral rainforest, 90 m, 12.25888°S, 49.37472°E, Feb. 22–28, 2007, Fisher-Griswold Arthropod Team, 1 ♂ (CASC PBI_OON 3327); 35 mixed (CASC PBI_OON 3880); 1 ♀ (CASC PBI_OON 3929); Forêt di'Andavakoera, 21.4 km 356° N Betsiaka, rainforest, 452 m, 13.11833°S, 49.23000°E, Dec. 15, 2003, Fisher-Griswold Arthropod Team, 1 ♂ (CASC PBI_OON 3152); Reserve Speciale Manogarivo, 20.4 km SW Antanambao, montane rainforest, 1860 m, 14.04533°S, 48.41000°E, Nov. 03, 1998, Fisher-Griswold Arthropod Team, 10 mixed (CASC PBI_OON 36379); Reserve Analamerana, 28.4 km SW from Anivorano Nord, tropical dry forest, 60 m, 12.74666°S, 49.49472°E, Dec. 05, 2004, Fisher-



Figs. 113–122. *Noideattella saka*, new species. **113.** Habitus male, dorsal view. **114.** Same, ventral view. **115.** Same, lateral view. **116.** Cephalothorax, dorsal view. **117.** Same, ventral view. **118.** Palp male, prolateral view. **119.** Cephalothorax male, anterior view. **120.** Palp male, retrolateral view. **121.** Genitalia female, ventral view. **122.** Same, dorsal view. Scale bars = 0.2 mm, except genitalia: 0.1 mm.



Figs. 123–130. *Noideattella saka*, new species. **123.** Genitalia female, dorsal view. **124.** Same, anterodorsal view. **125.** Same, lateral view. **126.** Receptaculum papillae field, anterior view. **127.** Epigastric region female, ventral view. **128.** Same male, ventral view. **129.** Endites male, ventral view. **130.** Endites female, ventral view. Scale bars = 50 μm, except 128: 10 μm.



Figs. 131–140. *Noideattella saka*, new species. **131.** Cephalothorax male, lateral view. **132.** Same, dorsal view. **133.** Same, ventral view. **134.** Infracoxal grooves male, ventral view. **135.** Palp male, prolateral view. **136.** Same, retrolateral view. **137.** Embolus, apical view. **138.** Embolus, prolateral view. **139.** Embolus, retrolateral view. **140.** Embolus, ventral view. Scale bars = 50 µm, except 137 and 139: 10 µm.

Griswold Arthropod Team, 1 ♂ (CASC PBI_OON 35267); Reserve Speciale d'Ambre, 3.5 km 235° SW Sakaramy, tropical dry forest, 325 m, S12.46888°, E49.24222°, Jan. 26–31, 2001, Fisher-Griswold Arthropod Team, 5 mixed (CASC PBI_OON 3265); 3 mixed (CASC PBI_OON 3338); 4 mixed (CASC PBI_OON 36375); Reserve Speciale Manongarivo: 10.8 km 229° SW Antanambao, rainforest, 400 m, 13.96166°S, 48.43333°E, Nov. 08, 1998, B.L. Fisher, 37 mixed (CASC PBI_OON 36393); 48 mixed (CASC PBI_OON 36377); Reserve Speciale Manongarivo: 14.5 km 220° SW Antanambao, rainforest, 1175 m, 13.99833°S, 48.42833°E, Oct. 20, 1998, B.L. Fisher, 1 ♀ (CASC PBI_OON 3296); 93 mixed (CASC PBI_OON 2001); Reserve Speciale Manongarivo: 17.3 km 218° SW Antanamabo, rainforest, 1580 m, 14.02166°S, 48.41833°E, Oct. 27, 1998, B.L. Fisher, 12 mixed (CASC PBI_OON 3237); 36 mixed (CASC PBI_OON 36391). *Mahajanga*: Parc National Tsingy de Bemaraha, 2.5 km 62° ENE Bekopaka, Ankidrodra River, tropical dry forest, 100 m, 19.13222°S, 44.81472°E, Nov. 11–15, 2001, Fisher-Griswold Arthropod Team, 1 ♂ (CASC PBI_OON 3253). *Toamasina*: Forêt Clasée Andriantately, rainforest, 530 m, 8.69500°S, 48.81333°E, Dec. 04–07, 1998, H.J. Ratsirarson, 2 mixed (CASC PBI_OON 3252); Forêt Clasée Didy, montane rainforest, 960 m, 18.19833°S, 48.57833°E, Dec. 16–23, 1998, H.J. Ratsirarson, 1 ♂ (CASC PBI_OON 3240); Ile Sainte Marie, Forêt Kalalao, 9.9 km 34° NW Ambodifotatra, rainforest, 100 m, 16.92250°S, 49.88722°E, Nov. 24–27, 2005, Fisher-Griswold Arthropod Team, 1 ♂ (CASC PBI_OON 3572); Masoala Peninsula, 5.3 km SSE Ambanizana, Andranobe, rainforest, 15.66666°S, 49.96666°E, Nov. 21, 1993, B.L. Fisher, 1 ♀ (CASC PBI_OON 3969); 1 ♀ (CASC PBI_OON 3970); 1 ♀ (CASC PBI_OON 3971); 2 mixed (CASC PBI_OON 3972); 2 ♀ (CASC PBI_OON 3973); Masoala Peninsula, 5.3 km SSE Ambanizana, Andranobe, rainforest, 15.66666°S, 49.96666°E, Nov. 19, 1993, B.L. Fisher, 1 ♀ (CASC PBI_OON 3975); Montagne d'Anjanaharibe, 19.5 km 27° NNE Ambinanitelo, montane rainforest, 1100 m, 15.17833°S, 49.63500°E, Mar. 12–16, 2003, Fisher-Griswold Arthropod Team, 1 ♀ (CASC PBI_OON 3530); Parcelle K9 Tampolo, littoral forest, 10 m, 17.17500°S, 49.26805°E, Apr. 19, 2004, Malagasy ant team, 1 ♀ (CASC PBI_OON 3862); Presquile de Masoala: 6.3 km S Ambanizana, Andranobe, rainforest, 25 m, 15.68333°S, 49.95000°E, Nov. 14, 1993, B.L. Fisher, 1 ♀ (CASC PBI_OON 3974); Reserve Betampona, Camp Vohitsivalana, 37.1 km from Toamasina, rainforest, 520 m, 17.88666°S, 49.20250°E, Dec. 01–03, 2005, Fisher-Griswold Arthropod Team, 1 ♂ (CASC PBI_OON 3864); Tamatave, 6.3 km S Ambanizana, Andranobe Field Station, littoral rainforest, 25 m, 15.68333°S, 49.95000°E, Nov. 13, 1993, B.L. Fisher, 1 ♀ (FMNH PBI_OON 10255).

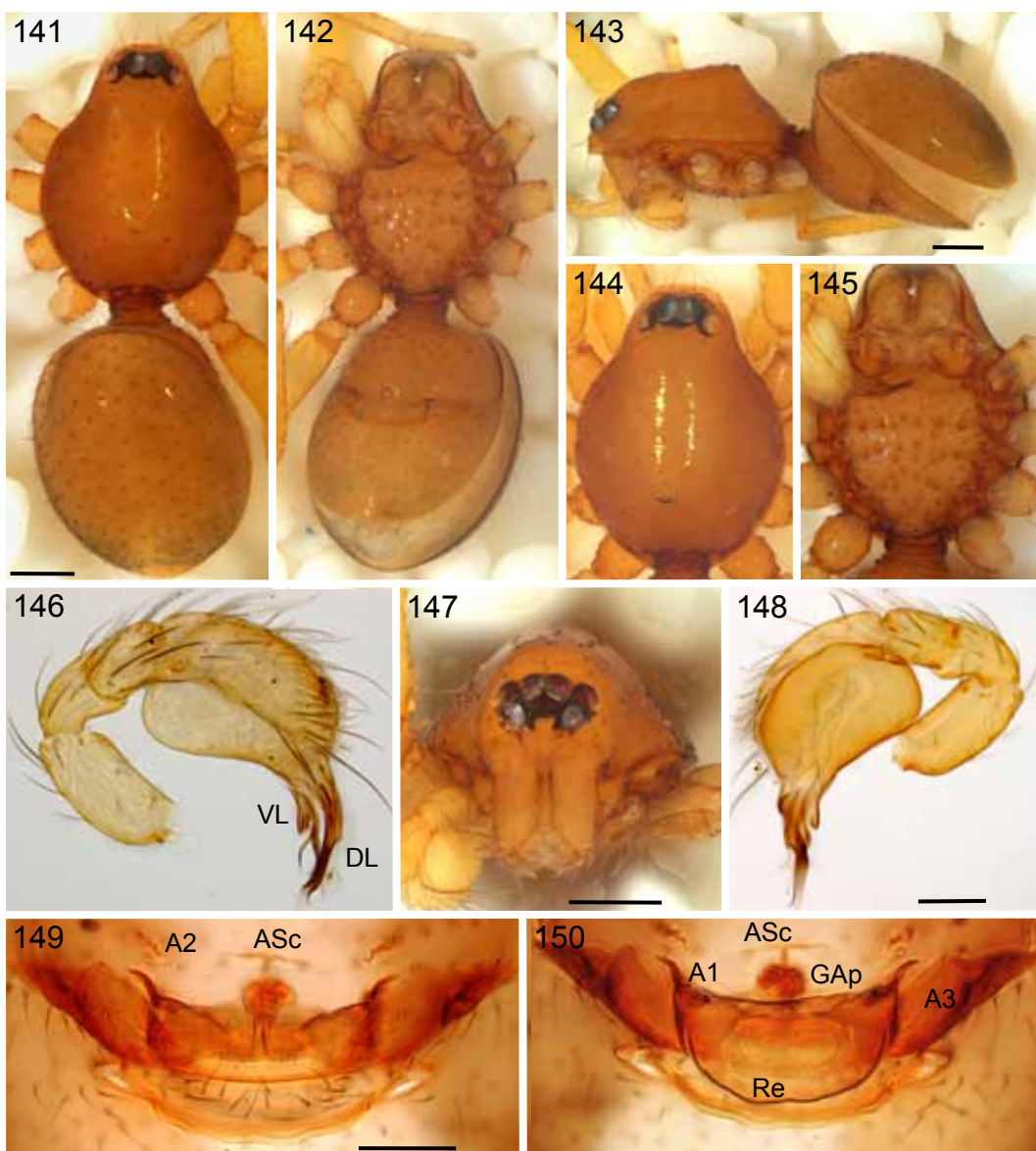
Noideattella tsiba, new species

Figures 141–170, 376

Types: Male holotype and female allotype from Berlese sample of sifted leaf litter of a tropical dry forest at an elevation of 375 m at Forêt de Binara, 7.5 km 230° SW Darania, 13°15'18"S, 49°37'E, Antsiranana Province (1 December 2003, Fisher-Griswold Arthropod Team) deposited in CASC (PBI_OON 00036159). The species epithet, a noun in apposition, is taken from the Malagasy word for the Coquerel's dwarf lemur.

Diagnosis: *N. tsiba* can be differentiated from other *Noideattella* species by the following combination of characters: habitus color pale orange; abdomen dorsal surface with a pair of dark marks posteriorly (figs. 141, 143); carapace pars cephalica and sides strongly granulate (figs. 159, 161); sternum furrows with row of large pits, surface coarsely reticulate, microsculpture (visible best with light microscopy) medially and in furrows (figs. 145, 162); book lung covers small, and ovoid (figs. 142, 143); color of legs homogeneous.

Description: *Male* (PBI_OON 0003545): Total length 1.4. **Cephalothorax:** Carapace pale orange. Sternum longer than wide, pale orange, anterior margin with continuous transverse groove (figs. 160, 162). Mouthparts: Chelicerae, endites, and labium pale orange. Paturon inner margin with scattered setae and without modified seta (fig. 147). **Abdomen:** Ovoid. Dorsal scutum pale orange, middle surface smooth, sides smooth. Postepigastric scutum pale orange,

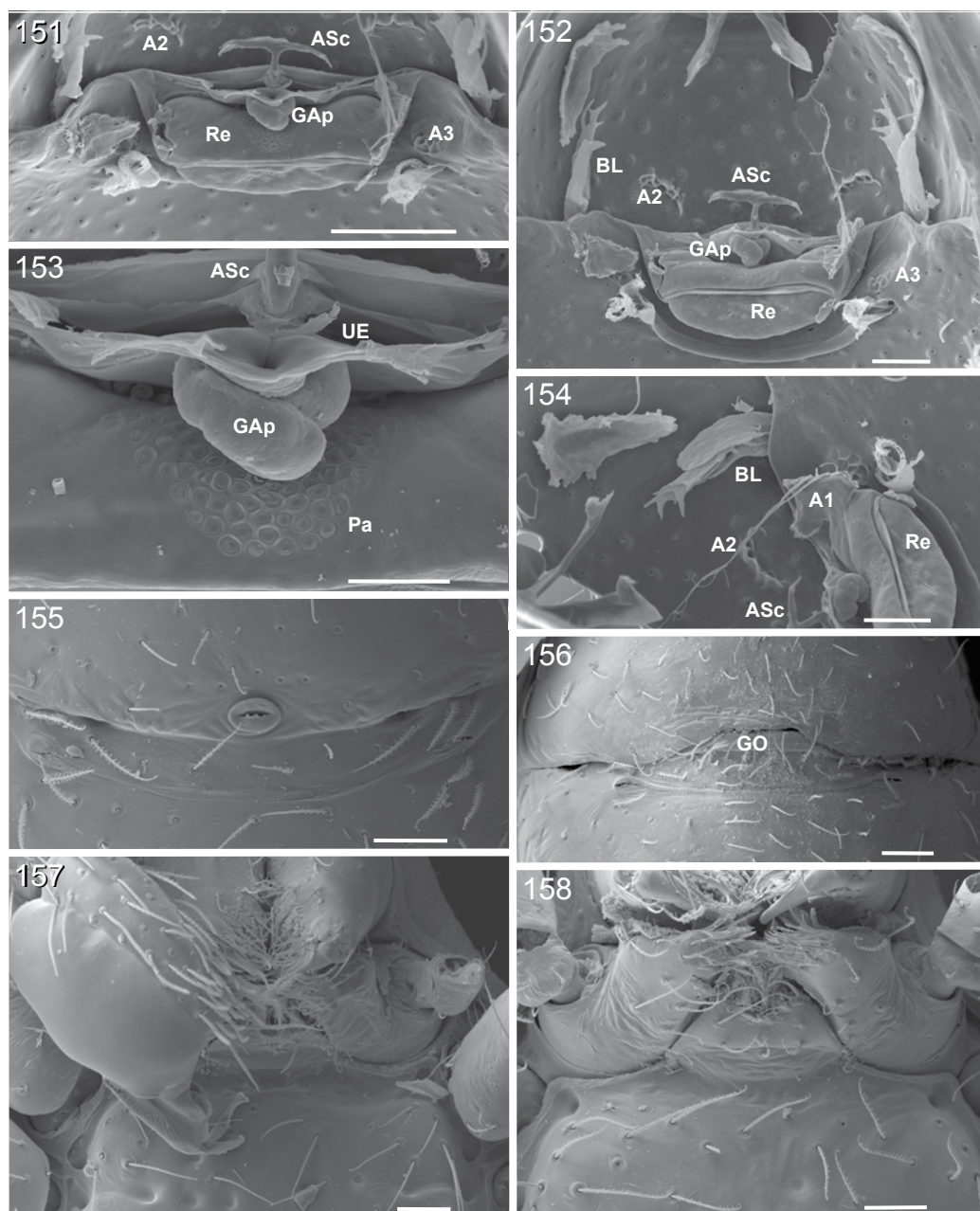


Figs. 141–150. *Noideattella tsiba*, new species. **141.** Habitus male, dorsal view. **142.** Same, ventral view. **143.** Same, lateral view. **144.** Cephalothorax, dorsal view. **145.** Same, ventral view. **146.** Palp male, prolateral view. **147.** Cephalothorax male, anterior view. **148.** Palp male, retrolateral view. **149.** Genitalia female, dorsal view. **150.** Same, ventral view. Scale bars = 0.2 mm, except genitalia: 0.1 mm.

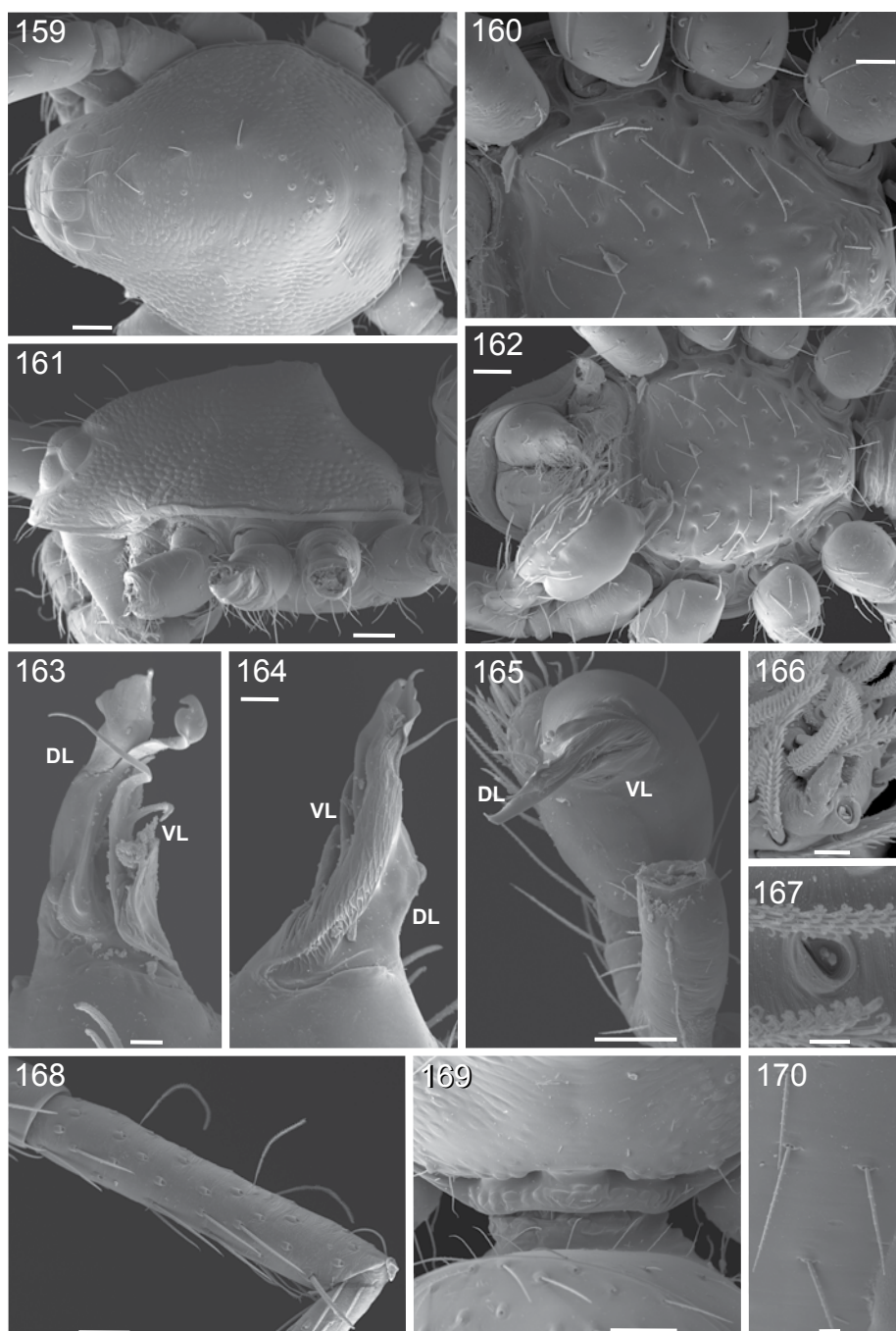
long, semicircular, covering nearly full length of abdomen (figs. 141–143). Male genital opening slightly protruded, epigastric scutum apodemes small, separated from the anterior book lung opening and connected by a shallow furrow. Posterior spiracles connected by a groove (fig. 155). **Legs:** Yellow, without color pattern. Leg spination (only surfaces bearing spines listed, all spines longer than segment width): tibiae: I p2-1-1; r2-1-1; II p1-1-1; r1-1-1; IV p0-0-1; metatarsi: I, II p1-1-0; r1-1-0. Tarsi I to IV superior claw teeth not examined in detail. **Genitalia:** Epigastric region with sperm pore situated at level of anterior spiracles (fig. 155). Palp proximal segments yellow; cymbium yellow, with distal patch of setae; bulb yellow (figs. 146, 148). Embolus dorsal lamella with one large apophysis (fig. 164), ventral lamella with two apophyses (fig. 163). Palp as in figures 163 to 165. *Female* (PBI_OON 0003545): Total length 1.6. As in male except as noted. **Legs:** Metatarsi III and IV without weak ventral scopula. Leg spination (only surfaces bearing spines listed, all spines longer than segment width): tibiae: I, II p2-1-1; r2-1-1; IV p0-0-1; metatarsi: I, II p1-1-0; r1-1-0. Trichobothria of metatarsus: I one, IV one. Tarsal organ with three sensilla visible. **Genitalia:** Genital opening slit shaped (fig. 156). GAP process shaped as a twisted tube. Sperm sac secretory gland openings flat, extending less than half the receptaculum length and concentrated in the center (figs. 151–153). Genitalia as in figures 149 and 150.

VARIATION: Leg I tibia spine numbers vary among specimens from four to three on both sides.

MATERIAL EXAMINED: *N* = 218. **Madagascar:** *Antsiranana:* 7.2 km 142° SE Antsiranana (=Diego Suarez), Montagne des Français, 180 m, 12.53796°S, 49.56361°E, Feb. 23–25, 2001, L.J. Boutin, 2 mixed (CASC PBI_OON 3849); Ambondrobe, 41.1 km from Vohemar, littoral forest, 10 m, 13.71527°S, 50.10166°E, Nov. 29, 2004, Fisher-Griswold Arthropod Team, 27 mixed (CASC PBI_OON 35298); Forêt Bekaraoka, 6.8 km 60° ENE Daraina, tropical dry forest, 150 m, 13.00277°S, 49.01166°E, Dec. 07, 2003, Fisher-Griswold Arthropod Team, 25 mixed (CASC PBI_OON 3578); 1 ♀ (CASC PBI_OON 3848); Forêt d'Ampondrabe, 26.3 km 10° NNE Daraina, tropical dry forest, 175 m, 12.97000°S, 49.70000°E, Dec. 10, 2003, Fisher-Griswold Arthropod Team, 11 mixed (CASC PBI_OON 3545); Forêt d'Ampombofofo, littoral forest, 25 m, 12.09944°S, 49.33861°E, Nov. 21–22, 2007, Fisher-Griswold Arthropod Team, 3 ♂ (CASC PBI_OON 36099); Forêt d'Analabe, 30.0 km 72° ENE Daraina, littoral forest, 30 m, 13.08333°S, 49.90833°E, Nov. 27, 2003, Fisher-Griswold Arthropod Team, 1 ♀ (CASC PBI_OON 3837); Forêt d'Antsahabe, 11.4 km 275° W Daraina, tropical dry forest, 550 m, 13.00333°S, 49.00916°E, Dec. 12, 2003, Fisher-Griswold Arthropod Team, 2 mixed (CASC PBI_OON 3312); Forêt d'Orangea, 3.6 km 128° SE Ramena, littoral forest, 90 m, 12.25888°S, 49.37472°E, Feb. 22–28, 2001, Fisher-Griswold Arthropod Team, 49 mixed (CASC PBI_OON 2015); 2 ♂ (CASC PBI_OON 3236); 5 ♂ (CASC PBI_OON 3271); 3 mixed (CASC PBI_OON 3290); Forêt de Binara, 7.5 km 230° SW Daraina, tropical dry forest, 375 m, 13.25500°S, 49.61666°E, Dec. 01, 2003, Fisher-Griswold Arthropod Team, 2 mixed (CASC PBI_OON 3566); 9 mixed (CASC PBI_OON 3574); 1 ♀ (CASC PBI_OON 3560); Montagne des Français, 7.2 km 142° SE Antsiranana (= Diego Suarez), tropical dry forest, 180 m, 12.32277°S, 49.33805°E, Feb. 22–28, 2001, Fisher-Griswold Arthropod Team, 4 mixed (CASC PBI_OON 3254); 4 mixed (CASC PBI_OON 36271); Reserve Analamerana, 16.7 km 123° SW Anivorano Nord, tropical dry forest, 225 m, S12.67138°, E49.37388°, Dec. 03, 2004, Fisher-Griswold Arthropod Team, 5 mixed (CASC PBI_OON 35277); Reserve Speciale de l'Ankarana, 22.9 km 224° SW Anivorano Nord, tropical dry forest, 80 m, S12.90888°, E49.10972°, Feb. 10–16, 2001, Fisher-Griswold Arthropod Team, 12 mixed (CASC PBI_OON 3255); 3 mixed (CASC PBI_OON 3258); Reserve Speciale l'Ankarana, 13.6 km 192° SSW Anivorano Nord, tropical dry forest, 210 m, S12.86361°, E49.22583°, Feb. 16–20, 2001, Fisher-Griswold Arthropod Team, 13 mixed (CASC PBI_OON 3267); 1 ♂ (CASC PBI_OON 3840); Reserve Speciale l'Ankarana, 22.9 km 224° SW Anivorano Nord, Camp Anglaise, 80 m, S12.90888°, 49.10972°, Feb. 10–16, 2001 L.J. Boutin, 4 ♀ (CASC PBI_OON 3845). *Toliara:* Parc National d'Andohahela, Forêt de Manantalinjo, 33.6 km 63° ENE Amboasary, 7.6 km 99° E Hazofotsy, spiny forest thicket, 150 m, S24.81694°, E46.61000°, Jan. 12–16, 2002, Fisher-Griswold Arthropod Team, 1 ♂ (CASC PBI_OON 3272).



Figs. 151–158. *Noideattella tsiba*, new species. 151. Genitalia female, anterior view. 152. Genitalia and book lungs female, dorsal view. 153. Receptaculum papillae field and uterus externus locking mechanism, anterodorsal view. 154. Genitalia and book lungs female, lateral view. 155. Epigastric region male, ventral view. 156. Same female, ventral view. 157. Endites male, ventral view. 158. Endites female, ventral view. Scale bars = 50 μ m except 153: 10 μ m.



Figs. 159–170. *Noideattella tsiba*, new species. **159.** Cephalothorax male, lateral view. **160.** Same, dorsal view. **161.** Infracoxal grooves male, ventral view. **162.** Cephalothorax male, lateral view. **163.** Embolus, prolateral view. **164.** Same, retrolateral. **165.** Palp male, ventral view. **166.** Palp female tarsal claw area, apical view. **167.** Tarsal organ palp female, dorsal view. **168.** Tibia 4 female, prolateral view. **169.** Pedicel area male, dorsal view. **170.** Abdomen seta male, dorsal view. Scale bars = 50 μm , except 163–164, 166, 167, 170: 10 μm .

Noideattella mamba, new species

Figures 171–200, 374

Types: Male holotype and female allotype from Berlese sample of sifted leaf litter of a montane rainforest at an elevation of 900 m at Parc National d'Andohahela, Col du 36.7 km 341° NNW Tolagnaro 24°45'50"S, 46°45'6"E, Toliara (21 to 25 January 2002, Fisher-Griswold Arthropod Team) deposited in CASC (PBI_OON 00036160). The species epithet, a noun in apposition, is taken from the Malagasy word for *crocodile*.

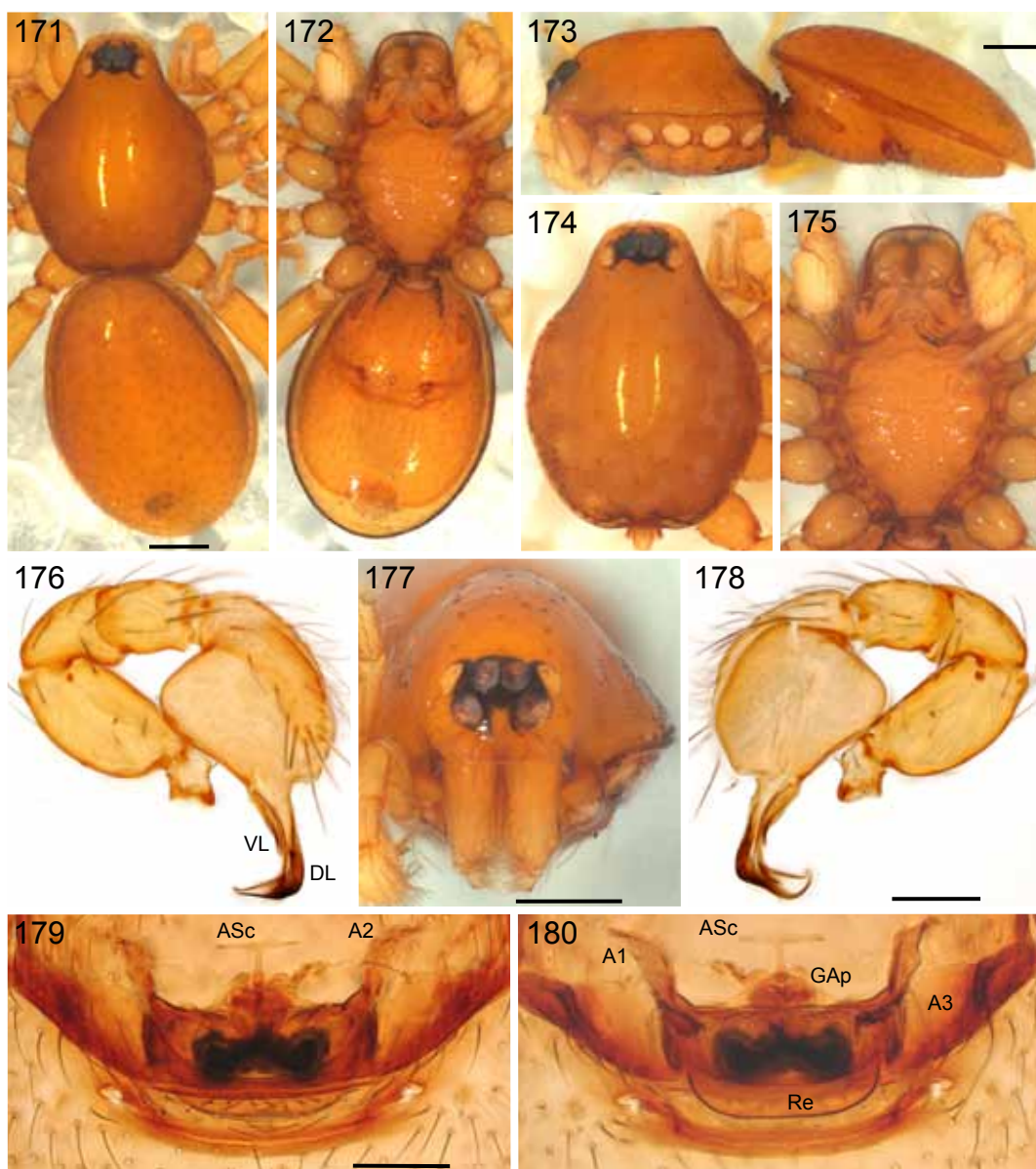
Diagnosis: *N. mamba* can be differentiated from other *Noideattella* species by the following combination of characters: habitus orange-brown to pale orange; book lung covers large and ovoid (figs. 172, 173); sternum microsculpture finely reticulate, distributed medially and in furrows (figs. 175, 189, 190); carapace pars cephalica sides granulate (fig. 196), granulation of elevated portion varies (figs. 174, 187, 188).

Description: *Male* (PBI_OON 0003259): Total length 1.8. **Cephalothorax:** Carapace orange-brown. Sternum longer than wide, orange-brown, furrow with rows of small pits, anterior margin with interrupted transverse groove (figs. 175, 185, 189, 190). Mouthparts: Chelicerae, endites, and labium orange-brown. Cheliceral paturon inner margin setae thickness varies among specimens (figs. 177, 191–193). **Abdomen:** Ovoid. Dorsal scutum orange-brown, middle surface smooth, sides smooth, abdomen dorsal scutum color varies from orange-brown to pale orange. Abdominal scuta color varies from orange-brown to pale orange. Postepigastric scutum orange-brown, long, semicircular, covering nearly full length of abdomen (figs. 171–173). Male genital opening slightly protruded, epigastric scutum apodemes large, contiguous with the anterior book lung opening and connected by a furrow. Posterior spiracles connected by a groove (fig. 183). **Legs:** Pale orange, without color pattern. Leg spination (only surfaces bearing spines listed, all spines longer than segment width): tibiae: I p2-1-1; r1-1-1; II p1-1-1; r1-1-1; IV p0-0-1; metatarsi: I, II p1-1-0; r1-1-0. Leg IV: legs I and II tibial spines as twice as large leg IV tibial spines. **Genitalia:** Epigastric region with sperm pore situated in front of anterior spiracles (fig. 183). Palp proximal segments pale orange; cymbium pale orange, without distal patch of setae; bulb pale orange (figs. 176, 178). Embolus dorsal lamella with one distal apophysis (fig. 199), ventral lamella bifurcated (fig. 200). Palp as in figures 194 and 197–200. *Female* (PBI_OON 0003251): Total length 2.1. As in male except as noted. **Legs:** Metatarsi III and IV weak ventral scopula absent. Leg spination (only surfaces bearing spines listed, all spines longer than segment width): tibiae: I, II p2-1-1; r2-1-1; IV p0-0-1; metatarsi: I, II p1-1-0; r1-1-0. Trichobothria of metatarsus: I and IV one. Tarsal organ with two sensilla visible. **Genitalia:** Genital opening slit shaped (fig. 184). Sperm sac secretory gland openings flat, extending less than half receptaculum length and concentrated in the center. GAP process shaped as a twisted tube (figs. 181, 182). Genitalia as in figures 179 and 180.

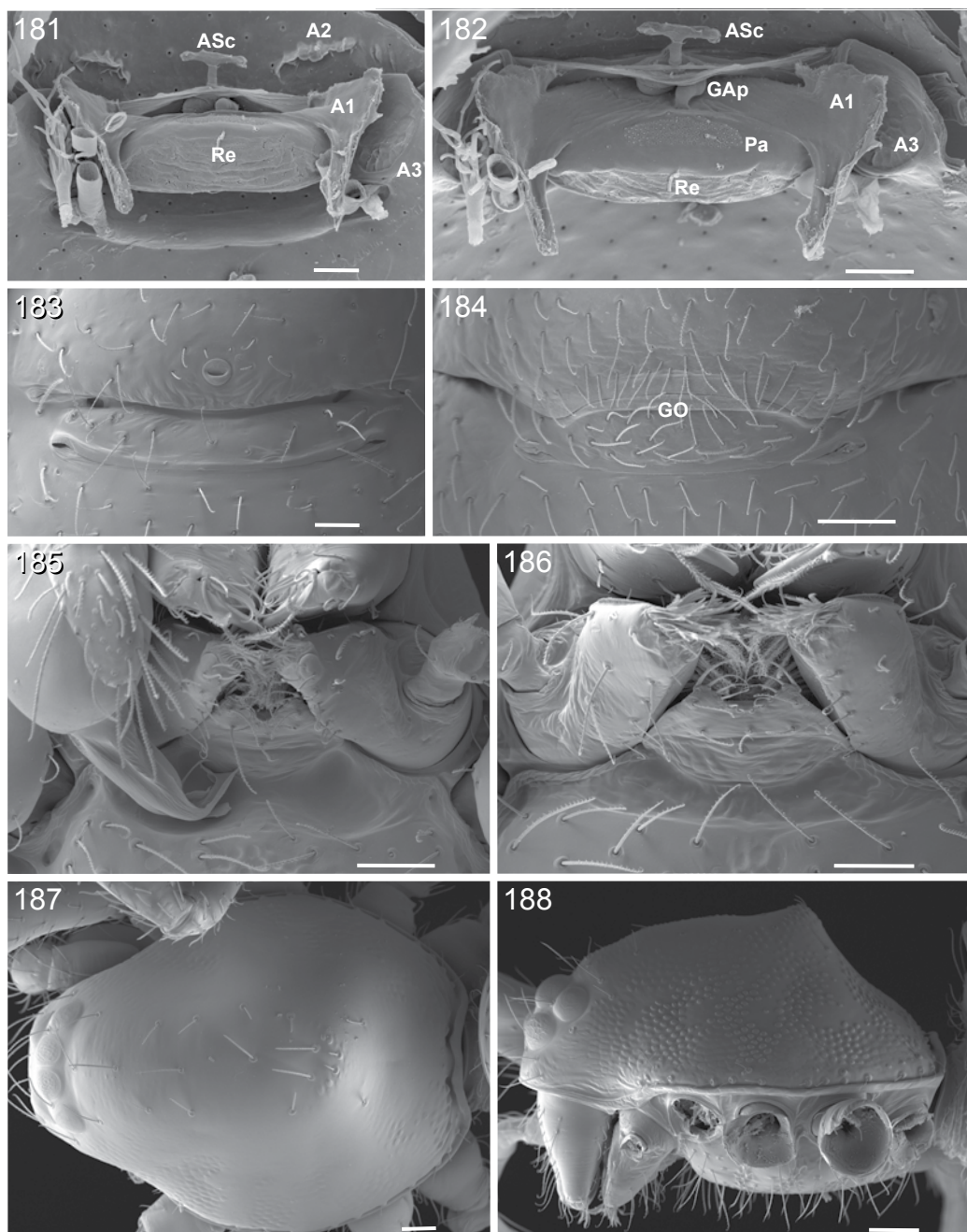
Variation: Carapace pars cephalica microsculpture varies from strongly granulate to smooth in the elevated portion of the carapace in both sexes; the sides are always moderately granulate (figs. 174, 187, 188). Some specimens lack modified setae over the paturon inner margin, while other specimens have a brush of these setae concentrated in the middle (figs. 177, 191–193). The

spine number in legs I and II of both sexes varies widely among specimens: most have four spines on the prolateral surface and three on the retrolateral, but some specimens have only one or none.

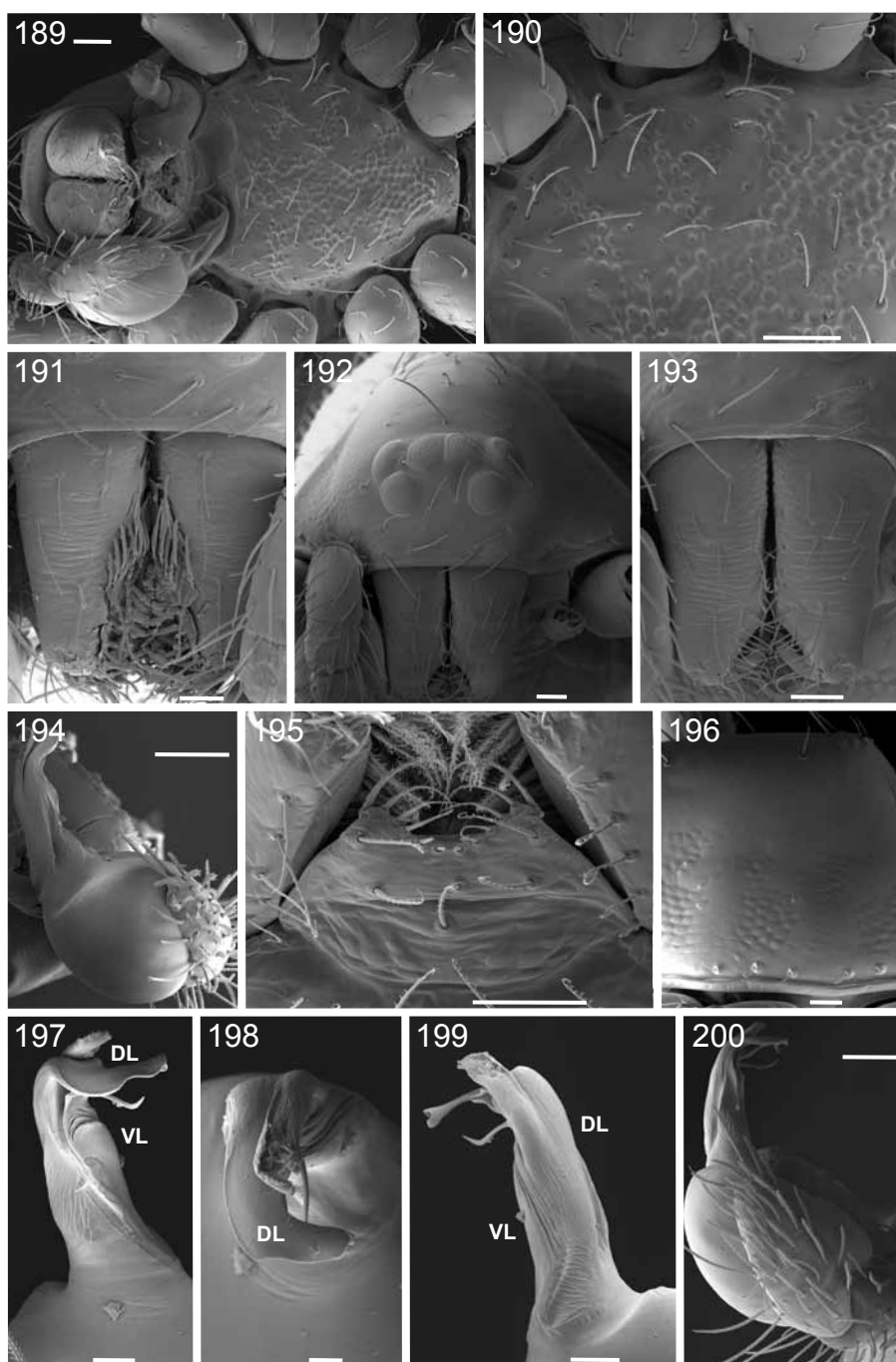
MATERIAL EXAMINED: *N* = 120. **Madagascar:** *Antananarivo:* 3 km 41° NE Andranomay, 11.5 km 147° SSE Anjozorobe, montane rainforest, 1300 m, S18.47333°, E47.96000°, Dec. 05–13, 2000, Fisher-Griswold Arthropod Team, 3 ♀ (CASC PBI_OON 3943); 1 ♀ (CASC PBI_OON 3944); *Ambohimanga,* 1400 m, S18.73333°, E47.56666°, Nov. 02, 1993, C. Griswold, S. Larcher, N. Scharff, 1 ♀ (CASC PBI_OON 3948); 1 ♂ (CASC PBI_OON 36236); *Reserve Speciale d'Ambohitantly, Forêt d'Ambohitantly, forest fragment, ca. 20 km NE d'Ankazobe, montane rainforest, 1638 m, S18.20805°, E47.28555°, Mar. 20, 2003, D. Andriamalala, D. Silva, et al., 1 ♂ (CASC PBI_OON 3291); 1 ♂ (CASC PBI_OON 3542); Reserve Speciale d'Ambohitantly, Forêt d'Ambohitantly, 20.9 km 72° NE d'Ankazobe, montane rainforest, 1410 m, S18.22527°, E47.28694°, Apr. 17–22, 2001, Fisher-Griswold Arthropod Team, 3 mixed (CASC PBI_OON 3259); Reserve Speciale d'Ambohitantly, Forêt d'Ambohitantly, 24.1 km 59° NE d'Ankazobe, montane rainforest, 1620 m, S18.00277°, E47.00444°, Apr. 17–22, 2001, Fisher-Griswold Arthropod Team, 1 ♀ (CASC PBI_OON 3940).* *Antsiranana:* 7 km N Joffreville, dry forest, 360 m, S12.33333°, E49.25000°, Mar. 06–20, 2001, R. Harin'Hala, 1 ♀ (CASC PBI_OON 3961); *Ampasindava, Forêt d'Ambilanivy, 3.9 km 181° S Ambaliha, rainforest, 600 m, S13.79861°, E48.16166°, Mar. 04–09, 2001, Fisher-Griswold Arthropod Team, 1 ♂ (CASC PBI_OON 3269); Marojejy Reserve, 8.4 km NNW Manantenina, 700 m, S14.43333°, E49.75000°, Nov. 10–16, 1993, J. Coddington, S. Larcher, C. Griswold, R. Andriamasimanana, N. Scharff, 1 ♀ (CASC PBI_OON 3476); Parc National de Marojejy, 25.4 km 30° NNE Andapa, 10.9 km 311° NW Manantenina, montane shrubland, 2000 m, S14.44500°, E49.73500°, Nov. 23, 2003, Fisher-Griswold Arthropod Team, 2 mixed (CASC PBI_OON 36241); Reserve Speciale d'Anjanaharibe, Sud, 12.2 km WSW Befingotra, montane rainforest, 1985 m, S14.00694°, E49.00722°, Nov. 25, 1994, B.L. Fisher, 1 ♀ (CASC PBI_OON 3249); 1 ♀ (CASC PBI_OON 3251); 1 ♀ (CASC PBI_OON 3288); 1 ♂ (CASC PBI_OON 3976); 2 mixed (CASC PBI_OON 36242); *Reserve Speciale Manongarivo:* 10.8 km 229° SW Antanambao, rainforest, 400 m, S13.96166°, E48.43333°, Nov. 08, 1998, B.L. Fisher, 1 ♂ (CASC PBI_OON 36140). *Fianarantsoa:* 3.62 km ENE Ranomafana, P.N. Ranomafana, Vohiparara, 1137 m, S21.24130°, E47.40147°, Jan. 13, 2009, D. Andriamalala, C. Griswold, G. Hormiga, A. Saucedo, N. Scharff, H. Wood, 9 mixed (GWU PBI_OON 35150); 7 km W Ranomafana, 1100 m, S21.12°, E47.27°, Nov. 1–7, 1988, W.E. Steiner, 3 ♀ (USNM 2046648 PBI_OON 27911); Oct. 22–31, 1988; 2 ♂ (USNM 2046648 PBI_OON 27910); Feb. 1–9, 1990, W.E. Steiner, 1 ♂ (USNM 2046648 PBI_OON 27913); Feb. 1–9, 1990, W.E. Steiner, 1 ♂ (USNM 2046648 PBI_OON 27912); 8.0 km NE Ivohibe, forest, 1200 m, S22.42100°, E46.89600°, Nov. 03–09, 1997, B.L. Fisher, 2 ♂ (CASC PBI_OON 3982); *Forêt de Vevembe, 66.6 km 293° WNW Farafangana, rainforest to montane transition, 600 m, S22.01305°, E47.00277°, Apr. 26, 2006, Fisher-Griswold Arthropod Team, 3 mixed (CASC PBI_OON 3445); Isalo National Park, S22.62277°, E45.36527°, May 23–26, 1992, V. Roth, 1 ♀ (MCZ 53662 PBI_OON 28198); P.N. Ranomafana, 2.3 km N Vohiparara, 1100 m, S21.21330°, E47.38300°, Apr. 28, 1998, C. Griswold, D. Ubick, 3 mixed (CASC PBI_OON 3984); 1 ♂ (CASC PBI_OON 3985); P.N. Ranomafana, 2.3 km N Vohiparara, 1100 m, S21.21330°, E47.38300°, Apr. 18, 1998, C. Griswold, D.H. Kavanaugh, N.D. Penny, M.J. Raherilalao, E. Rajeriarison, J.S. Ranorianarisoa, 1 ♂ (CASC PBI_OON 3990); Parc Nationale Ranomafana: road side vegetation near park entrance, 800 m, S21.23833°, E47.43333°, Apr. 22, 1998, C. Griswold, D.H. Kavanaugh, N.D. Penny, M.J. Raherilalao, E. Rajeriarison, J.S. Ranorianarisoa, 3 mixed (CASC PBI_OON 3987); Parc Nationale Ranomafana: Talatakely, S21.24833°, E47.42666°, Apr. 19–30, C. Griswold, D. Ubick, 1 ♀ (CASC PBI_OON 3986); Parc Nationale Ranomafana, Talatakely, S21.24833°, E47.42666°, Apr. 19–30, 1998, C. Griswold, D.H. Kavanaugh, N.D. Penny, M.J. Raherilalao, E. Rajeriarison, J.S. Ranorianarisoa, 1 ♂ (CASC PBI_OON 3989); Parc Nationale Ranomafana: Talatakely, Trail F, 940 m, S21.26333°, E47.42000°, Nov. 01–21, 1998, V. Lee, K. Ribardo, 1 ♂ (CASC PBI_OON 3983); Parc Nationale Ranomafana, Vohiparara, Piste Touristique, 1000 m, S21.22666°, E47.40000°, Apr. 12–14, 1998, C. Griswold, D.H. Kavanaugh, N.D. Penny, M.J. Raherilalao, E. Rajeriarison, J.S. Ranorianarisoa, 1 ♀ (CASC PBI_OON 3988); *Ranomafana N.P., Maharira trail, Apr. 10, 1992, Emile (Kariko-Roth Coll.), 2 ♂ (MCZ 53654 PBI_OON 28197).* *Mahajanga:* *Reserve Speciale de Bemarivo, 23.8 km 223° SW Besalampy, tropical dry forest, 30 m, S16.92500°, E44.36833°, Nov. 19–23, 2002, Fisher-Griswold Arthropod Team, 1 ♀ (CASC PBI_OON 3540).* *Majunga:* *Reserve forestiere Beanka, 50.2 km E Maintirano, tropical dry forest on tsingy, 250 m, S18.02638°, E44.05055°, Oct. 19–22, 2009, Fisher-Griswold Arthropod Team, 1 ♂ (CASC PBI_OON 36119); Beanana forêt annual, 500m, 1–31 Dec. 1946, 1 ♂ (MNHN PBI_OON 36136); C. Mandraka (battage), Dec. 1–31 1946, J. Millot, 1 ♀ (MNHN***



Figs. 171–180. *Noideattella mamba*, new species. 171. Habitus male, dorsal view. 172. Same, ventral view. 173. Same, lateral view. 174. Cephalothorax, dorsal view. 175. Same, ventral view. 176. Palp male, prolateral view. 177. Cephalothorax male, anterior view. 178. Palp male, retrolateral view. 179. Genitalia female, ventral view. 180. Same, dorsal view. Scale bars = 0.2 mm, except genitalia: 0.1 mm.



Figs. 181–188. *Noideattella mamba*, new species. **181.** Genitalia female, dorsal view. **182.** Same, anterodorsal view. **183.** Same, lateral view. **184.** Receptaculum papillae field, anterior view. **185.** Epigastric region female, ventral view. **186.** Same male, ventral view. **187.** Endites male, ventral view. **188.** Endites female, ventral view. Scale bars = 50 μ m.



Figs. 189–200. *Noideattella mamba*, new species. **189.** Cephalothorax male, dorsal view. **190.** Infracoxal grooves male, ventral view. **191.** Chelicerae with modified setae male, anterior view. **192.** Cephalothorax male, anterior view. **193.** Chelicerae male variations, anterior view. **194.** Palp male, apical view. **195.** Labium female. **196.** Cephalothorax pars thoracica, lateral view. **197.** Embolus, prolateral view. **198.** Embolus, ventral view. **199.** Embolus, retrolateral view. **200.** Palp male, dorsal view. Scale bars = 50 μm , except 197–199: 10 μm ; 195: 20 μm .

PBI_OON 36280); 1 ♀ (MNHN PBI_OON 3540); Forêt Analamazaotra Perinet, Dec. 1–31, 1962, Mission Bauchot, 1 ♀ (MNHN PBI_OON 36277); Forêt Dioy, Dec., 4 ♀ (MNHN PBI_OON 36138); Lokobe 1X Rav-enala, Dec., 1 ♀ (MNHN PBI_OON 36276); Valle de la Besanetribé, 1200m, Dec. 05–09, 1963, P.V., 1 ♀ (MNHN PBI_OON 36275); N.O. Mahilara (battage), Dec. 1–31, 1946, J. Millot, 2 ♀ (MNHN PBI_OON 36279); Tam-polo (battage), Dec., 1 ♂ (MNHN PBI_OON 36137); Tsiafajavona (Sasns Pierre), 2500 m, Dec. 1–31, 1946, J. Millot, 1 ♂ (MNHN PBI_OON 36135); Tsiafajavona (Sasns Pierre), 2500 m, June 1–30, 1947, 2 mixed (MNHN PBI_OON 36278); Vohibe, July 1–31, 1970, Lambillon A., 2 mixed (MRAC MT.142.763 PBI_OON 8000). *Toamasina*: Ile Sainte Marie, Forêt Ambohidenana, 22.8 km 44° NW Ambodifotatra, littoral forest, 20 m, S16.82444°, E49.96416°, Nov. 21–24, 2005, Fisher-Griswold Arthropod Team, 1 ♀ (CASC PBI_OON 3571); Parc National Masoala, Ambohitsitondroina, Mt. Ambanizana, rainforest, 650 m, S15.58166°, 50.00333°, Feb. 26–Mar. 06, 2003, D. Andriamalala, D. Silva, et al., 1 ♂ (CASC PBI_OON 3292); Tamatave, Foulpointe, Forêt sur argile, S17.68720°, E49.51530°, July 01–31, 1994, A. Pauly, 3 mixed (MRAC MT. 205. 595 PBI_OON 7997); 1 ♀ (MRAC MT. 205. 632 PBI_OON 8014); 1 ♂ (MRAC MT. 205. 743 PBI_OON 8020); 3 mixed (MRAC MT. 205. 559 PBI_OON 8023). *Toliara*: 2.7 km 302° WNW Ste. Luce, littoral rainforest, 20 m, S24.77166°, E47.17166°, Dec. 09–11, 1998, B.L. Fisher, 1 ♂ (CASC PBI_OON 36238); 2.7 km 302° WNW Ste. Luce, littoral rainforest, 20 m, S24.77166°, E47.17166°, Dec. 09–11, 1998, B.L. Fisher, 1 ♀ (CASC PBI_OON 36382); Betioky (Forêt), Mar. 01–30, 1961, E. Ramahana, 1 ♂ (MRAC MT. 142. 975 PBI_OON 8002); Bohibasia Forest, 59 km NE Sakaraha, tropical dry forest, 780 m, S22.46666°, E41.83333°, Jan. 13, 1996, B.L. Fisher, 1 ♀ (CASC PBI_OON 36269); Forêt de Beroboka, 5.9 km 131° SE Ankidranoka, tropical dry forest, 80 m, S22.23305°, E43.36638°, Mar. 12–16, 2002, Fisher-Griswold Arthropod Team, 1 ♂ (CASC PBI_OON 36240); Forêt de Petriky, 12.5 km W Tolagnaro, littoral forest, 10 m, S25.06216°, E46.86933°, Nov. 22, 1998, Sylvian, B.L. Fisher, 3 ♂ (CASC PBI_OON 2012); Manderano, gallery forest, 75 m, S23.52416°, E44.09277°, May 10, 2002, Frontier Project, 3 ♀ (CASC PBI_OON 3305); Parc National d'Andohahela, 36.7 km 341° NNW Tolagnaro, montane rainforest, 900 m, S24.76388°, E46.75166°, Jan. 21–25, 2002, Fisher-Griswold Arthropod Team, 1 ♀ (CASC PBI_OON 3529); Parc National d'Andohahela, Forêt de Manantalinjo, 33.6 km 63° ENE Amboasary, 7.6 km 99° E Hazofotsy, spiny forest thicket, 150 m, S24.81694°, E46.61000°, Jan. 12–16, 2002, Fisher-Griswold Arthropod Team, 2 ♀ (CASC PBI_OON 3235); Parc National de Kirindy Mite, 16.3 km 127° SE Belo sur Mer, tropical dry forest, 80 m, S20.79527°, E44.14694°, Dec. 06–10, 2001, Fisher-Griswold Arthropod Team, 1 ♀ (CASC PBI_OON 3277); Reserve Speciale de Cap Sainte Marie, 12.3 km 262° W Marovato, spiny forest thicket, 200 m, S25.58166°, E45.16833°, Feb. 11–15, 2002, Fisher-Griswold Arthropod Team, 1 ♂ (CASC PBI_OON 3308); Reserve Integrale Naturelle d'Andohahela, parcel 1, 13.5 km NW Eminiminy, 1200 m, S24.58333°, E46.73500°, Nov. 07–17, 1995, S. Goodman, 1 ♂ (FMNH FMNH-INS 0000 033 741 PBI_OON 10243); Reserve Integrale Naturelle d'Andohahela, parcel 1, 15.0 km NW Eminiminy, 1500 m, S24.57000°, E46.73166°, Nov. 17–27, 1995, S. Goodman, 3 mixed (FMNH PBI_OON 10250); Reserve Integrale Naturelle d'Andohahela, parcel 1, 20.0 km SE Andranondambo, 1857 m, S24.56166°, E46.72166°, Nov. 27–Dec. 05, 1995, S. Goodman, 1 ♂ (FMNH PBI_OON 10246); S.F. Mandena, 8.4 km NNE Tolagnaro, littoral forest, 20 m, S24.95233°, E47.00100°, Nov. 20, 1998, B.L. Fisher, 3 mixed (CASC PBI_OON 36237); Sept Lacs, gallery forest, 80 m, S23.52833°, E44.15555°, Mar. 08, 2002, Frontier Project, 3 mixed (CASC PBI_OON 36239); Southern Isoky-Vohimena Forest, tropical dry forest, 730 m, S22.68333°, E44.83333°, Jan. 21, 1996, Sylvian, B.L. Fisher, 2 mixed (CASC PBI_OON 3349); Nosey Mangabe, Feb. 20, 1990, G. Alpert, 1 ♀ (MCZ 53666 PBI_OON 28199).

Noideattella tany, new species

Figures 201–230, 375

Types: Male holotype and female allotype from Berlese sample of sifted leaf litter of a littoral rainforest at an elevation of 30 m at Forêt Analabe, 30.0 km 72° ENE Daraina, 13°5'S 49°54'30"E, Antsiranana (27 November 2003, Fisher-Griswold Arthropod Team) deposited in CASC (PBI_OON 00036161). The species epithet, a noun in apposition, is taken from the

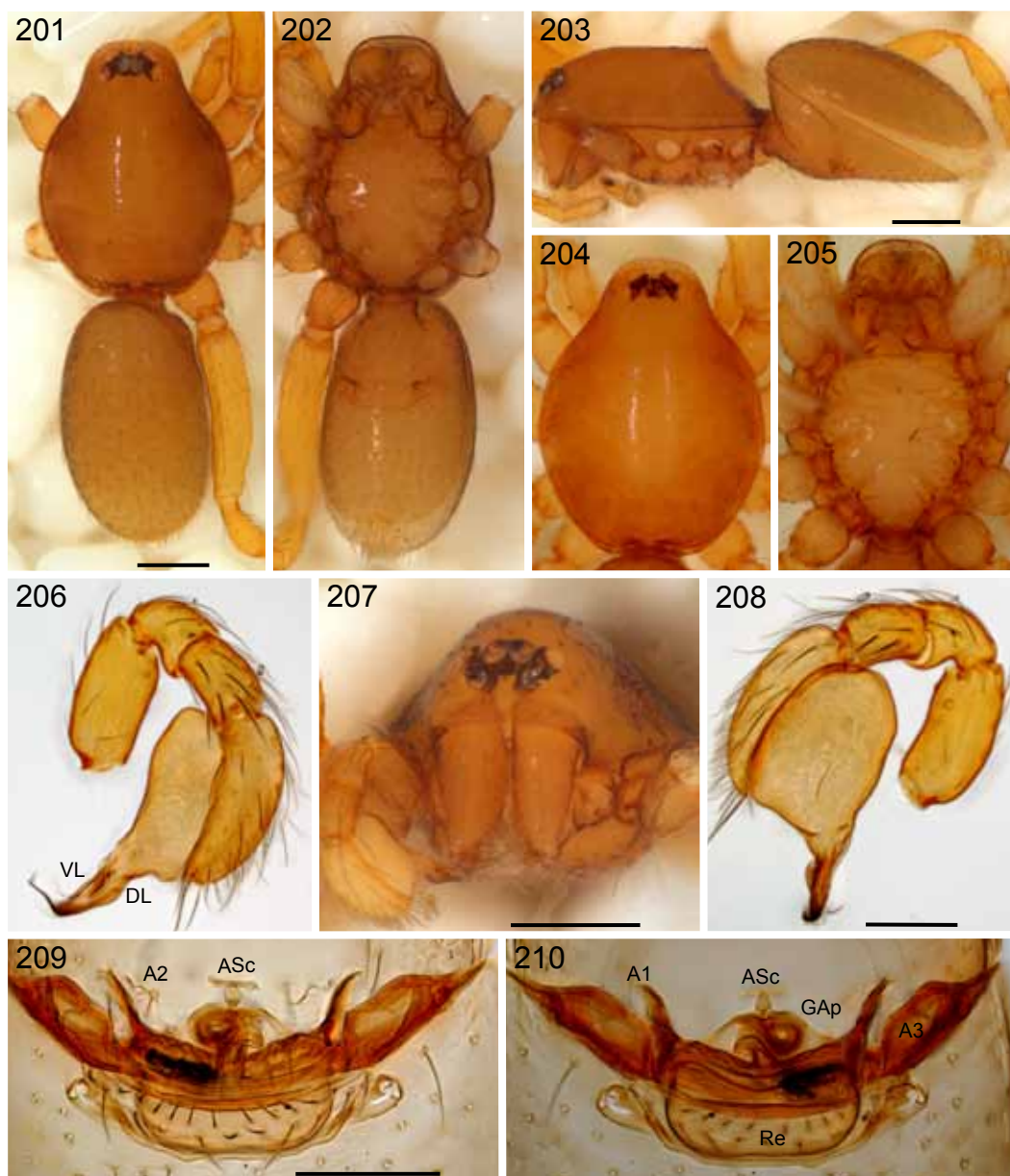
Malagasy word for *earth, soil, land, or country*.

DIAGNOSIS: *N. tany* can be differentiated from other *Noideattella* species by the following combination of characters: habitus pale orange; abdomen cylindrical, rounded posteriorly; post-epigastric scutum pale orange, long narrow rectangle; carapace surface only slightly elevated and sides granulate (figs. 201, 202); ocular area narrow, slightly higher than the clypeus height (fig. 207); embolus dorsal lamella curved (figs. 227, 228); book lung covers large and ovoid; male paturon anterior surface with gland openings (visible only with SEM) (figs. 221–223).

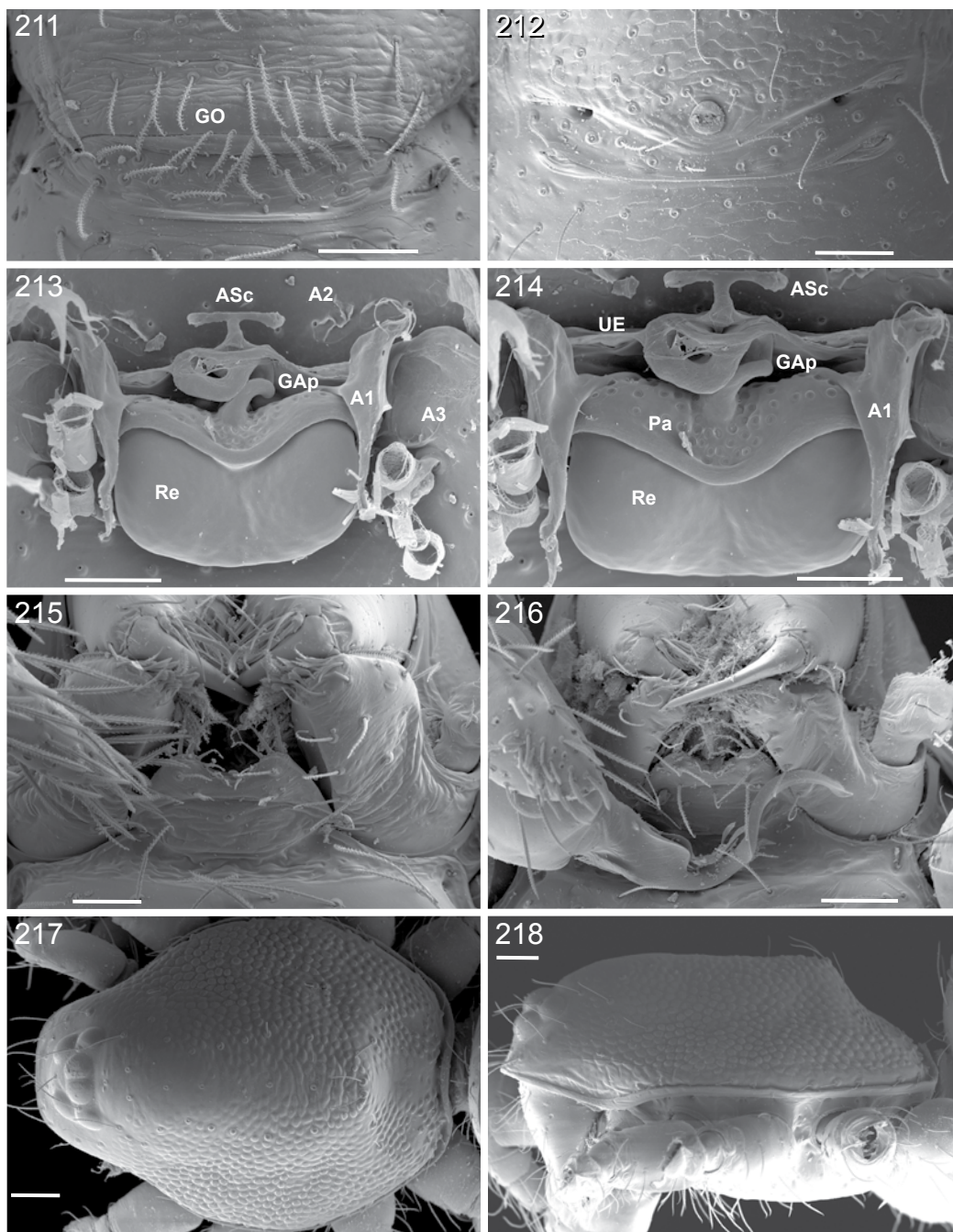
DESCRIPTION: *Male* (PBI_OON 0003563): Total length 1.4. **Cephalothorax:** Carapace pale orange. Sternum longer than wide, pale orange, anterior margin with continuous transverse groove, furrows with rows of large pits, microsculpture medially (observed better with SEM) (figs. 205, 219, 220). Mouthparts: Chelicerae, endites, and labium pale orange. Chelicer al paturon inner margins lack modified setae. Sternum anterior margin with interrupted transverse groove (fig. 216). **Abdomen:** Dorsal scutum pale orange, middle surface reticulate, sides reticulate. Male genital opening slightly protruded, epigastric scutum apodemes small, separated from the anterior book lung opening and not connected by a furrow. Posterior spiracles connected by a groove (fig. 212). **Legs:** Pale orange, without color pattern. Leg spination (only surfaces bearing spines listed, all spines longer than segment width): tibiae: I, II p2-1-1; r1-1-1; IV p0-0-1; metatarsi: I, II p1-1-0; r1-1-0. Tarsal organ with two sensilla visible. **Genitalia:** Palp proximal segments pale orange; cymbium pale orange, with distal patch of setae; bulb pale orange (figs. 206, 208). Embolus dorsal lamella with one distal apophysis, bifurcate at the apex (fig. 229), ventral lamella with at least three apophyses (fig. 230). Palp as in figures 224, 225, 227–230. *Female* (PBI_OON 0003563): Total length 1.7. As in male except as noted. **Legs:** Tibia I Emerit's glands absent, metatarsi III and IV weak ventral scopula absent. Leg spination (only surfaces bearing spines listed, all spines longer than segment width): tibiae: I, II p2-1-1; r1-1-1; IV p0-0-1; metatarsi: I, II p1-1-0; r1-1-0. Trichobothria of metatarsus: I one, IV one. **Genitalia:** Epigastric region with sperm pore situated at level of anterior spiracles (fig. 212). Genital opening slit shaped (fig. 211). Sperm sac secretory glands openings flat, extending all over the receptaculum posterior surface. GAP process shaped as a twisted tube (figs. 213, 214). Genitalia as in figures 209 and 210.

VARIATION: Male paturon lacks modified setae; however, some specimens have two long and thick setae at the apex of the paturon (figs. 221–223). The extension of the carapace surface texture varies from all over the cephalothorax to only at the sides. Sternum furrows can have either rows of large pits or reticulate microsculpture, and sternum also varies medially from finely reticulated to smooth. In some specimens the eyes are slightly reduced.

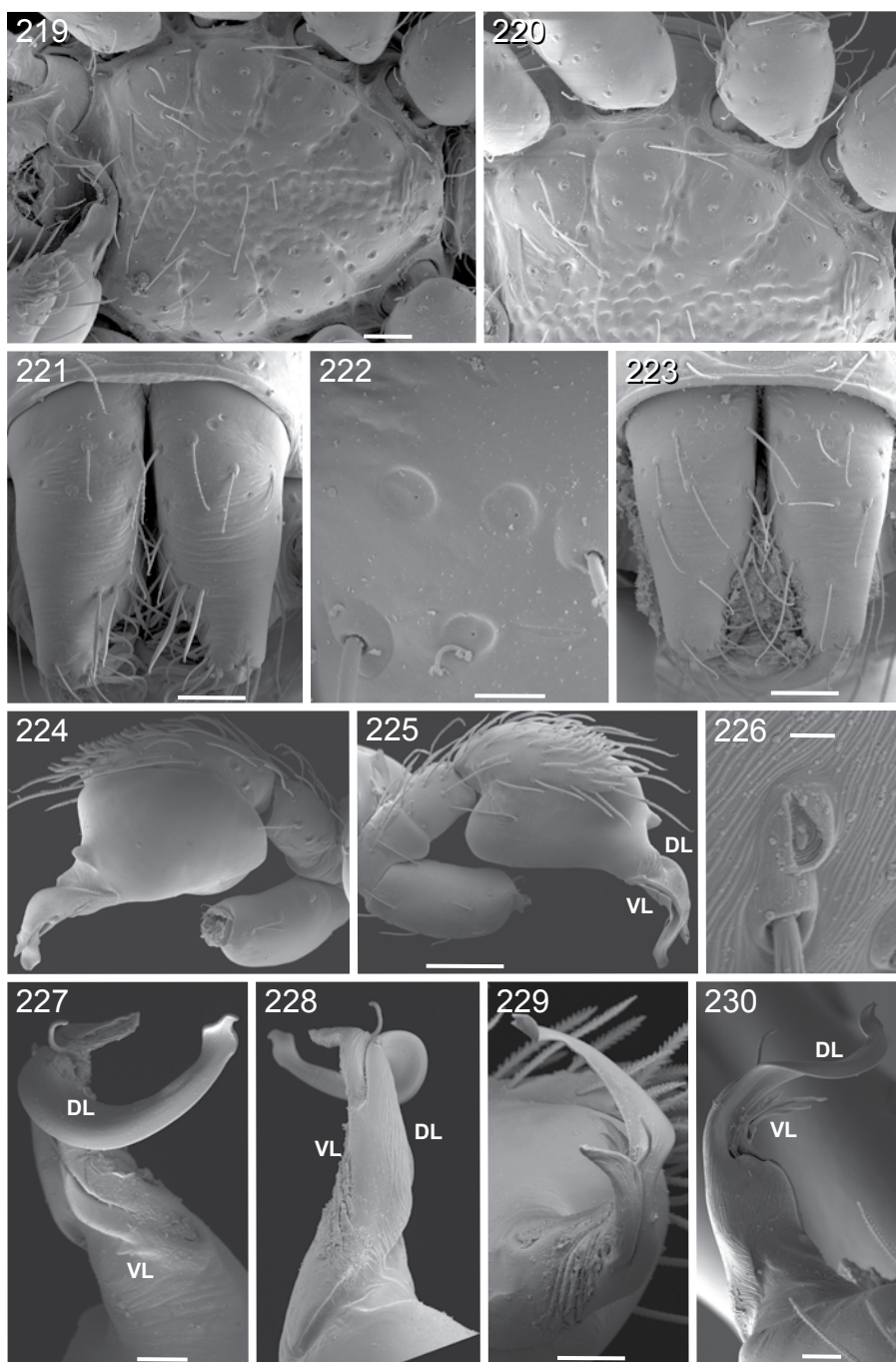
MATERIAL EXAMINED: *N* = 61. **Madagascar:** *Antsiranana:* Forêt Bekaraoka, 6.8 km 60° ENE Daraina, tropical dry forest, 150 m, S13.00277°, E49.01166°, Dec. 07, 2003, Fisher-Griswold Arthropod Team, 2 ♂ (CASC PBI_OON 3577); Forêt d'Ampondrabe, 26.3 km 10° NNE Daraina, tropical dry forest, 175 m, S12.97000°, E49.70000°, Dec. 10, 2003, Fisher-Griswold Arthropod Team, 2 ♀ (CASC PBI_OON 3582); Forêt d'Analabe, 30.0 km 72° ENE Daraina, littoral forest, 30 m, S13.08333°, E49.90833°, Nov. 27, 2003, Fisher-Griswold Arthropod Team, 12 mixed (CASC PBI_OON 3563); Forêt d'Antsahabe, 11.4 km 275° W Daraina, tropical dry forest, 550 m, S13.00333°, E49.00916°, Dec. 12, 2003, Fisher-Griswold Arthropod Team, 3 mixed (CASC PBI_OON 3559); Forêt d'Orange, 3.6 km 128° SE Ramena, remnant dry forest, 90 m, S12.25888°,



Figs. 201–210. *Noideattella tany*, new species. **201.** Habitus male, dorsal view. **202.** Same, ventral view. **203.** Same, lateral view. **204.** Cephalothorax, dorsal view. **205.** Same, ventral view. **206.** Palp male, protrolateral view. **207.** Cephalothorax male, anterior view. **208.** Palp male, retrolateral view. **209.** Genitalia female, ventral view. **210.** Same, dorsal view. Scale bars = 0.2 mm, except genitalia: 0.1 mm.



Figs. 211–218. *Noideattella tany*, new species. **211.** Epigastric region female, ventral view. **212.** Same male, ventral view. **213.** Genitalia female, dorsal view. **214.** Same, anterodorsal view. **215.** Endites female, ventral view. **216.** Endites male, ventral view. **217.** Cephalothorax male, dorsal view. **218.** Same, lateral view. Scale bars = 50 μ m.



Figs. 219–230. *Noideattella tany*, new species. **219.** Cephalothorax male, ventral view. **220.** Infracoxal grooves male, ventral view. **221.** Chelicerae with modified setae male, anterior view. **222.** Cheliceral pits detail, anterior view. **223.** Chelicerae male variations, anterior view. **224.** Palp male, retrolateral view. **225.** Same, prolateral view. **226.** Palp tarsal organ male, dorsal view. **227.** Embolus, prolateral view. **228.** Embolus, retrolateral view. **229.** Embolus, ventral view. **230.** Embolus, dorsal view. Scale bars = 50 μ m, except 222, 226–230: 10 μ m.

E49.37472°, Feb. 22–28, 2001, L.J. Boutin, 1 ♀ (CASC PBI_OON 3922); Forêt de Binara, 9.4 km 235° SW Daraina, montane rainforest, 1100 m, S13.26333°, N49.60000°, Dec. 5, 2003, B.L. Fisher, 1 ♀ (CASC PBI_OON 3548); Reserve Speciale Manongarivo: 10.8 km 229° SW Antanambao, rainforest, 400 m, S13.96166°, E48.43333°, Nov. 08, 1998, B.L. Fisher, 18 mixed (CASC PBI_OON 36390); Reserve Speciale Manongarivo: 12.8 km 228° SW Antanambao, montane rainforest, 780 m, S13.97666°, E48.42333°, Oct. 11, 1998, B.L. Fisher, 1 ♀ (CASC PBI_OON 36141); 10 mixed (CASC PBI_OON 36246); Reserve Speciale Manongarivo: 14.5 km 220° SW Antanambao, rainforest, 1175 m, S13.99833°, E48.42833°, Oct. 20, 1998, B.L. Fisher, 1 ♀ (CASC PBI_OON 3296). *Mahajanga*: Parc National de Namoroka, 16.9 km 317° NW Vilanandro, tropical dry forest, 100 m, S16.40666°, E45.31000°, Nov. 12–16, 2002, Fisher-Griswold Arthropod Team, 1 ♀ (CASC PBI_OON 3296); 5 ♀ (CASC PBI_OON 3567); 1 ♀ (CASC PBI_OON 36139); Reserve Speciale de Bemarivo, 23.8 km 223° SW Besalamy, tropical dry forest, 30m, S16.92500°, N44.36833°, Nov. 19–23, 2002, Fisher, Griswold et al., 1 ♀ (CASC PBI_OON 3541). *Toamasina*: Montagne d'Anjanaharibe, 18.0 km 21° NNE Ambinanitelo, rainforest, 470 m, S15.18833°, N49.61500°, Mar. 8–12, 2003, C. Griswold, B. Fisher, et al., 1 ♂ (CASC PBI_OON 3947); 1 ♀ (CASC PBI_OON 3955); Sahafina forest 11.4 km W Brickaville, rainforest, 140 m, S18.81444°, N48.96194°, Dec. 13–14, 2007, B.L. Fisher et al., 1 ♀ (CASC PBI_OON 36290).

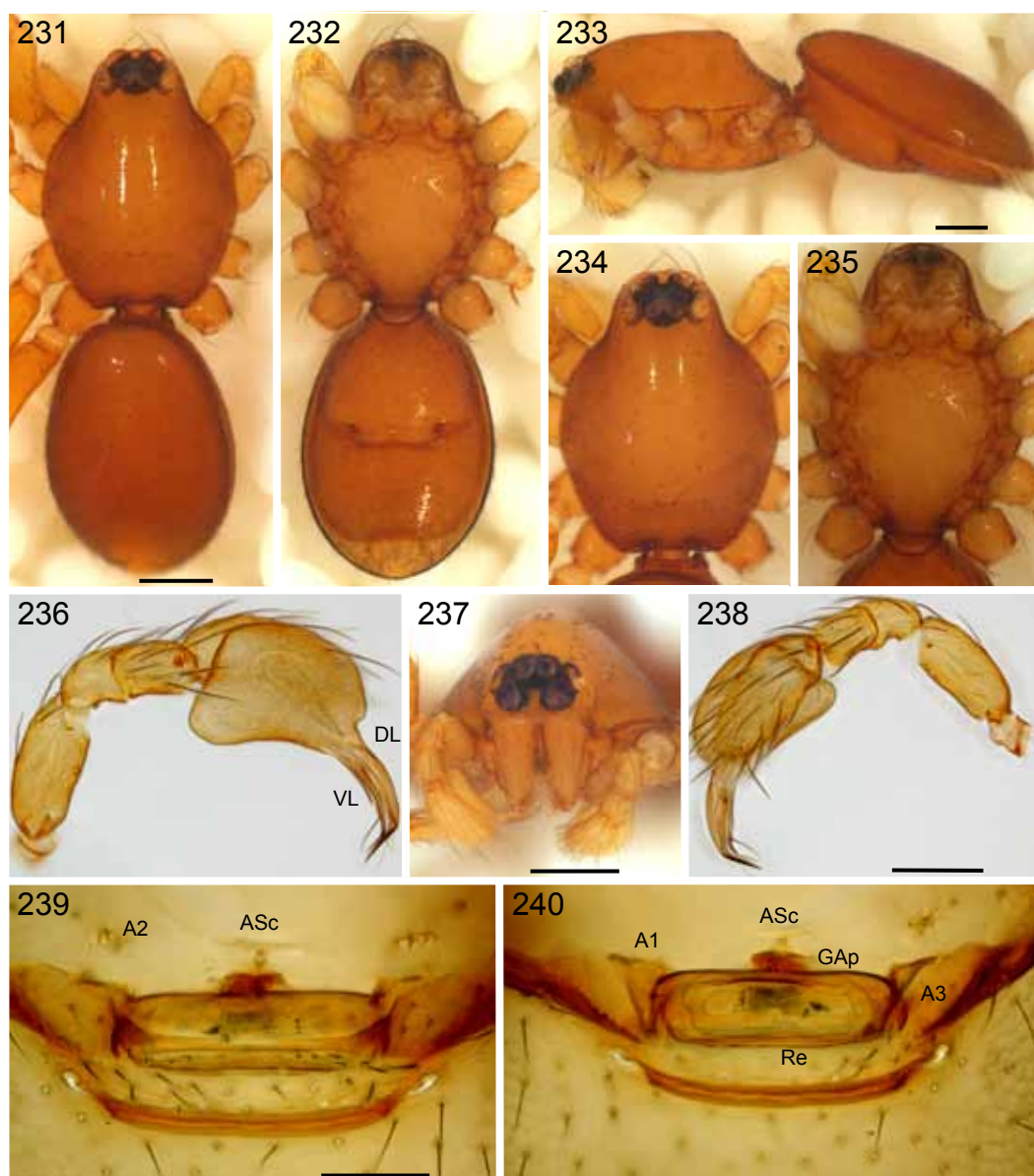
Noideattella fantara, new species

Figures 231–256, 376

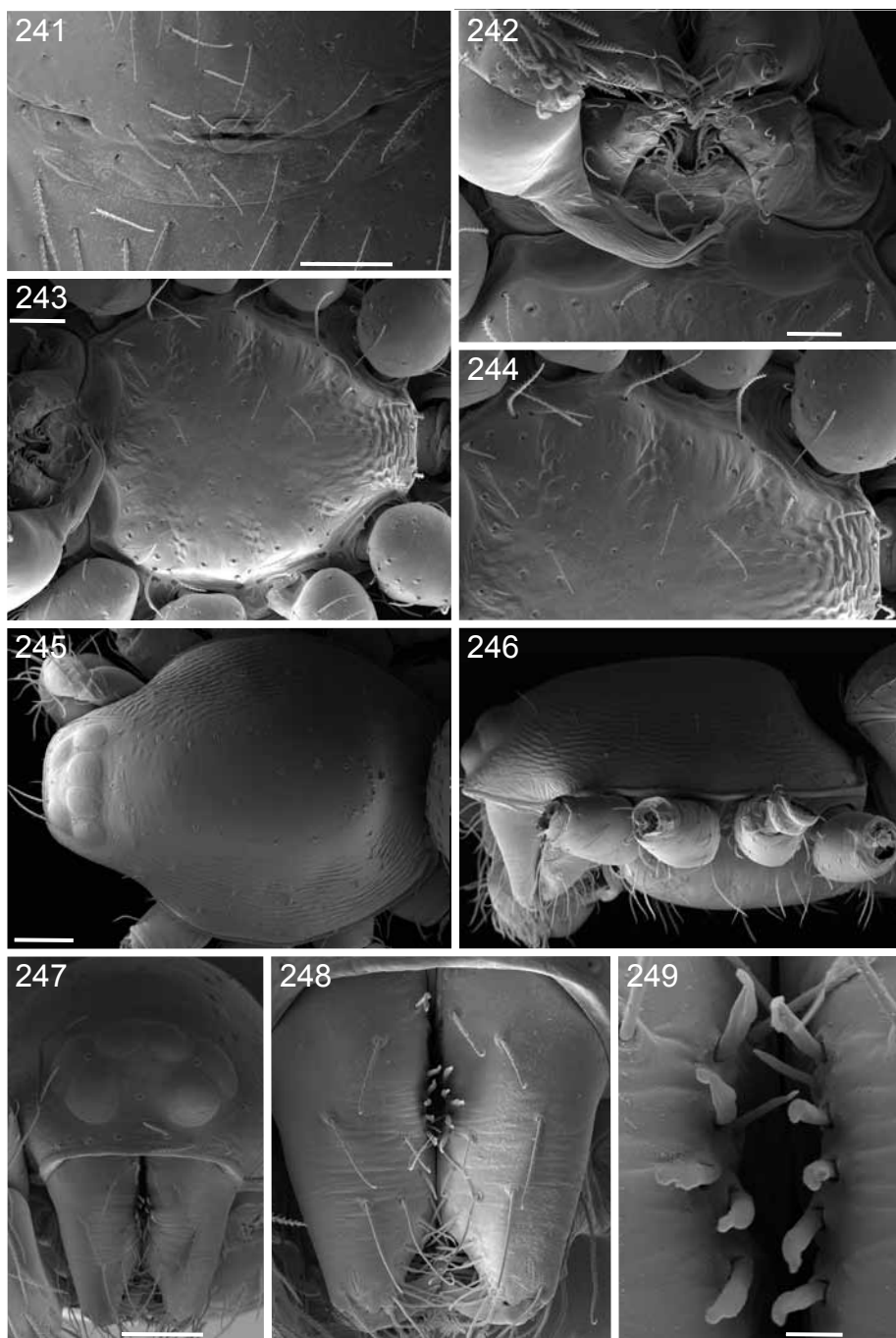
TYPES: Male holotype and female allotype from Berlese and sifted leaf litter of a spiny forest/thicket at an elevation of 150 m at Parc National d'Andohahela, Forêt de Manantalinjo, 33.6 km 63° ENE Amboasary, 7.6 km 99° E Hazofotsy, 24°49'1"S 46° 36'36"E, Toliara Province, 12–16 January 2002, Fisher-Griswold Arthropod Team, deposited in CASC (PBI_OON 00036162). The species epithet, a noun in apposition, is taken from the Malagasy word for *falling star*.

DIAGNOSIS: *N. fantara* can be differentiated from other *Noideattella* species by the following combination of characters: habitus pale orange; carapace surface of elevated portion of pars cephalica and sides granulate (figs. 245, 246); sternum surface finely reticulate, without pits and microsculpture only in furrows (figs. 235, 243, 244); male cheliceral paturon inner margin with brush of modified setae (figs. 247–249); abdomen cylindrical, book lung covers small and round, epigastric scutum length about at half of the abdomen (figs. 232, 233).

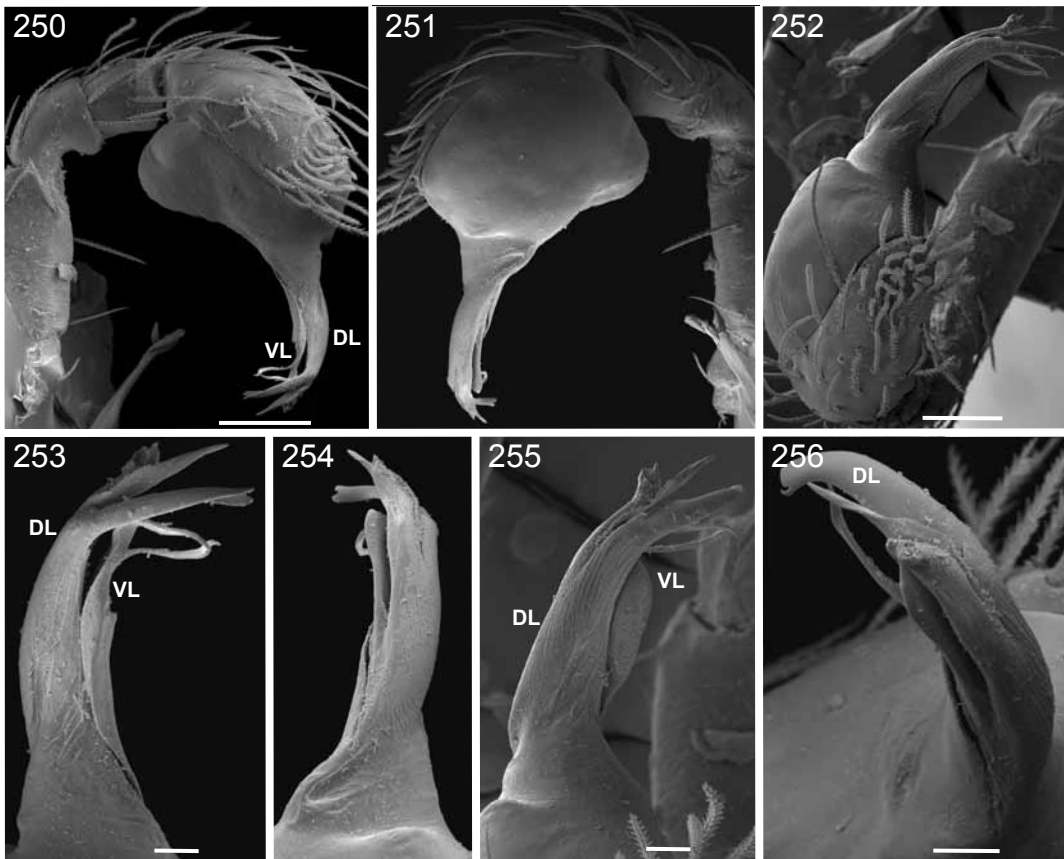
DESCRIPTION: *Male:* Total length 1.4. **Cephalothorax:** Carapace pale orange. Sternum longer than wide, pale orange, anterior margin with interrupted transverse groove. Mouthparts: Chelicerae, endites, and labium pale orange. Sternum anterior margin with interrupted transverse groove (fig. 242). **Abdomen:** Dorsal scutum pale orange, middle surface and sides reticulate. Postepigastric scutum pale orange, long, semicircular, covering nearly full length of abdominal length. Male genital opening slightly protruded, epigastric scutum apodemes small, separated from the anterior book lung opening and not connected by a furrow. Posterior spiracles connected by a groove (fig. 241). **Legs:** Yellow, without color pattern. Leg spination (only surfaces bearing spines listed, all spines longer than segment width): tibiae: I, II p1-1-1; r1-1-1; IV p0-0-1; metatarsi: I, II p1-1-0; r1-1-0. Tarsi I to IV superior claw teeth not examined in detail. Tarsal organ with two sensilla visible. **Genitalia:** Epigastric region with sperm pore situated at level of anterior spiracles (fig. 241). Palp proximal segments yellow; cymbium yellow,



Figs. 231–240. *Noideattella fantara*, new species. **231.** Habitus male, dorsal view. **232.** Same, ventral view. **233.** Same, lateral view. **234.** Cephalothorax, dorsal view. **235.** Same, ventral view. **236.** Palp male, prolateral view. **237.** Cephalothorax male, anterior view. **238.** Palp male, retrolateral view. **239.** Genitalia female, ventral view. **240.** Same, dorsal view. Scale bars = 0.2 mm, except genitalia: 0.1 mm.



Figs. 241–249. *Noideattella fantara*, new species. **241.** Epigastric region male, ventral view. **242.** Endites male, ventral view. **243.** Sternum male, ventral view. **244.** Infracoxal grooves male, ventral view. **245.** Cephalothorax male, dorsal view. **246.** Same, lateral view. **247.** Cephalothorax male, anterior view. **248.** Chelicerae male, anterior view. **249.** Chelicerae modified setae male, anterior view. Scale bars = 50 μm , except 249: 10 μm .



Figs. 250–256. *Noideattella fantara*, new species. **250.** Palp male, prolateral view. **251.** Same, retrolateral view. **252.** Same, dorsal view. **253.** Embolus, prolateral view. **254.** Same, retrolateral view. **255.** Same, dorsal view. **256.** Same, ventral view. Scale bars = 50 μm , except 253–256: 10 μm .

with distal patch of setae; bulb yellow (figs. 236, 238). Embolus dorsal lamella with at least two distal apophyses, ventral lamella with at least three apophyses (figs. 253–256). Palp as in figures 250–252. *Female* (PBI_OON 0003270): Total length 1.8. As in male except as noted. **Legs:** Metatarsi III and IV weak ventral scopula absent. Leg spination (only surfaces bearing spines listed, all spines longer than segment width): tibiae: I, II p1-1-1; r1-1-1; IV p0-0-1; metatarsi: I, II p1-1-0; r1-1-0. Genitalia as in figures 239 and 240.

MATERIAL EXAMINED: *N* = 33. **Madagascar:** *Antananarivo:* Reserve Speciale d'Ambohitantely, Forêt d'Ambohitantely, 24.1 km 59° NE d'Ankazobe, montane rainforest, 1620 m, S18.00277°, E47.00444°, Apr. 17–22, 2001, Fisher-Griswold Arthropod Team, 1 ♂ (CASC PBI_OON 3980). *Antsirana:* Reserve Speciale d'Anjaharibe, Sud: 12.2 km WSW Befingotra, montane rainforest, 1985 m, S14.00694°, E49.00722°, Nov. 25, 1994, Fisher-Griswold Arthropod Team, 1 ♂ (CASC PBI_OON 3918); Reserve Speciale l'Ankarana, 13 km 192° SSW Anivorano Nord, tropical dry forest, 210 m, S12.86361°, E49.22583°, Feb. 16–21, 2001, Fisher-Griswold Arthropod Team, 1 ♀ (CASC PBI_OON 3270). *Toliara:* Parc National d'Andohahela, Forêt de Manantalinjo, 33.6 km 63° ENE Amboasary, 7.6 km 99° E Hazofotsy, spiny forest thicket, 150 m, S24.81694°, E46.61000°, Jan. 12–16, 2002, Fisher-Griswold Arthropod Team, 11 ♂ (CASC PBI_OON 36386); Parc National de Tsimanampetsotsa, Forêt de Bemanateza, 20.7 km 81° E Efoetse, 23.0 km 131° SE Beheloka, spiny forest

thicket, 90 m, S23.99222°, E43.88055°, Mar. 22–26, 2002, Fisher-Griswold Arthropod Team, 2 mixed (CASC PBI_OON 36245); Reserve Speciale de Cap Sainte Marie, 12.3 km 262° W Marovato, spiny forest thicket, 200 m, S25.58166°, E45.16833°, Feb. 11–15, 2002, Fisher-Griswold Arthropod Team, 13 ♂ (CASC PBI_OON 3342); Reserve Speciale de Cap Sainte Marie, 14.9 km 261° W Marovato, spiny forest thicket, 160 m, S25.59444°, E45.14694°, Feb. 13–19, 2002, Fisher-Griswold Arthropod Team, 2 ♂ (CASC PBI_OON 36374).

Noideattella lakana, new species

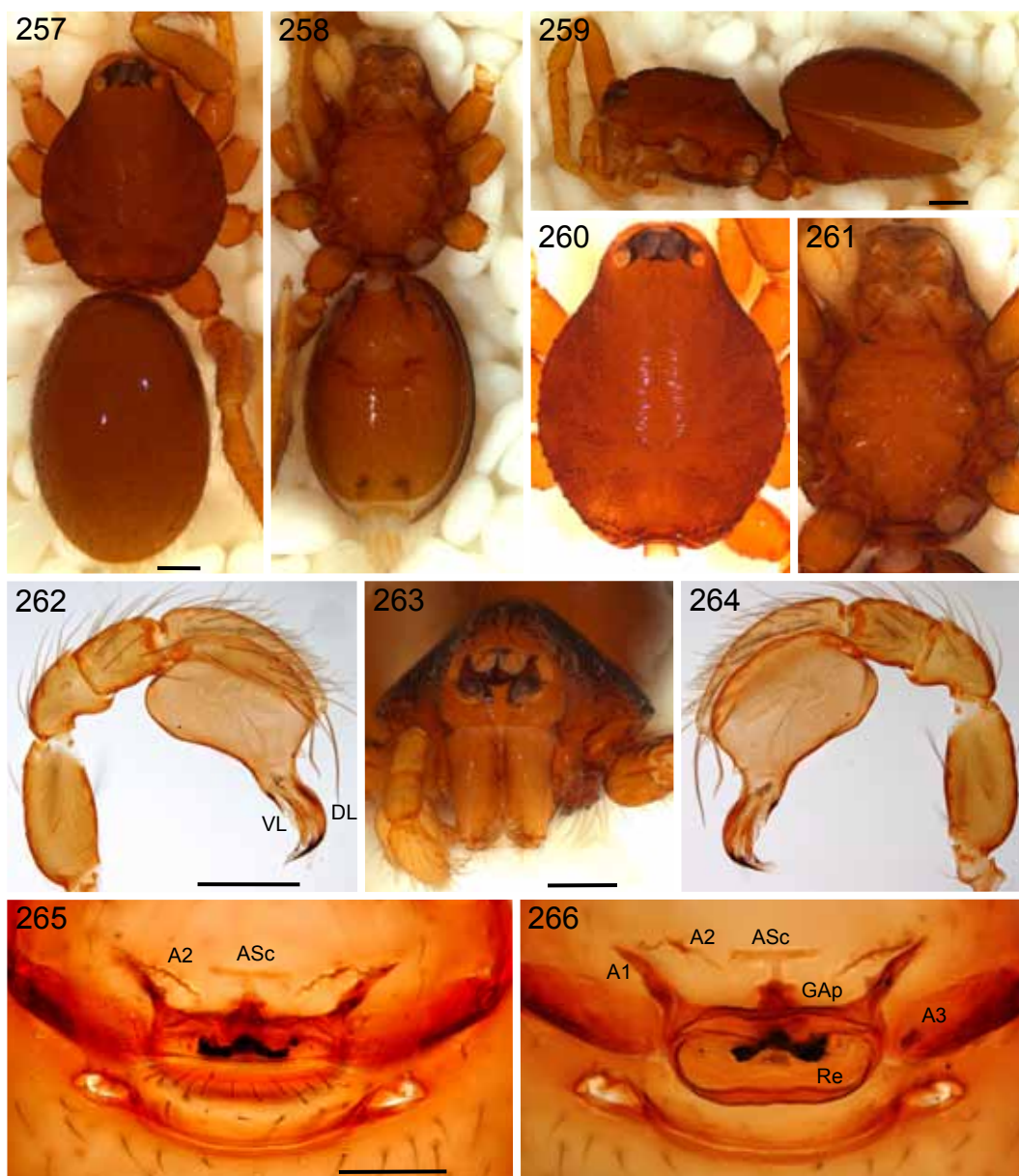
Figures 257–284, 375

Types: Male holotype and female allotype from Berlese and sifted leaf litter of a tropical dry forest at an elevation of 325 m at Reserve Speciale d'Ambre, 3.5 km 235° SW Sakaramy, 12°28'8"S, 49°14'32"E, Antsiranana Province, 26–31 January 2001, Fisher-Griswold Arthropod Team, deposited in CASC (PBI_OON 00003275). The species epithet, a noun in apposition, is taken from the Malagasy word for a *dugout canoe* or any *small boat*.

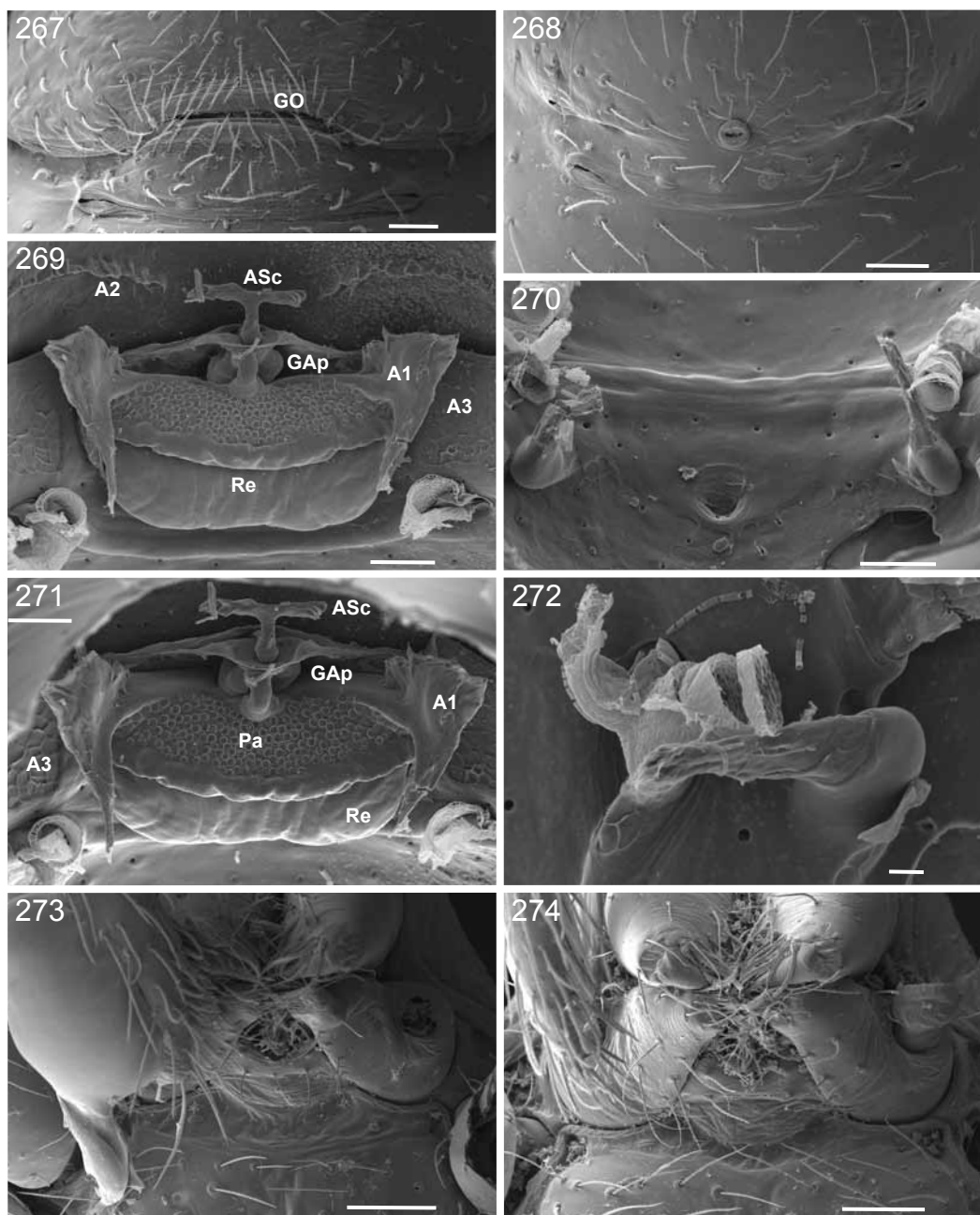
Diagnosis: *N. lakana* can be differentiated from other *Noideattella* species by the following combination of characters: habitus color dark red-brown, body length 2.1 to 2.4 mm; carapace surface of elevated portion of pars cephalica strongly granulate, sides granulate (figs. 260, 275, 276); sternum furrows with row of large pits, surface coarsely reticulate, with microsculpture medially and in furrows (fig. 277); book lung covers large and elliptical (figs. 258, 259).

Description: *Male* (PBI_OON 0003462): Total length 2.1. **Cephalothorax:** Carapace dark red-brown, sternum longer than wide, dark red-brown, anterior margin with continuous transverse groove (fig. 273). Mouthparts: Chelicerae, endites, and labium dark red-brown, paturon inner margin with scattered setae (fig. 263). **Abdomen:** Ovoid. Book lung covers large, elliptical. Dorsal scutum dark red-brown, middle surface smooth, sides smooth. Postepigastric scutum orange-brown, long, semicircular. Male genital opening slightly protruded, epigastric scutum apodemes small, separated from the anterior book lung opening and connected by a furrow. Posterior spiracles connected by a groove (fig. 268). **Legs:** Orange-brown, without color pattern. Leg spination (only surfaces bearing spines listed, all spines longer than segment width): tibiae: I, II p3-1-1; r2-1-1; IV p0-0-1; metatarsi: I, II p1-1-0; r1-1-0. Tarsal organ with two sensilla visible. **Genitalia:** Epigastric region with sperm pore situated at level of anterior spiracles (fig. 268). Palp proximal segments pale orange; cymbium pale orange, with distal patch of setae; bulb pale orange (figs. 262, 264). Embolus dorsal and ventral lamellae with at least three distal apophyses each (figs. 281–284). Palp as in figures 279 and 280. *Female* (PBI_OON 0003462): Total length 2.4. As in male except as noted. **Legs:** Metatarsi III and IV weak ventral scopula absent. Leg spination (only surfaces bearing spines listed, all spines longer than segment width): tibiae: I, II p3-1-1; r3-1-1; IV p0-0-1; metatarsi: I, II p1-1-0; r1-1-0. Trichobothria of metatarsus: I and IV one. **Genitalia:** Genital opening slit shaped (fig. 267). Sperm sac secretory glands openings flat, extending all over the receptaculum posterior surface. GAP process shaped as a twisted tube (figs. 269–271). Genitalia as in figures 265 and 266.

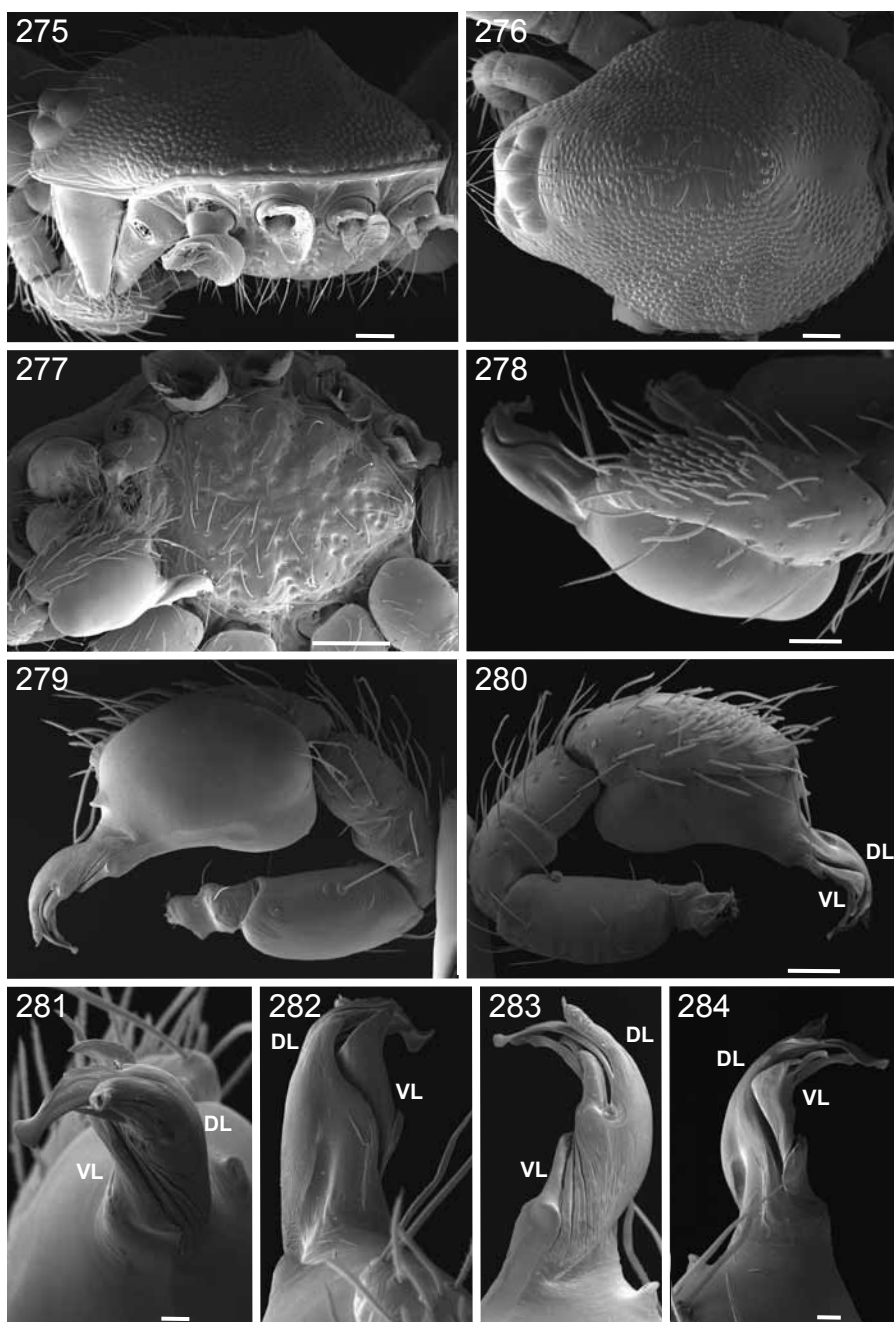
Material Examined: *N* = 86. **Madagascar:** *Antananarivo:* 3 km 41° NE Andranomay, 11.5 km 147° SSE Anjozorobe, montane rainforest, 1300 m, S18.47333°, E47.96000°, Dec. 05–13, 2000, Fisher-Griswold Arthro-



Figs. 257–266. *Noideattella lakana*, new species. **257.** Habitus male, dorsal view. **258.** Same, ventral view. **259.** Same, lateral view. **260.** Cephalothorax, dorsal view. **261.** Same, ventral view. **262.** Palp male, prolateral view. **263.** Cephalothorax male, anterior view. **264.** Palp male, retrolateral view. **265.** Genitalia female, ventral view. **266.** Same, dorsal view. Scale bars = 0.2 mm, except genitalia: 0.1 mm.



Figs. 267–274. *Noideattella lakana*, new species. **267.** Epigastric region female, ventral view. **268.** Same male, ventral view. **269.** Genitalia female, dorsal view. **270.** Epigastric region male, anterodorsal view (internal). **271.** Genitalia female, anterodorsal view. **272.** Abdomen apodemes genital area lame, lateral view. **273.** Endites male, ventral view. **274.** Endites female, ventral view. Scale bars = 50 μm , except 272: 10 μm .



Figs. 275–284. *Noideattella lakana*, new species. 275. Cephalothorax male, lateral view. 276. Same, dorsal view. 277. Same, ventral view. 278. Palp male, dorsal view. 279. Palp male, retrolateral view. 280. Same, prolateral view. 281. Embolus, ventral view. 282. Embolus, dorsal view. 283. Embolus, retrolateral view. 284. Embolus, prolateral view. Scale bars = 50 μm , except 282–284: 10 μm .

pod Team, 1 ♀ (CASC PBI_OON 3941). *Antsiranana*: 7.2 km 142° SE Antsiranana (=Diego Suarez), Montagne des Français, 180 m, S12.53796°, E49.56361°, Feb. 23–25, 2001, L.J. Boutin, 1 ♀ (CASC PBI_OON 3921); Forêt de Binara, 9.4 km 235° SW Daraina, montane rainforest, 1100 m, S13.26333°, E49.60000°, Dec. 05, 2003, B.L. Fisher, 5 mixed (CASC PBI_OON 3153); P.N. Montagne d'Ambre, 2.79 air km NE of park entrance forest, 1000 m, S12.53333°, E49.16666°, Nov. 21–30, 1993, J. Coddington, S. Larcher, C. Griswold, R. Andriamasimanana, N. Scharff, 1 ♀ (CASC PBI_OON 3460); 12 mixed (ZMUC PBI_OON 3462); 5 mixed (CASC PBI_OON 3463); 5 mixed (CASC PBI_OON 3465); 2 ♂ (CASC PBI_OON 3468); 2 ♀ (CASC PBI_OON 3473); 1 ♂ (CASC PBI_OON 3474); 1 ♂ (CASC PBI_OON 3475); 15 mixed (CASC PBI_OON 3477); 2 mixed (CASC PBI_OON 36378); 5 mixed (CASC PBI_OON 36380); 13 mixed (CASC PBI_OON 36389); 6 mixed (CASC PBI_OON 36392); Parc National Montagne d'Ambre, 3.6 km 235° SW Joffreville, montane rainforest, 925 m, S12.53444°, E49.17944°, Jan. 20–26, 2001, Fisher-Griswold Arthropod Team, 4 mixed (CASC PBI_OON 36376); Reserve Speciale d'Ambre, 3.5 km 235° SW Sakaramy, tropical dry forest, 325 m, S12.46888°, E49.24222°, Jan. 26–31, 2001, Fisher-Griswold Arthropod Team, 1 ♀ (CASC PBI_OON 3359); Reserve Speciale de l'Ankarana, 22.9 km 224° SW Anivorano Nord, tropical dry forest, 80 m, S12.90888°, E49.10972°, Feb. 10–16, 2001, Fisher-Griswold Arthropod Team, 1 ♂ (CASC PBI_OON 3172); Reserve Speciale l'Ankarana, 13.6 km 192° SSW Anivorano Nord, tropical dry forest, 210 m, S12.86361°, E49.22583°, Feb. 16–20, 2001, Fisher-Griswold Arthropod Team, 3 mixed (CASC PBI_OON 3721).

Noideattella farihy, new species

Figures 285–312, 375

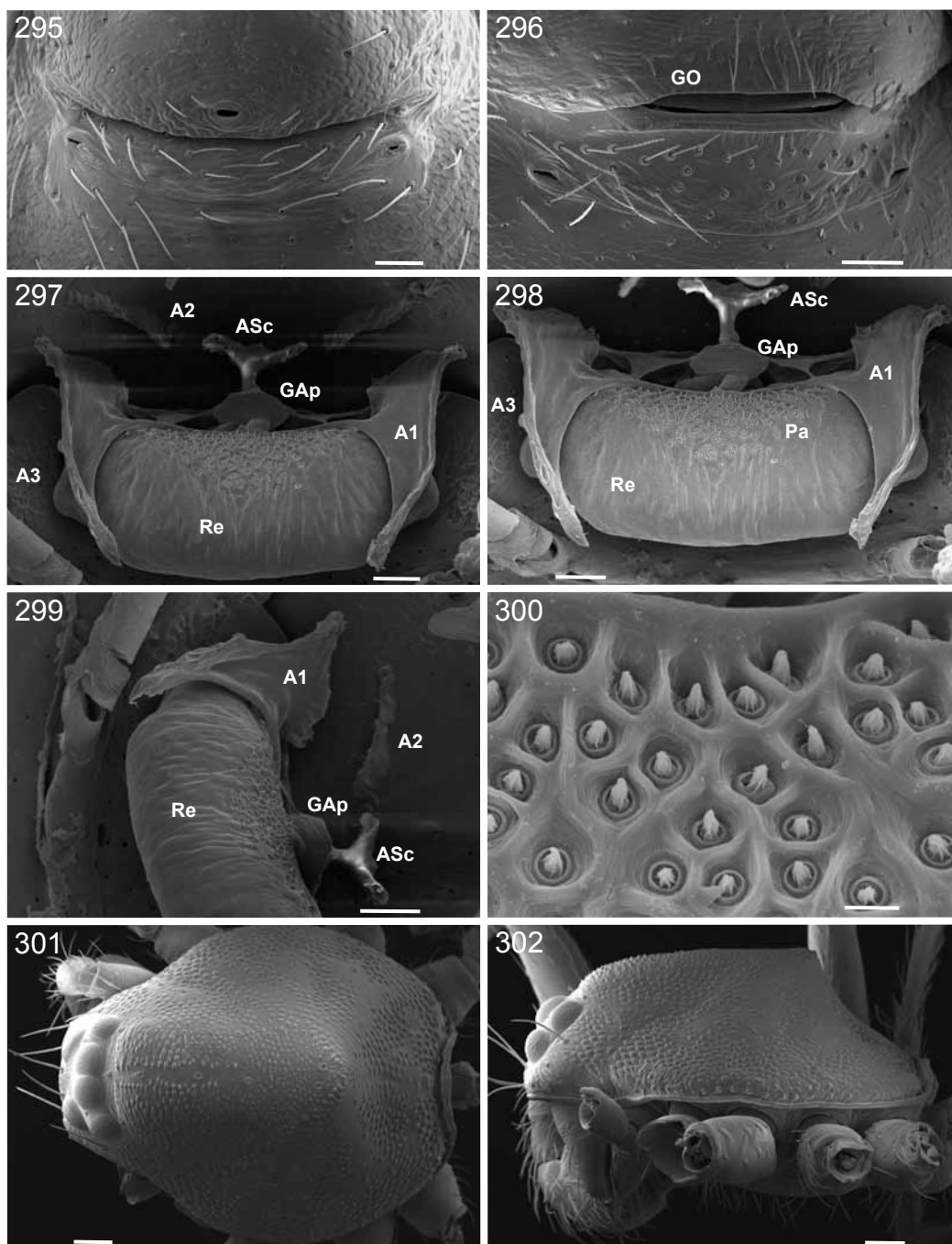
TYPES: Male holotype from Berlese and sifted leaf litter of a spiny forest at an elevation of 25 m at Parc National de Tsimanampetsotsa, 6.7 km 130° SE Efoetse, 32.0 km 175° S Beheloka, 24°6'2"S, 43°45'36"E, Toliara Province, 18–22 March 2002, Fisher-Griswold Arthropod Team, deposited in CASC (PBI_OON 00003340). The species epithet, a noun in apposition, is taken for the Malagasy word for a *pool*, *pond*, or *lake*.

DIAGNOSIS: *N. farihy* can be differentiated from other *Noideattella* species by the following combination of characters: habitus dark red-brown; carapace with surface of elevated portion of pars cephalica and sides granulate (figs. 301, 302); sternum microsculpture finely reticulate, distributed in all surfaces (figs. 289, 303, 304); embolus with a flat curved apophysis at its base (figs. 290, 292); book lung covers large and elliptical (figs. 286, 287).

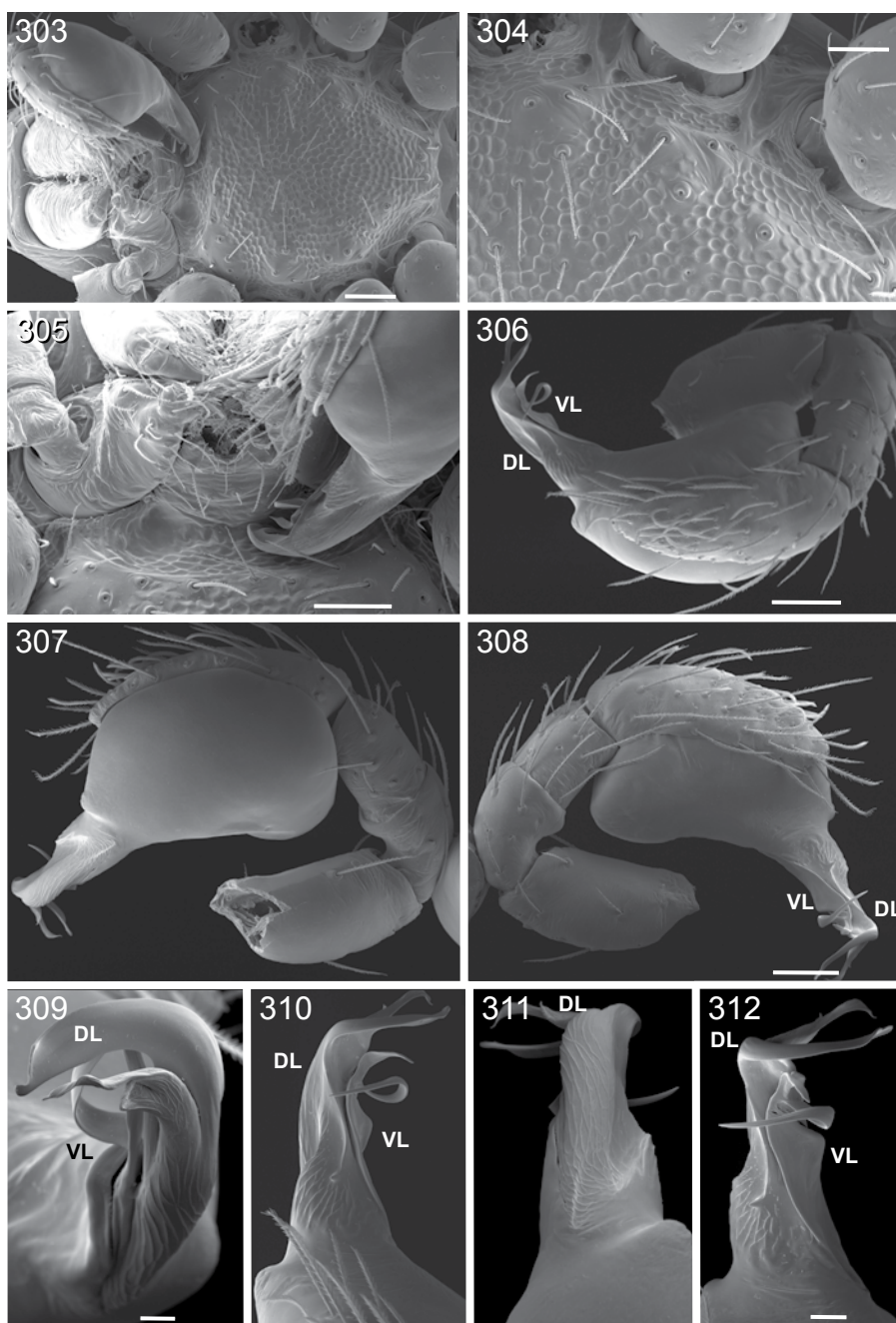
DESCRIPTION: *Male* (PBI_OON 0003533): Total length 2.1. **Cephalothorax:** Carapace dark red-brown. Sternum as long as wide, dark red-brown, furrow with rows of small pits, surface finely reticulate, without pits, with microsculpture medially and in furrows, anterior margin with interrupted transverse groove (figs. 303–305). Mouthparts: Chelicerae, endites, and labium dark red-brown, paturon inner margin with scattered setae (fig. 291). **Abdomen:** Ovoid. Dorsal scutum dark red-brown, middle surface smooth, sides reticulate. Postepigastric scutum dark red-brown, long, semicircular, covering nearly full length of abdomen (figs. 285–287). **Legs:** Pale orange, without color pattern. Leg spination (only surfaces bearing spines listed, all spines longer than segment width): tibiae: I, II p2-1-1; r1-1-1; metatarsi: I, II p1-1-0; r1-1-0. **Genitalia:** Epigastric region with sperm pore situated at level of anterior spiracles (fig. 295). Palp proximal segments pale orange; cymbium pale orange, without distal patch of setae; bulb pale orange (figs. 290, 292). Embolus dorsal lamella with at least three distal apophyses, ventral lamella with at least two apophyses (figs. 309–312). Palp as in figures 307 and 308. *Female* (PBI_OON 0003569): Total length 2.3. As in male except as noted. **Legs:** Leg spination (only



Figs. 285–294. *Noideattella farihy*, new species. **285.** Habitus male, dorsal view. **286.** Same, ventral view. **287.** Same, lateral view. **288.** Cephalothorax, dorsal view. **289.** Same, ventral view. **290.** Palp male, prolateral view. **291.** Cephalothorax male, anterior view. **292.** Palp male, retrolateral view. **293.** Genitalia female, ventral view. **294.** Same, dorsal view. Scale bars = 0.2 mm, except genitalia: 0.1 mm.



Figs. 295–302. *Noideattella farihy*, new species. 295. Epigastric region male, ventral view. 296. Same female, ventral view. 297. Genitalia female, dorsal view. 298. Same, anterodorsal view. 299. Same, lateral view. 300. Receptaculum papillae field, anterior view. 301. Cephalothorax male, dorsal view. 302. Same, lateral view. Scale bars = 50 μ m, except 300: 10 μ m.



Figs. 303–312. *Noideattella farihy*, new species. **303.** Cephalothorax male, ventral view. **304.** Infracoxal grooves male, ventral view. **305.** Endites male, ventral view. **306.** Palp male, dorsal view. **307.** Palp male, retrolateral view. **308.** Same, prolateral view. **309.** Embolus, ventral view. **310.** Embolus, prolateral view. **311.** Embolus, retrolateral view. **312.** Embolus, dorsal view. Scale bars = 50 μm , except 309–312: 10 μm .

surfaces bearing spines listed, all spines longer than segment width): tibiae: I, II p2-1-1; r1-1-1; metatarsi: I, II p1-1-0; r1-1-0. **Genitalia:** Genital opening slit shaped (fig. 296). Sperm sac secretory gland openings pointed, extending all over the receptaculum posterior surface. GAP process shaped as a twisted tube (figs. 297–300). Genitalia as in figures 293 and 294.

MATERIAL EXAMINED: $N = 12$. **Madagascar:** *Fianarantsoa*: near Isalo National Park, at stream E of Interpretive Center, open fields, 750 m, S22.62666°, E45.35816°, Oct. 15–Nov. 09, 2001, M. Irwin, F. Parker, R. Harin'Hala, 1 ♀ (CASC PBI_OON 3859). *Toliara*: Berenty Special Reserve, 8 km NW Amboasary, gallery forest, 85 m, S25.01111°, E46.30555°, Jan. 26–Feb. 05, 2003, M. Irwin, F. Parker, R. Harin'Hala, 1 ♀ (CASC PBI_OON 3860); Forêt de Beroboka, 5.9 km 131° SE Ankidranoka, tropical dry forest, 80 m, S22.23305°, E43.36638°, Mar. 12–16, 2002, Fisher-Griswold Arthropod Team, 1 ♀ (CASC PBI_OON 3569); Parc Nat. d'Tsimanampetsotsa, Mitocho Cave, 6.4 km 77° ENE Efoetse, 17.4 km 170° S Beheloka, spiny forest thicket, 40 m, S24.04722°, E43.75305°, Mar. 18–22, 2002, Fisher-Griswold Arthropod Team, 1 ♀ Paratype (CASC PBI_OON 3538); Parc National de Zombitse, 19.8 km 84° E Sakaraha, tropical dry forest, 770 m, S22.84333°, E44.71000°, Feb. 05–09, 2003, Fisher-Griswold Arthropod Team, 1 ♂ (CASC PBI_OON 3533). *Tulear*: 18 km NNW Betroka, 825 m, S23.16333°, E44.96861°, Dec. 09–14, 1994, M. Ivie and A. Pollock, 1 ♂ (CASC PBI_OON 3981); Andohahela Natl. Park, Tsimelahy, Parcelle II, spiny forest thicket, 180 m, S24.93683°, E46.62666°, June 29–July 06, 2003, M. Irwin, F. Parker, R. Harin'Hala, 1 ♂ (CASC PBI_OON 36300); Beza Mahafaly Reserve, Parcelle I near research station, tropical dry forest, 165 m, S23.68650°, N44.59100°, Dec. 18–25, 2001, M. Irwin, F. Parker, R. Harin'Hala, 1 ♀ (CASC PBI_OON 36297); Cap Ste Marie Special Reserve, 74 km S of Tsihombe, 37 m, -25.58766°, 45.16300°, Apr. 14–22, 2003, M. Irwin, F. Parker, R. Harin'Hala, 1 ♀ (CASC PBI_OON 36298); June 29–July 05, 2003, 1 ♂ (CAS PBI_OON 36299).

Tolegnaro, new genus

TYPE SPECIES: *Tolegnaro sagani*, new species.

ETYMOLOGY: This name is an arbitrary combination of letters and masculine in gender.

DIAGNOSIS: *Tolegnaro* species must have the following five characters: carapace pars cephalica strongly elevated in lateral view posteriorly forming a wide cone (figs. 315, 326, 344, 361); plumose setae present around the carapace and abdomen area (figs. 328, 329, 357); abdomen globular covered with scuta (figs. 313–315, 342–344); epigynum dorsal view with a T-shaped anterior sclerite (figs. 332–334); embolus curved approximately 90° at its half length, and divided in two lamellae with several apophyses (figs. 318–320, 347–349).

DESCRIPTION: Total length males 1.4–1.8, females 1.56–1.9. Habitus orange-brown (figs. 313, 342). **Cephalothorax:** Carapace orange-brown, without any pattern, broadly oval in dorsal view, pars cephalica strongly elevated in lateral view, anteriorly narrowed to between 0.5 and 0.75 times its maximum width, with rounded posterolateral corners, posterolateral edge without pits, posterior margin not bulging below posterior rim, anterolateral corners without extension or projections, posterolateral surface without spikes (figs. 315–317, 344–346), surface of elevated portion of pars cephalica smooth, sides finely reticulate, thorax without depressions, fovea absent, without radiating rows of pits; lateral margin straight, rebordered, without denticles; nonmarginal pars cephalica setae light colored, needlelike, present in U-shaped row; nonmarginal pars thoracica setae absent; marginal setae present, light colored, needlelike (figs. 316, 325, 326, 345, 360, 361). Clypeus margin slightly rebordered, straight in front view, vertical in lateral view, high, ALE separated from edge of carapace by their radius or more, median projection absent (figs. 319, 348); setae present, light colored, needlelike. Clypeal setae are

larger than the setae over the nonmarginal pars cephalica and thoracica (figs. 325, 360). Six eyes, subequal in size and well developed (figs. 319, 348). Posterior eye row recurved from above and from front; ALE separated by their radius to diameter, ALE-PLE separated by less than ALE radius, PME touching throughout most of their length, PLE-PME separated by less than PME radius (figs. 316, 345). Sternum as long as wide, orange-brown, uniform markings and sculpture, fused to carapace, median concavity absent, radial furrow opposite coxae III absent, surface smooth, without pits, sickle-shaped structures absent, posterior margin not extending posteriorly of coxae IV, anterior corner unmodified, lateral margin with infracoxal grooves and anterior and posterior openings, distance between coxae approximately equal, extensions of precoxal triangles absent, lateral margins unmodified, without posterior hump; setae sparse, light colored, needlelike, evenly scattered, originating from surface, without hair tufts (figs. 317, 327, 346, 364). Mouthparts: Chelicerae, endites, and labium orange-brown. Chelicerae straight, anterior face unmodified; promargin without teeth; without toothlike projections, directed medially, without prominent basal process, tip unmodified; setae light colored, needlelike, evenly scattered, posterior surface unmodified, promargin unmodified (figs. 319, 348). Labium triangular, not fused to sternum, anterior margin indented at middle, same as sternum in sclerotization; with six or more setae on anterior margin, subdistal portion with unmodified setae. Male endites same as sternum in sclerotization, anteromedian and posteromedian parts unmodified (figs. 317, 346), distally excavated, anteromedian tip and posteromedian part unmodified, same as sternum in sclerotization (figs. 323, 359). **Abdomen:** Globular, without color pattern, dorsal scutum present, strongly sclerotized and covering all abdomen, both epigastric scuta strongly sclerotized and covering all abdomen, without long posterior extension, rounded posteriorly, interscutal membrane rows of small sclerotized platelets absent posteriorly; dorsum soft portions white, without color pattern. Book lung covers small, round without setae, anterolateral edge unmodified (figs. 313–315, 342–344). Posterior spiracles connected by groove. Pedicel tube short, ribbed, scutopedicel region unmodified, scutum not extending far dorsal of pedicel, with plumose hairs dorsal and lateral of pedicel, without matted setae on anterior ventral abdomen in pedicel area absent, cuticular outgrowths near pedicel (figs. 313, 315, 342, 344). Dorsal scutum strongly sclerotized, orange-brown, without color pattern, covering full length of abdomen, no soft tissue visible from above, not fused to epigastric scutum, middle surface smooth, sides smooth, anterior half without projecting denticles. Epigastric scutum strongly sclerotized, surrounding pedicel, not protruding, small lateral sclerites absent. Postepigastric scutum strongly sclerotized, orange-brown, almost semicircular, covering nearly full length of abdomen, fused to epigastric scutum. Spinneret scutum present, incomplete ring. Supra anal scutum present. Dorsum setae present, light colored, needlelike. Epigastric area setae uniform, light colored, needlelike. Postepigastric area setae present, light colored. Spinneret scutum with fringe of needlelike setae. Dense patch of setae anterior to spinnerets absent. Interscutal membrane with setae. Colulus represented only by setae. **Legs:** Spination variable, present on tibia and metatarsi I and II of *T. sagani*, absent from all legs of *T. kepleri*. Metatarsi spines one pair, tibia IV prolateral distal surface without spines. Legs without color pattern; femur IV not thickened, same size as femora I–III, patella plus tibia I shorter than carapace,

tibia IV specialized hairs on ventral apex absent, tibia IV ventral scopula absent, metatarsi III and IV weak ventral scopula absent. Trichobothria base longitudinally narrowed, aperture internal texture gratelike, hood covered by numerous low, closely spaced ridges. **Male genitalia:** Epigastric region with sperm pore small, oval, situated at level of anterior spiracles, rebordered (figs. 330, 358); furrow without Ω -shaped insertions (figs. 314, 330, 343, 352). Male palpal patella shorter than femur and not swollen, male bulb spherical, not strongly sclerotized, right and left palps symmetrical, proximal segments pale orange; embolus light colored; femur without posteriorly rounded lateral dilation, attaching to patella basally; patella shorter than femur, not enlarged, without prolateral row of ridges, setae unmodified; tibia with three trichobothria; cymbium pale orange, ovoid in dorsal view, not fused with bulb, not extending beyond distal tip of bulb, plumose setae absent, without stout setae; bulb pale orange, 1 to 1.5 times as long as cymbium, stout, spherical. Internal structures and embolus details similar to those in *Noideattella* species (figs. 318, 320, 336, 337). **Female:** As in male except as noted. **Cephalothorax:** Sternum anterior margin unmodified. Mouthparts: Endites distally not excavated (figs. 324, 359). Female palp spines absent; tarsus unmodified, patella without prolateral row of ridges. **Abdomen:** Epigastric scutum without lateral joints. Postepigastric scutum not fused to epigastric scutum. **Legs:** Tibia I unmodified, metatarsi I and II mesoapical comb absent. Trichobothria: tibia I and IV, three; metatarsus I and IV, one. **Female genitalia:** Internal structures of *Tolegnaro* species are similar to *Noideattella* species (figs. 321, 322, 350, 351).

TAXONOMIC NOTE: The plumose setae present around the carapace and abdomen area (figs. 328, 329, 357) are not unique to *Tolegnaro* within the Oonopidae, but are a homoplastic synapomorphy for this genus (see Phylogenetic Relationships). On our cladogram this character is a synapomorphy at the *Tolegnaro* node but homoplastic elsewhere (length = 4, CI = 25, RI = 62).

PHYLOGENETIC RELATIONSHIPS: *Tolegnaro* is supported by the following 10 synapomorphies common to all minimal-length cladograms: posterior edge of carapace with plumose setae in both sexes (253-1) and distributed dorsally and laterally of pedicel (335-3: fig. 357); carapace seta on pars thoracica absent in males (247-0: fig. 325) and females (24-0); abdomen shape globular in males (322-2: figs. 313, 342) and females (94-2) [ancestral state either cylindrical or ovoid]; book lung cover size small in males (326-0: figs. 315, 344) and females (98-0); abdomen postepigastric scutum almost semicircular in males (352-0: figs. 314, 343) and females (125-0) [ancestral state long, semicircular].

SPECIES INCLUDED: *Tolegnaro kepleri* and *T. sagani*.

Tolegnaro sagani, new species

Figures 313–341, 377

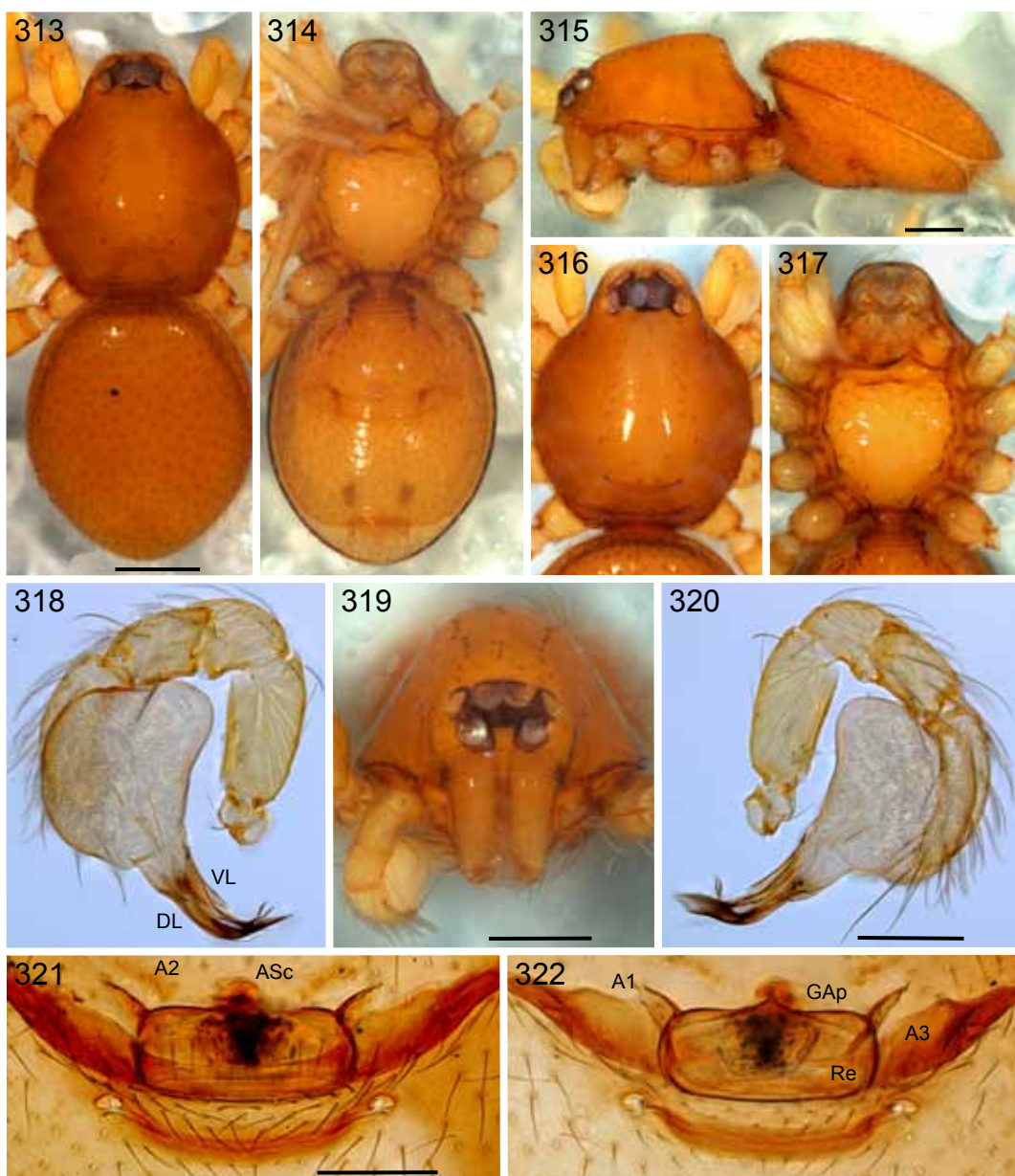
TYPES: Male holotype and female allotype from Berlese and sifted leaf litter of a littoral rainforest at an elevation of 10 m at Forêt de Petriky, 12.5 km W Tolagnaro, littoral forest 25°3.73'S, 46°42.26'E, Toliara Province, 22 November 1998, B.L. Fisher, deposited in CASC (PBI_OON 00036154). The species epithet is in honor of the astronomer Carl Sagan.

DIAGNOSIS: *T. sagani* can be differentiated from other *Tolegnaro* species by the following combination of characters: carapace surface smooth (figs. 316, 325); male cheliceral paturon inner margin with scattered setae; sternum without radial furrows between coxae I–II, II–III, III–IV, surface and furrows smooth, microsculpture absent (figs. 317, 327); leg spines present, one pair on metatarsi I and II; paturon distal region unmodified (fig. 319).

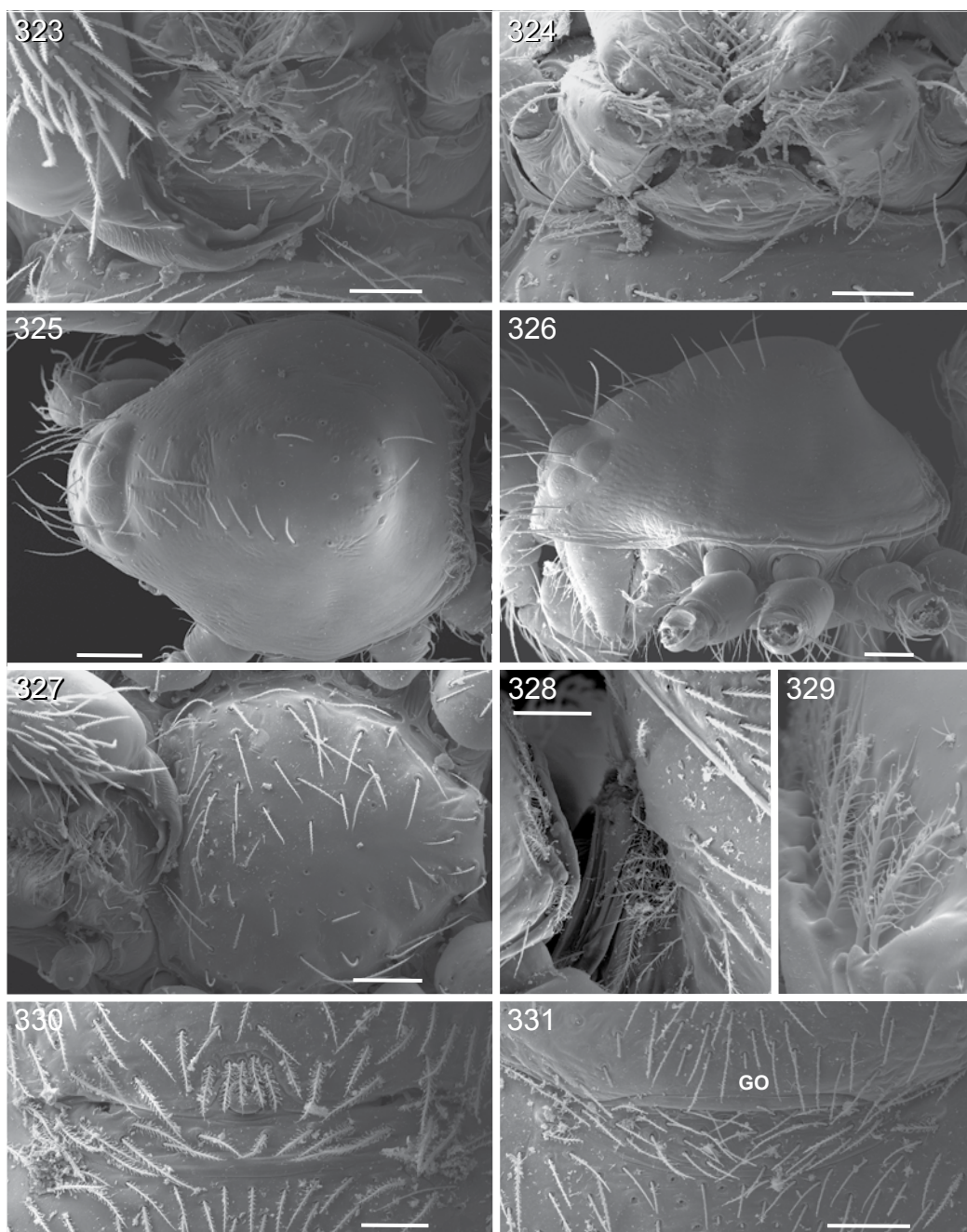
DESCRIPTION: *Male* (PBI_OON 0003282): Total length 1.40. Sternum microsculpture absent, anterior margin with continuous transverse groove (fig. 323), anterior margin unmodified (fig. 327). Mouthparts: Cheliceral paturon surface with scattered setae (fig. 319). **Abdomen:** Pedicel has a pair of triangular dorsal projections on its margin and a line of dorsal setae. Postepigastric area setae needlelike. Male genital opening slightly protruded and covered by a line of feathery seta, epigastric scutum apodemes large, near the anterior book lung opening and connected by a shallow groove (fig. 330). **Legs:** Yellow; tibia I with dorsal row of ridges. Leg spination (only surfaces bearing spines listed, all spines longer than segment width): tibiae: I, II p1-1-0; r1-1-0; metatarsi: I, II p0-1-0; r0-1-0. Tarsi I to IV superior claw teeth not examined in detail. Trichobothria on tibiae: I three, IV three, trichobothria base longitudinally narrowed, aperture internal texture gratelike, hood covered by numerous low, closely spaced ridges. Tarsal organ with three sensilla visible. **Genitalia:** Palp proximal segments pale orange; cymbium pale orange (figs. 318–320), cymbium without distal patch of setae (fig. 306). Embolus dorsal lamella with three distal apophyses (figs. 340, 341), ventral lamella with at least two apophyses, one bifurcated (figs. 338, 339). Palp as in figures 336 and 337. *Female* (PBI_OON 0003282): Total length 1.56. As in male except as noted. **Abdomen:** Pedicel with pair of triangular dorsal projections on margin and line of dorsal setae. **Legs:** Tibia I Emerit's glands absent. Leg spination (only surfaces bearing spines listed, all spines longer than segment width): tibiae: I, II p1-1-0; r1-1-0; metatarsi: I, II p0-1-0; r0-1-0. Tarsi I to IV superior claw teeth not examined in detail. **Genitalia:** Genital opening slit shaped (fig. 331). Sperm sac secretory glands openings flat, extending over the receptaculum center. GAp process shaped as a twisted tube (figs. 332–334). Genitalia as in figures 321 and 322.

VARIATION: Male leg I spine number varies on the tibia from one to two pairs, tibia leg II spine number varies widely, some specimens do not have spines. Female leg II spine number varies, some specimens only have one spine on the prolateral side. The shape and number of embolar dorsal and ventral lamella apophyses varies among individuals (figs. 336, 339, 340).

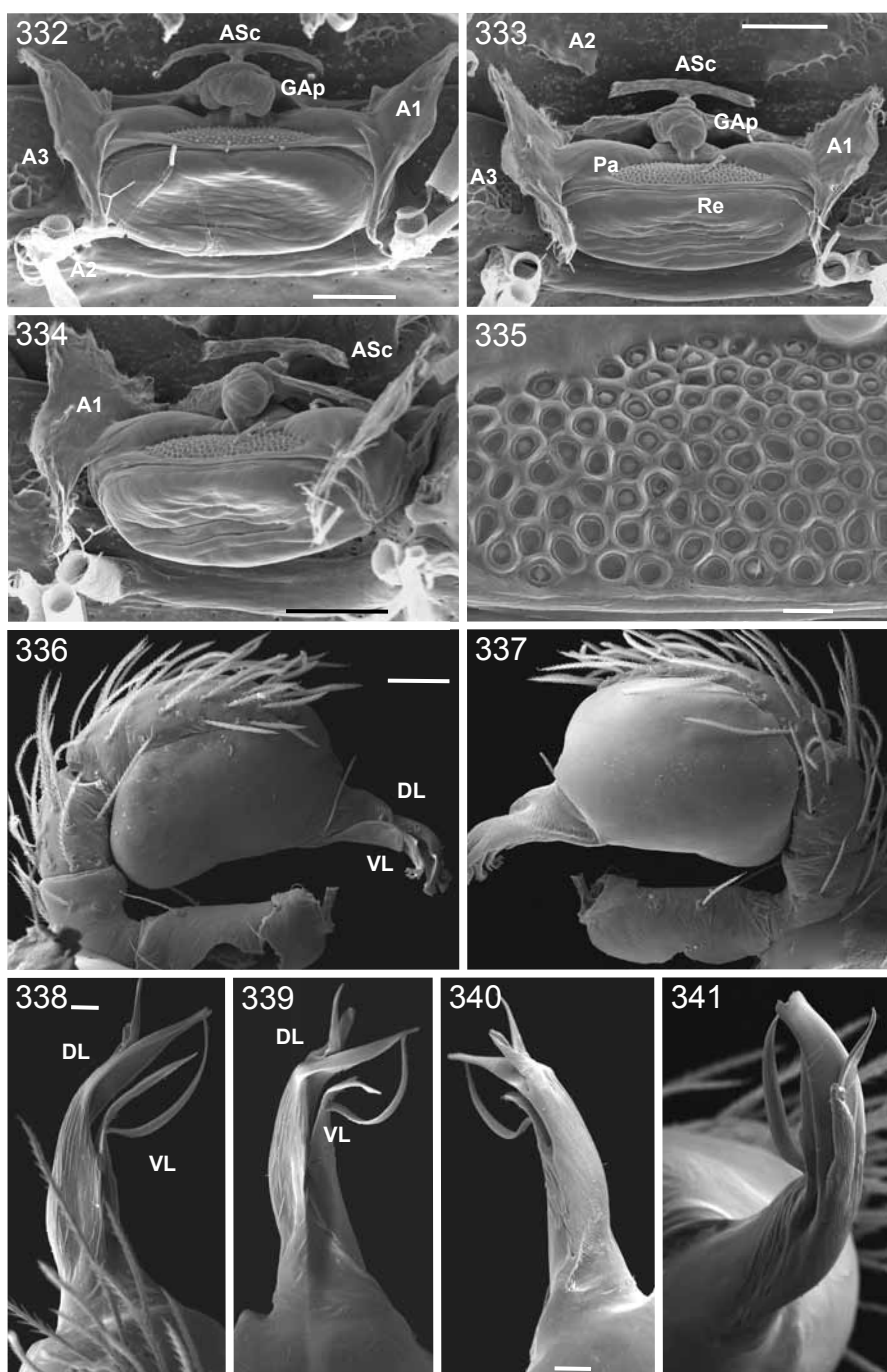
MATERIAL EXAMINED: *N* = 649. **Madagascar:** *Antananarivo:* Reserve Speciale d'Ambohitantly, Forêt d'Ambohitantly, 20.9 km 72° NE d'Ankazobe, montane rainforest, 1410 m, S18.22527°, E47.28694°, Apr. 17–22, 2001, Fisher-Griswold Arthropod Team, 15 mixed (CASC PBI_OON 3238); 1 ♂ (CASC PBI_OON 3287); Reserve Speciale d'Ambohitantly, Forêt d'Ambohitantly, 24.1 km 59° NE d'Ankazobe, montane rainforest, 1620 m, S18.00277°, E47.00444°, Apr. 17–22, 2001, Fisher-Griswold Arthropod Team, 36 mixed (CASC PBI_OON 3243). *Fianarantsoa:* 7.6 km from Kianjavato, Forêt Clasee Vatovavy, 175 m, S21.40000°, E47.94000°, June 06–08, 2005, Fisher-Griswold Arthropod Team, 7 mixed (CASC PBI_OON 3454); 8.0 km NE Ivohibe, forest, 1200 m, S22.42100°, E46.89600°, Nov. 03–09, 1997, B.L. Fisher, 2 ♀ (CASC PBI_OON 36398); 9.0 km NE Ivohibe, forest, 900 m, S22.92666°, E46.93833°, Nov. 12–17, 1997, B.L. Fisher, 2 mixed (CASC PBI_OON 36397); Forêt d'Atsirakambiaty, 7.6 km 285° WNW Itremo, montane rainforest, 1550 m, S20.59333°, E46.56333°, Jan. 22–26, 2003, Fisher-Griswold Arthropod Team, 1 ♂ (CASC PBI_OON 3555); 12 mixed (CASC PBI_OON 3924); Forêt de Vevembe, 66.6 km 293° WNW Farafangana, rainforest to montane



Figs. 313–322. *Tolegnaro sagani*, new species. **313.** Habitus male, dorsal view. **314.** Same, ventral view. **315.** Same, lateral view. **316.** Cephalothorax, dorsal view. **317.** Same, ventral view. **318.** Palp male, retrolateral view. **319.** Cephalothorax male, anterior view. **320.** Palp male, prolateral view. **321.** Genitalia female, ventral view. **322.** Same, dorsal view. Scale bars = 0.2 mm, except genitalia: 0.1 mm.



Figs. 323–331. *Tolegnaro sagani*, new species. **323.** Endites male, ventral view. **324.** Endites female, ventral view. **325.** Cephalothorax male, dorsal view. **326.** Same, lateral view. **327.** Same, ventral view. **328.** Pedicel area female, lateral view. **329.** Pedicel plumose setae female. **330.** Epigastric region male, ventral view. **331.** Same female, ventral view. Scale bars = 50 μ m.



Figs. 332–341. *Tolegnaro sagani*, new species. **332.** Genitalia female, anterodorsal view. **333.** Same, dorsal view. **334.** Same, lateral view. **335.** Receptaculum papillae field, anterior view. **336.** Palp male, prolateral view. **337.** Same, retrolateral view. **338.** Embolus, dorsal view. **339.** Embolus, prolateral view. **340.** Embolus, retrolateral view. **341.** Embolus, ventral view. Scale bars = 50 µm, except 335, 338–340: 10 µm.

transition, 600 m, S22.01305°, E47.00277°, Apr. 26, 2006, Fisher-Griswold Arthropod Team, 11 mixed (CASC PBI_OON 3464); P.N. Befotaka-Midongy, 27.7 km S Midongy-Sud, Mount Papango, rainforest, 1250 m, S23.84100°, E46.95800°, Nov. 17–19, 2006, Fisher-Griswold Arthropod Team, 13 mixed (CASC PBI_OON 3448); P.N. Befotaka-Midongy, 28.5 km S Midongy-Sud Mount Papango, montane rainforest, 940 m, S23.83500°, E46.94800°, Nov. 13–15, 2006, Fisher-Griswold Arthropod Team, 1 ♂ (CASC PBI_OON 3439); Reserve Speciale Ivohibe, 6.5 km ESE Ivohibe, camp III, montane rainforest, 1575 m, S22.49666°, E46.95500°, Oct. 24–30, 1997, B.L. Fisher, 1 ♀ (FMNH PBI_OON 10253); Reserve Speciale Ivohibe, 8.0 km NE Ivohibe, camp IV, montane rainforest, 1200 m, S22.42166°, E46.89833°, Nov. 03–09, 1997, B.L. Fisher, 1 ♀ (FMNH PBI_OON 10251); Reserve Forestiere d'Agnalazaha, Mahabo, 42.9 km 215° SW Farafangana, littoral forest, 20 m, S23.19388°, E47.72305°, Apr. 19, 2006, Fisher-Griswold Arthropod Team, 14 mixed (CASC PBI_OON 3469); Reserve Speciale Ivohibe, 6.5 km ESE Ivohibe, forest, S22.49666°, E46.95500°, Dec. 24–30, 1997, B.L. Fisher, 24 mixed (CASC PBI_OON 36396); Reserve Speciale Ivohibe, 7.5 km ESE Ivohibe, forest, S22.47000°, E46.96000°, Dec. 07–12, 1997, B.L. Fisher, 18 mixed (CASC PBI_OON 36395). *Mahajanga*: Parc National Tsingy de Bemaraha, 10.6 km ESE 123° Antsalova, tropical dry forest, 150 m, S19.70944°, E44.71805°, Nov. 16–20, 2001, Fisher-Griswold Arthropod Team, 16 mixed (CASC PBI_OON 3244); 1 ♀ (CASC PBI_OON 3543); 1 ♂ (CASC PBI_OON 3546); 37 mixed (CASC PBI_OON 3565); Parc National Tsingy de Bemaraha, 2.5 km 62° ENE Bekopaka, Ankidrodra River, tropical dry forest, 100 m, S19.13222°, E44.81472°, Nov. 11–15, 2001, Fisher-Griswold Arthropod Team, 32 mixed (CASC PBI_OON 3979); Parc National Tsingy de Bemaraha, 3.4 km 93° E Bekopaka, Tombeau Vazimba, tropical dry forest, 50 m, S19.14194°, E44.82805°, Nov. 06–10, 2001, Fisher-Griswold Arthropod Team, 1 ♂ (CASC PBI_OON 3302); Reserve d'Ankoririka, 10.6 km 13° NE de Tsaramandroso, tropical dry forest, 210 m, S16.26722°, E46.04861°, Apr. 09–14, 2001, Fisher-Griswold Arthropod Team, 4 ♂ (CASC PBI_OON 3883); Reserve Speciale de Bemarivo, 23.8 km 223° SW Besalamy, tropical dry forest, 30 m, S16.92500°, E44.36833°, Nov. 19–23, 2002, Fisher-Griswold Arthropod Team, 1 ♂ (CASC PBI_OON 3539); Pont Onibe, Clay Forest, Dec. 01–31, 1993, A. Pauly, 1 ♂ (MRAC MT. 177. 693 PBI_OON 8004). *Toliara*: 2.7 km 302° WNW Ste. Luce, littoral forest, 20 m, S24.77166°, E47.17166°, Dec. 09–11, 1998, B.L. Fisher, 1 ♀ (CASC PBI_OON 3595); Bohibasia Forest, 59 km NE Sakaraha, tropical dry forest, 780 m, S22.46666°, E41.83333°, Jan. 13, 1996, B.L. Fisher, 6 mixed (CASC PBI_OON 3965); Enakara, 11 km NW Reserve Andohahela, rainforest, 800 m, S24.56666°, E46.81666°, Nov. 17, 1992, B.L. Fisher, 1 ♀ (FMNH PBI_OON 10252); Enakara, 13 km NW Reserve Andohahela, montane rainforest, 1250 m, S24.55000°, E46.80000°, Oct. 30, 1992, B.L. Fisher, 5 mixed (FMNH PBI_OON 10240); 2 ♂ (FMNH PBI_OON 10244); Forêt Clasee d'Analavelona, 29.2 km 343° NNW Mahaboboka, montane rainforest, 1300 m, S22.67500°, E44.18666°, Feb. 22–26, 2003, Fisher-Griswold Arthropod Team, 2 mixed (CASC PBI_OON 3534); 53 mixed (CASC PBI_OON 3951); Forêt de Petriky, 12.5 km W Tolagnaro, littoral forest, 10 m, S25.06216°, E46.86933°, Nov. 22, 1998, Sylvian, B.L. Fisher, 88 mixed (CASC PBI_OON 2036); 1 ♀ (FMNH PBI_OON 10249); Forêt Ivohibe, 55.0 km N Tolagnaro, rainforest, 200 m, S24.56888°, E47.20388°, Dec. 02–04, 2006, B.L. Fisher, 4 mixed (CASC PBI_OON 3441); Fort Dauphin, Mt. Ilapiry, primary forest, SE slope, 300 m, Feb. 02, 1995, K. Emberton, 1 ♂ (MRAC MT. 202. 862 PBI_OON 7995); Mahafaly Plateau, 6.2 km 74° ENE Itampolo, spiny forest thicket, 80 m, S24.65361°, E43.99666°, Feb. 21–25, 2002, Fisher-Griswold Arthropod Team, 1 ♂ (CASC PBI_OON 3256); Parc Nat. Andohahela, Col de Tanatana, 33.3 km NW Tolagnaro, rainforest, 275 m, S24.75861°, E46.85361°, Nov. 22–24, 2006, B.L. Fisher, 22 mixed (CASC PBI_OON 3440); Parc National d'Andohahela, Forêt d'Ambobihory, 1.7 km 61° ENE Tsimelaky, 36.1 km 308° NW Tolagnaro, tropical dry forest, 300 m, S24.93000°, E46.64555°, Jan. 16–20, 2002, Fisher-Griswold Arthropod Team, 52 mixed (CASC PBI_OON 3537); 74 mixed (CASC PBI_OON 3554); 1 ♀ (CASC PBI_OON 36399); Parc National d'Andohahela, 36.7 km 341° NNW Tolagnaro, montane rainforest, 900 m, S24.76388°, E46.75166°, Jan. 21–25, 2002, Fisher-Griswold Arthropod Team, 3 mixed (CASC PBI_OON 3544); Parc National de Zombitse, 19.8 km 84° E Sakaraha, tropical dry forest, 770 m, S22.84333°, E44.71000°, Feb. 05–09, 2003, Fisher-Griswold Arthropod Team, 5 mixed (CASC PBI_OON 3925); 1 ♀ (CASC PBI_OON 3950); Reserve Speciale d'Ambohijanahary, Forêt d'Ankazotsihitafototra, 35.2 km 312° NW Ambaravarana, montane rainforest, 1050 m, S18.26666°, E45.40666°, Jan. 13–17, 2003, Fisher-Griswold Arthropod Team, 1 ♀ (CASC PBI_OON 3281); 26 mixed (CASC PBI_OON 3282); 10 mixed (CASC PBI_OON 3532); 1 ♂ (CASC PBI_OON 3927); 18 mixed (CASC PBI_OON 3928); S.F. Mandena, 8.4 km NNE Tolagnaro, littoral forest, 20 m, S24.95233°, E47.00100°, Nov. 20, 1998, B.L. Fisher, 16 mixed (CASC PBI_OON 3436).

Tolegnaro kepleri, new species

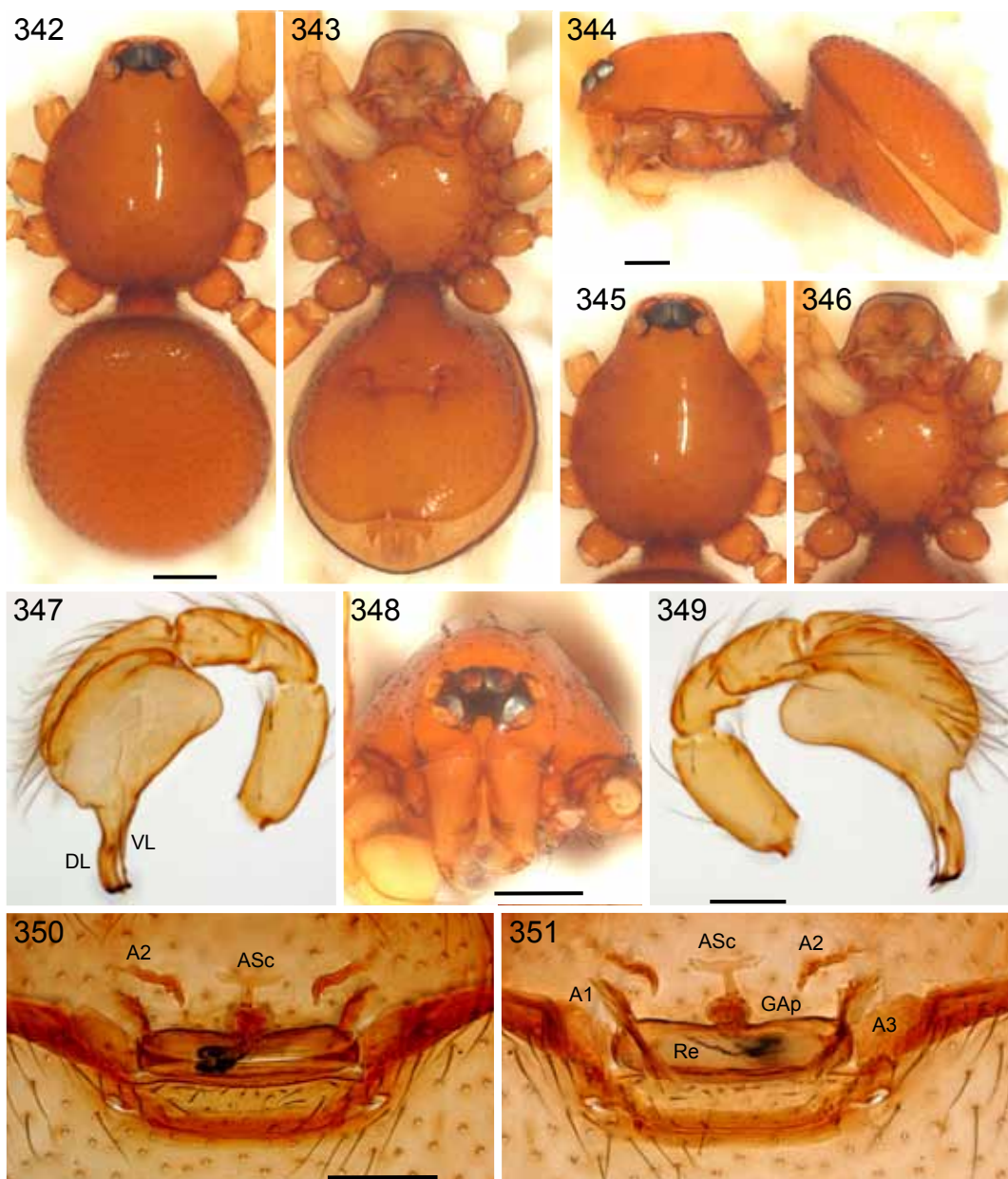
Figures 342–370, 377

Types: Male holotype and female allotype from Berlese and sifted leaf litter of a tropical dry forest at an elevation of 100 m at Parc National de Namoroka, 17.8 km 329° WNW Vilanandro, 16°22'36"S, 45°19'36"E, Mahajanga, 8–12 December 2002, Fisher-Griswold Arthropod Team, deposited in CASC (PBI_OON 00036155). The species epithet is in honor of the astronomer Johannes Kepler.

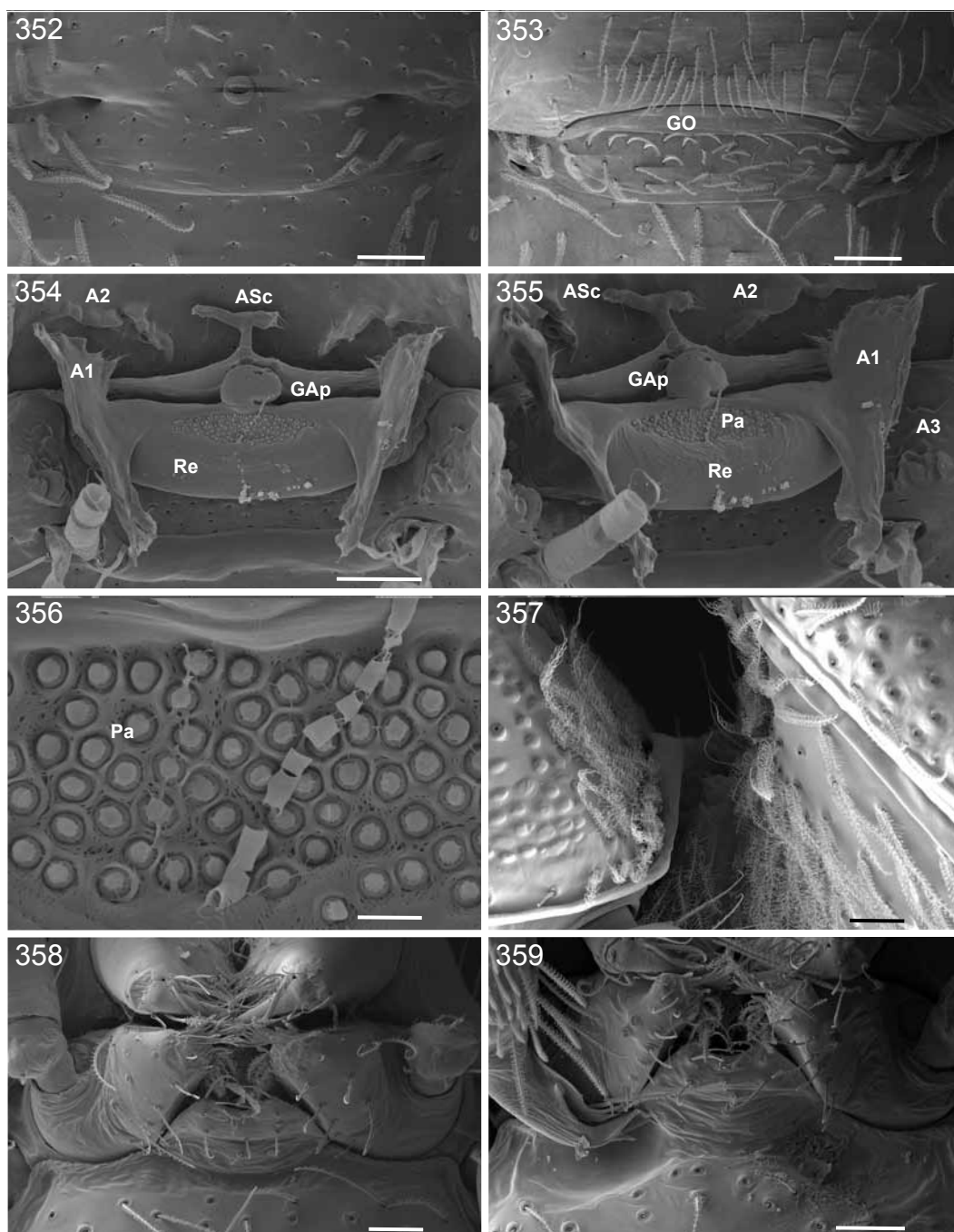
Diagnosis: *T. kepleri* can be differentiated from other *Tolegnaro* species by the following combination of characters: carapace side microsculpture finely reticulate (figs. 346, 361); male cheliceral paturon inner margin distal portion with long curved modified seta (figs. 348, 363); sternum with radial furrows between coxae I–II, II–III, III–IV, surface finely reticulate, microsculpture only in furrows (figs. 346, 362); leg spines absent (fig. 364).

Description: *Male:* Total length 1.8. **Cephalothorax:** Sternum anterior margin with interrupted transverse groove (fig. 359). Mouthparts: Paturon inner margin with recumbent, curved setae (figs. 348, 363). **Abdomen:** Postepigastric area setae plumose. **Legs:** Pale orange; tibia I unmodified. Male genital opening slightly protruded, epigastric scutum apodemes large, separated from the anterior book lung opening and not connected by a furrow. Posterior spiracles connected by a groove (fig. 352). Leg spines absent (fig. 364). Tarsi I to IV superior claw teeth not examined in detail. Trichobothria examined with SEM. Tarsal organ with two sensilla visible. **Genitalia:** Palp cymbium with distal patch of setae. Palp proximal segments pale orange; cymbium pale orange (figs. 347–349). Embolus dorsal lamella and ventral lamella with at least two apophyses each (figs. 367–370). Palp as in figures 365 and 366. *Female* (PBI_OON 0003325): Total length 1.9. As in male except as noted. **Cephalothorax:** Mouthparts: Cheliceral paturon inner margin with scattered setae. **Legs:** Tibia I Emerit's glands present. Tarsi I to IV superior claw teeth not examined in detail. **Genitalia:** Genital opening slit shaped (fig. 353). Sperm sac secretory glands openings flat, extending over the receptaculum center. GAP process shaped as a twisted tube (figs. 354, 355). Genitalia as in figures 350 and 351.

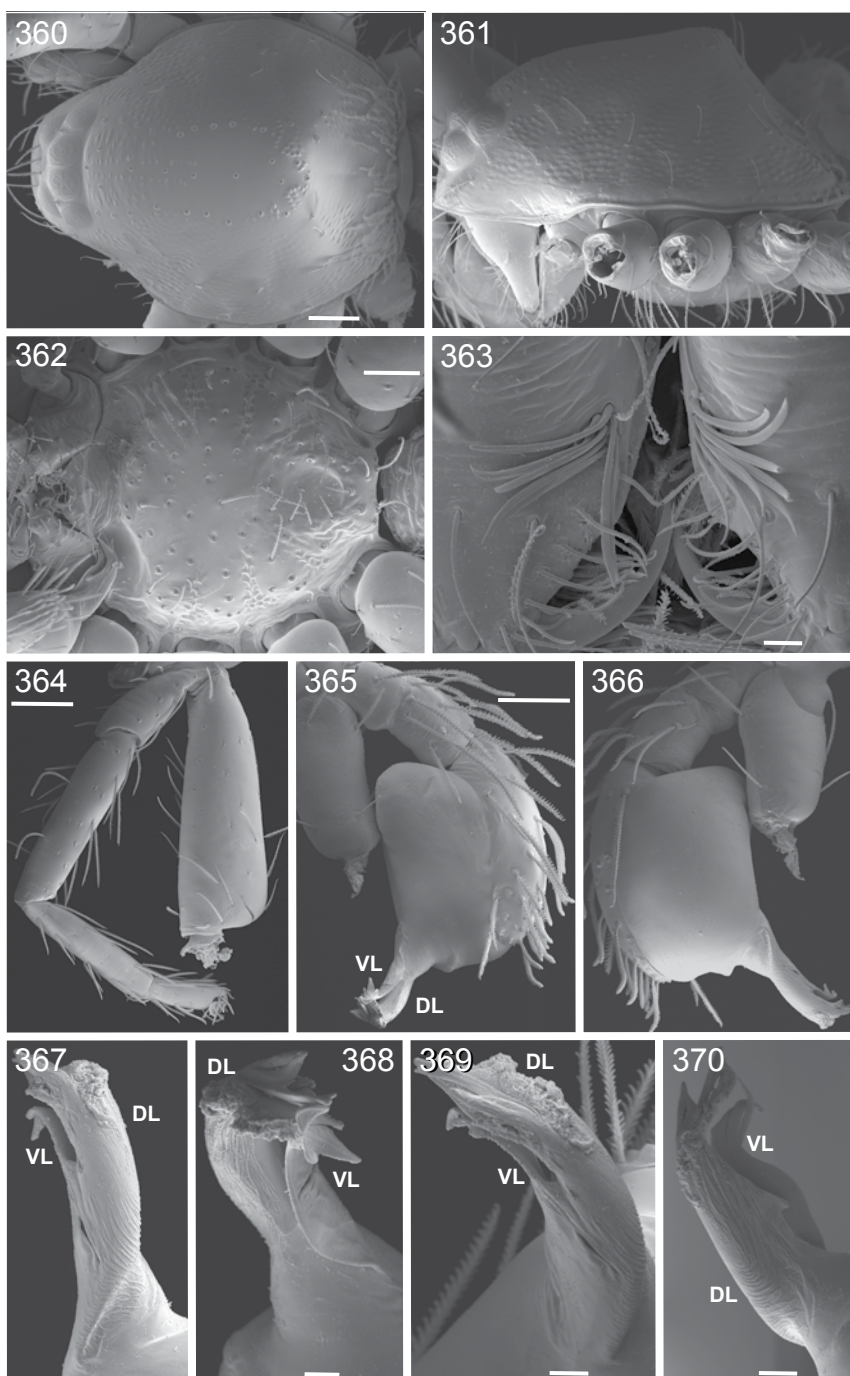
Material Examined: *N* = 69. **Madagascar:** *Mahajanga:* Parc National de Baie de Baly, 12.4 km 337° NNW Soalala, tropical dry forest, 10 m, S16.01000°, E45.26500°, Nov. 26–30, 2002, Fisher-Griswold Arthropod Team, 15 mixed (CASC PBI_OON 3044); 15 mixed (CASC PBI_OON 3357); Parc National de Namoroka, 16.9 km 317° NW Vilanandro, tropical dry forest, 100 m, S16.40666°, E45.31000°, Nov. 12–16, 2002, Fisher-Griswold Arthropod Team, 9 mixed (CASC PBI_OON 3325); 2 mixed (CASC PBI_OON 36282); Parc National de Namoroka, 17.8 km 329° WNW Vilanandro, tropical dry forest, 100 m, S16.37666°, E45.32666°, Nov. 08–12, 2002, Fisher-Griswold Arthropod Team, 32 mixed (CASC PBI_OON 1993). *Toamasina:* Forêt Classee Andriantatety, rainforest, 530 m, S18.69500°, E48.81333°, Dec. 04–07, 1998, H.J. Ratsirarson, 3 mixed (CASC PBI_OON 3838). *Toliara:* 2.7 km 302° WNW Ste. Luce, littoral forest, 20 m, S24.77166°, E47.17166°, Dec. 09–11, 1998, B.L. Fisher, 1 ♂ (CASC PBI_OON 3889); Fort Dauphin, Mt. Vasiha, primary forest, 100 m, Feb. 07, 1995, K. Emberton, 1 ♀ (MRAC MT. 202. 867 PBI_OON 8036); Parc National d'Andohahela, 36.7 km 341° NNW Tolagnaro, montane rainforest, 900 m, S24.76388°, E46.75166°, Jan. 21–25, 2002, Fisher-Griswold Arthropod Team, 2 ♀ (CASC PBI_OON 3871); Reserve Integrale Naturelle d'Andohahela, parcel 1, 20.0 km SE Andranondambo, 1857 m, S24.56166°, E46.72166°, Nov. 27–Dec. 05, 1995, S. Goodman, 1 ♀ (FMNH PBI_OON 36301).



Figs. 342–351. *Tolegnaro kepleri*, new species. **342.** Habitus male, dorsal view. **343.** Same, ventral view. **344.** Same, lateral view. **345.** Cephalothorax, dorsal view. **346.** Same, ventral view. **347.** Palp male, retrolateral view. **348.** Cephalothorax male, anterior view. **349.** Palp male, prolateral view. **350.** Genitalia female, ventral view. **351.** Same, dorsal view. Scale bars = 0.2 mm, except genitalia: 0.1 mm.



Figs. 352–359. *Tolegnaro kepleri*, new species. 352. Epigastric region male, ventral view. 353. Same female, ventral view. 354. Genitalia female, dorsal view. 355. Same, lateral view. 356. Receptaculum papillae field, anterior view. 357. Pedicel area female, lateral view. 358. Endites female, ventral view. 359. Endites male, ventral view. Scale bars = 50 μ m, except 356: 10 μ m.



Figs. 360–370. *Tolegnaro kepleri*, new species. **360.** Cephalothorax male, dorsal view. **361.** Same, lateral view. **362.** Sternum male, ventral view. **363.** Chelicerae modified setae male, anterior view. **364.** Leg 1 female, retrolateral view. **365.** Palp male, prolateral view. **366.** Same, retrolateral view. **367.** Embolus, retrolateral view. **368.** Embolus, prolateral view. **369.** Embolus, ventral view. **370.** Embolus, dorsal view. Scale bars = 50 μm except 365–369: 10 μm .

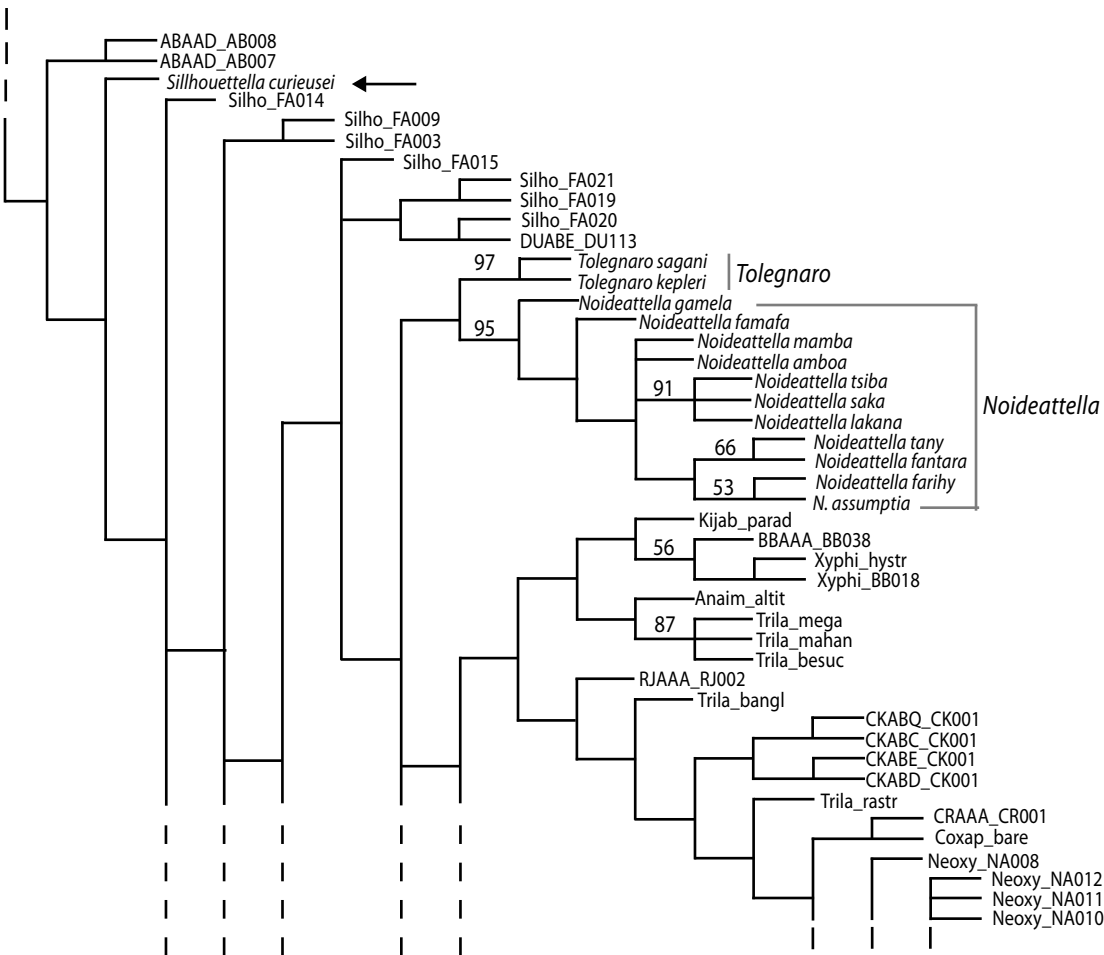
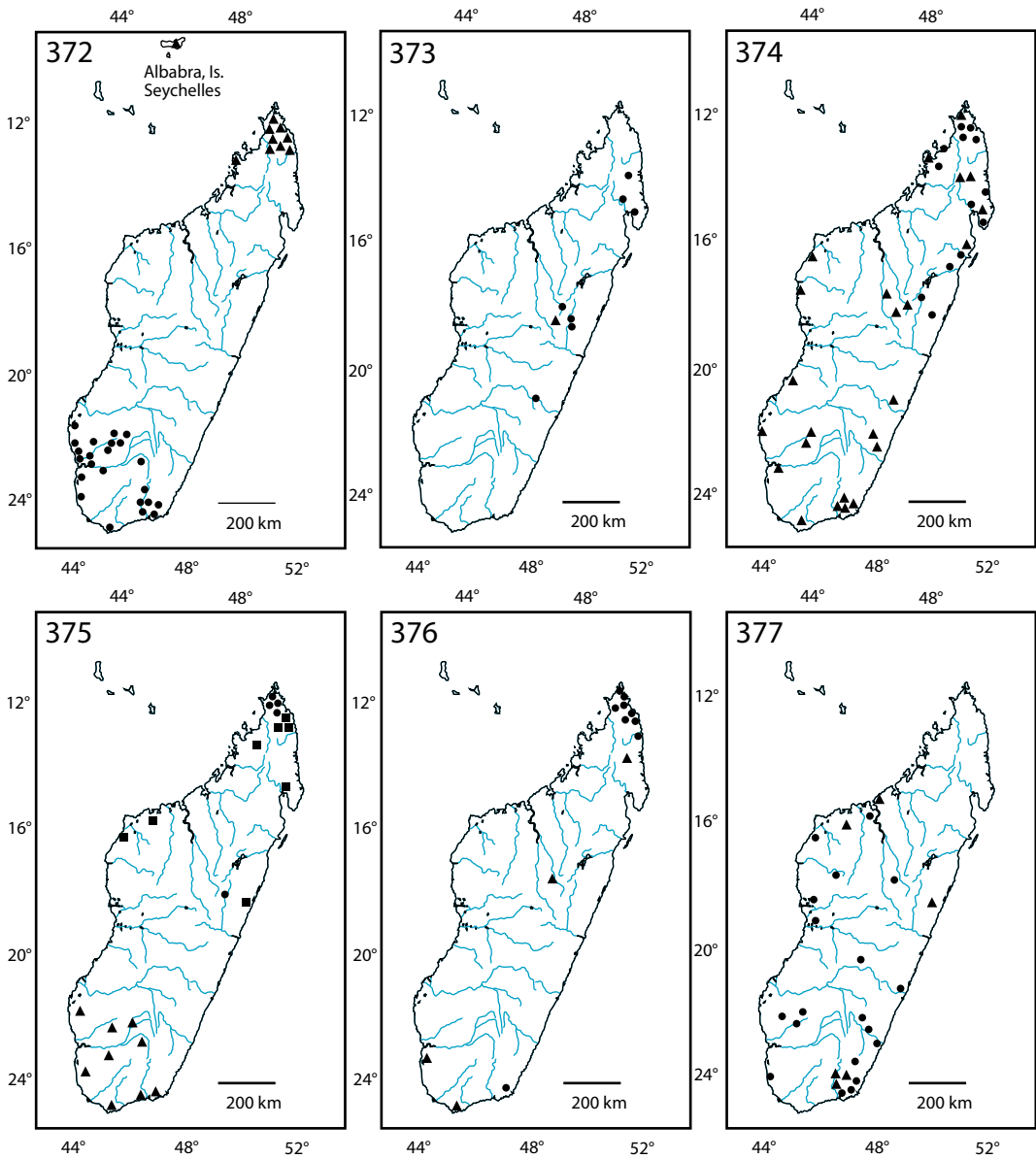


Fig. 371. Cladogram section showing *Noideattella* and *Tolegnaro* species. Strict consensus of 10,000 cladograms of 7418 steps (CI = 10, RI = 73). Arrow indicates the placement of *Silhouettella curieusei*, numbers under the nodes are jackknife support values cutoff value 51%. Nodes resolved as in strict consensus.

ACKNOWLEDGMENTS

Support for this project came from the Research/Education Divisions at California Academy of Sciences (CASC), the Exline-Frizzell and Lindsay Funds (CASC), the private Schlinger, Oracle, and McBean foundations, and the U.S. National Science Foundation (NSF). Álvarez-Padilla (F.A.P.) was supported by a Schlinger Chair of Arachnology Postdoctoral Fellowship at CASC. Griswold (C.E.G.) acknowledges NSF grants DEB 9296271: “Systematics and Biogeography of Afromontane Spiders” and DEB-0613775: “PBI: Collaborative Research: The Megadiverse, Microdistributed Spider Family Oonopidae” (to C.E.G.) and DEB-0072713: “Terrestrial Arthropod Inventory of Madagascar” (to Brian Fisher and C.E.G.). The 1998 CASC expeditions to Ranomafana, Madagascar, were supported by grants from the Oracle and McBean foundations. The Schlinger Foundation provided support for all aspects of this study.

We would like to thank the many organizations, researchers and other persons that have contributed to the Madagascar arthropod inventory that provided most of the 2421 specimens revised. Permits to



Figs. 372–377. Distribution maps. 372. *Noideattella amboa* (circles), *Noideattella assumptia* (triangles). 373. *Noideattella gamela* (circles), *Noideattella famafa* (triangles). 374. *Noideattella saka* (circles), *Noideattella mamba* (triangles). 375. *Noideattella lakana* (circles), *Noideattella farihy* (triangles), *Noideattella tany* (squares). 376. *Noideattella tsiba* (circles), *Noideattella fantara* (triangles). 377. *Tolegnaro sagani* (circles), *Tolegnaro kepleri* (triangles).

conduct research in and to export specimens from Madagascar were granted by the Association Nationale pour le Gestion des Aires Protégées (ANGAP) and Direction des Eaux et Forêts of the Ministre d'Etat à l'Agriculture et au Développement Rural, under Accordes de Collaboration of the Xerces Society, facilitated by Claire Kremen, C. Ramilison, and B. Davies of that organization, of the Madagascar Institut pour la Conservation des Ecosystèmes Tropicaux (MICET), facilitated by Benjamin Andriamihaja, Directeur Général of that organization, and of the California Academy of Sciences, facilitated by Balsama Rajemison. For help with logistics and for many favors within Madagascar we also thank Benjamin Andriamihaja and Harin'Hala Hasinjaka (Rin'ha) of MICET and Balsama Rajemison of CASC. For collecting specimens, for assistance in fieldwork and for hospitality in Madagascar, we thank Barbara and the late Vince Roth, Rija Andriamasimanana, Marie Jeanne Raheirilalao, Samuelson Randrianarisoa, Christophe Roland, Ranomafana Park Ranger Emile Rajeriarison, Alma Saucedo, Nikolaj Scharff, Jonathan Coddington, Vince Lee, Keve Ribardo, Diana Silva Dávila, Scott Larcher, Daniela Andriamalala, Gustavo Hormiga, Wendy Moore, Rick Brusca, and Joel Ledford. We offer special gratitude to members of the Fisher-Griswold Arthropod Survey team, who were responsible for collecting and processing many of the specimens studied: Daniela Andriamalala, Lantoniaina Andriamampianina, Dylan Berge, Lisa Joy Boutin, Alison Cameron, Randriambololona Tantely Nirina, Brian Fisher, Jennifer Jacobs, Joel Ledford, Gary Ouellette, Pascal Rabeson, Jean-Jacques Rafanomezantsoa, Maminiaina Rajaonarivo, Balsama Rajemison, Jean Claude Rakotonirina, Chrislain Ranaivo, Nicole Rasoamanana, Hanitriniana Rasoazanamavo, Helian Ratsirarson, Domoina Razafindratandra, Diana Silva Dávila, Corrie Moreau, and Brinda Vavy. David Kavanaugh and Hannah Wood deserve special thanks for help in the field as do the members of the California Academy of Sciences/Parc Botanique et Zoologique Tzimbazaza (CASC/PBZT) 2000 Ant-Spider course: Daniela Andriamalala, Balsama Rajemison, Jean-Jacques Rafonomezantsoa, Jean Claude Rakotonirina, and Helian Ratsirarson and in particular Brian Fisher and his ant team.

Finally, we would like to thank Gustavo Hormiga and Norman I. Platnick for reviewing this manuscript and the following museums and institutions for lending additional material: Cristian Kropf and Yvonne Kranz (NMBE), Petra Sierwald (FMNH), Gustavo Hormiga (GWU), Gonzalo Giribet and Laura Leibensperger (MCZ), Christine Rollard (MNHN), Rudy Joqué and Wouter Fannes (MRAC), Michael Saaristo (MZT), Jon Coddington (USNM), and Nikolaj Scharff (ZMUC).

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