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Synaphridae of Madagascar (Araneae: Araneoidea): A New Family Record for the Afrotropical Region

Jeremy A. Miller
Department of Entomology, California Academy of Sciences, 875 Howard Street, San Francisco, California 94103, USA; email: jmiller@calacademy.org

The spider family Synaphridae is reported for the first time from Madagascar. Three new species are described. *Africepheia* gen. nov. is established for *A. madagascariensis* sp. nov.; two species of *Synaphris* Simon, 1894 are described: *S. schlingeri* sp. nov. and *S. toliara* sp. nov. Diagnostic characteristics for the family and putative synapomorphies are discussed, elucidated by scanning electron microscope images representing both Malagasy genera. This research highlights the connection between large scale collecting efforts in biodiversity hotspots like Madagascar and advances in systematics.

KEYWORDS: taxonomy, synapomorphy, scanning electron microscopy, *Africepheia, Cepheia, Synaphris*

Synaphrids are tiny, old world, sheet-web building spiders (Marusik et al. 2005; Marusik and Lehtinen 2003; Schütt 2003). Although the precise circumscription and even taxonomic rank of the group remains controversial (Marusik and Lehtinen 2003; Platnick 2007; Schütt 2003; Wunderlich 2004), synaphrids have been subjected to detailed morphological study (Lopardo and Hormiga, in press; Lopardo et al. 2007; Marusik et al. 2005; Marusik and Lehtinen 2003) and placed phylogenetically among related families (Schütt 2003).

Although the first synaphrid described was from Egypt, the family has never been reported from Madagascar or sub-Saharan continental Africa (Dippenaar-Schoeman and Jocqué 1997; Platnick 2007). *Synaphris* is known from the Canary Islands, the Mediterranean region, and Central Asia; *Cepheia* is a monotypic genus from Southern Europe. New species from Madagascar representing *Synaphris* and a new genus are described here.

The spider fauna of Madagascar remains rich, highly endemic, and understudied (Griswold 2003; Legendre 1972). It includes the endemic spider family Halidae (Jocqué 1994), and major endemic portions of the families Archaeidae (Forster and Platnick 1984), Cyatholipidae (Griswold 2001), Gallieniellidae (Platnick 1984), Migidae (Griswold and Ledford 2001), and Phyxelididae (Griswold 1990) among others. Madagascar remains a hotspot for arachnological discovery (e.g., Agnarsson 2006; Agnarsson and Kuntner 2005; Huber 2003; Miller 2006; Silva-Dávila 2005, 2007 [this issue]).

METHODS

All measurements are in millimeters and were taken using a reticule in a Leica MZ12.5 dissecting microscope. Total length measurements (front of clypeus to posterior of abdomen) are approximate and may be influenced by the angle the abdomen is held at and changes in the size of the abdomen due to preservation artifacts. Carapace measurements were made in dorsal view. Leg

articles were measured in lateral view along the dorsal margin. Metatarsal trichobothrium position (Tm position) is expressed as the ratio of the distance between the proximal margin of the metatarsus and the root of the trichobothrium divided by the total length of the metatarsus (Denis 1949; Locket and Millidge 1953).

Somatic illustrations were based on digital photographs taken with a Nikon DXM 1200 digital camera mounted on a Leica MZ16 dissecting microscope. Genitalia were cleared in methyl salicylate (Holm 1979), slide mounted (Coddington 1983), and illustrated using a Leica DM4000 M compound microscope fitted with a drawing tube. Illustrations were rendered in Adobe Photoshop (version 6.0). Photographs of cleared genitalia were taken using a DXM 1200 digital camera mounted on a Leica DM4000 M; multiple images were combined using Auto-Montage (version 5.01).

For examination of the respiratory system, abdomens were digested in warm potassium hydroxide. Digested abdomens were stained with chlorazol black, washed in distilled water, examined in lactic acid using a temporary slide mount (Hormiga 1994), and illustrated using a drawing tube on a Leica DM4000 M microscope.

SEM images were taken using the Leo 1450VP at the California Academy of Sciences. Specimens for SEM examination were air-dried and sputter coated with gold-palladium. Specimens were mounted on copper wire using white glue.

SEMs and illustrations of the male genitalia were either made from the left palp or reversed so they appear to depict the left palp.

All specimens examined are deposited in the California Academy of Sciences (CAS). No synaphrids from beyond Madagascar were examined for this study. Comparisons with other taxa were drawn based on images and descriptions from publications and manuscripts.

Abbreviations and Conventions.— References to figures published elsewhere are listed in lowercase type (fig.); references to figures in this paper are listed with an initial capital (Fig.).

Abbreviations used in the text and figures are given in Table 1. The table also includes abbreviations for putatively homologous structures of the male palp used elsewhere (Lopardo and Hormiga, in press; Lopardo et al. 2007; Marusik et al. 2005). Anatomical terminology for the male palp should be interpreted as implying homology only within Synaphridae; assessment of homology with other spiders (especially symphytognathoids and other araneoids) must await a broader comparative study.

For material examined, when multiple consecutive records were from the same locality, the locality data after the first record is given in brackets as [same locality].

Taxonomy

Family Synaphridae Wunderlich, 1986

Synaphrinae (Anapidae) Wunderlich 1986:113; 1987:137; 1995a:775; 2004:1080.
Synaphridae Marusik and Lehtinen 2003:144. Lopardo, Hormiga and Melic 2007:11.

Diagnosis.— Distinguished from all other spiders by the constriction at the tarsus-metatarsus joint (Figs. 12, 44; Lopardo and Hormiga, in press; Lopardo et al. 2007); distinguished from most araneoids (except symphytognatids and most anapids, micropholcommatids, and mysmenids) by the tracheate anterior respiratory system; further distinguished from most other araneoids (except some theridiids and possibly *Iardinis* and *Crassignatha*) by having the chelicerae armed only with an anterior keel (Figs. 11, 47). Unlike other araneoids, synaphrids may have the tarsi divided into two pseudosegments (Fig. 13; Marusik et al. 2005; but see Lopardo and Hormiga, in press; Lopardo et al. 2007). The strong groove connecting the posterior tracheal spiracles (Fig. 61) is reminiscent

of Cyatholipidae (Griswold 2001: fig. 22C) and the micropholcommatid genus *Teutoniella* (Platnick and Forster 1986: fig. 9).

DESCRIPTION.— Small (ca. 1 mm) eight-eyed, three clawed, ecribellate, entelegyne spiders. Carapace longer than wide to nearly round (Figs. 3, 37; Thaler and Noflatscher 1990: fig. 29), median row of setae with enlarged bases (Marusik et al. 2005: fig. 22). Eyes subequal, evenly spaced in two rows, lateral eyes juxtaposed (Fig. 42). Chelicerae with anterior keel, no other teeth (Figs. 11, 53). No enlarged cheliceral gland mound or peg teeth (Fig. 47). Labrum without anterior spur (Fig. 46). Labium fused to sternum (Schütt 2003), not rebordered. Posterior margin of sternum truncated (Figs. 4, 38). Patellae with one long dorsal macroseta; no other leg macrosetae. Tibiae with long trichobothria, metatarsi I and II each with one trichobothrium; bothria hooded (Figs. 14–15, 50–51); tibial bothria occasionally modified with a deep central notch and small pit (Marusik and Lehtinen 2003: fig. 23). Metatarsi tapered distally with large dorsal lyriform organ (Figs. 12, 44). Tarsi sometimes divided into two pseudosegments (Fig. 13; but see Lopardo and Hormiga, in press; Lopardo et al. 2007), teeth on major tarsal claws variable (Fig. 13; Marusik et al. 2005: figs. 25, 29, 32; Marusik and Lehtinen 2003: fig. 19); inferior claw with dorsal denticle (Fig. 13; Lopardo et al. 2007). Tarsal organ small, round, flush with surrounding cuticle (i.e., not raised; Figs. 16, 52; Schütt 2003; Marusik and Lehtinen 2003), located on proximal half of tarsus. Anterior respiratory system tracheate with some tubes passing into the prosoma (Fig. 8); vestigial book lung covers present (Figs. 1, 35); posterior tracheae with a pair of widely-spaced spiracles connected by a deep groove advanced from the spinnerets about ⅕ the distance to the epigastric furrow (Fig. 61). Tracheae with two trunks branching into numerous tracheoles, some of which pass through the pedicel into the prosoma (Fig. 8). Male with 3–4 epiandrous gland spigots (Figs. 26, 62, 75). Colulus present (Fig. 29). ALS with a major ampullate gland spigot, one tartipore, one nubbin, and

TABLE 1: List of anatomical abbreviations used in the text and figures with abbreviations of putatively homologous structures of the male palp used elsewhere.

Male palp:	
C	conductor
CA	terminal apophysis of conductor (= SA of Marusik et al. 2005; Cap of Lopardo and Hormiga, in press; Lopardo et al., in press)
CB	cymbium
CG	groove of conductor (= TG of Marusik et al. 2005)
CM	membranous part of cymbium (= Ct of Marusik et al. 2005)
CT	tip of conductor (= TA of Marusik et al. 2005)
E	embolus
EB	embolic base
L	lamella (= EP of Lopardo et al., in press)
PC	paracymbium
ST	subtegulum
T	tegulum
TM	tegular membrane
Epigynum:	
CD	copulatory duct
CO	copulatory opening
FD	fertilization duct
S	spermatheca
Spinnerets and somatic morphology:	
AC	aciniform gland spigot
AG	aggregate gland spigot
ALS	anterior lateral spinneret
CL	colulus
CY	cylindrical gland spigot
FL	flagelliform gland spigot
MAP	major ampullate gland spigot
mAP	minor ampullate gland spigot
N	nubbin
PI	piriform gland spigots
PLS	posterior lateral spinneret
PMS	posterior median spinneret
PS	pseudosegmentation
Tm	metatarsal trichobothrium
TR	tartipore

a few (3–4) piriform gland spigots (see also Lopardo et al. 2007); PLS with terminal segment nearly as long as basal, with one flagelliform gland spigot and one aggregate gland spigot, aciniform gland spigots absent (but see Discussion); female with one cylindrical gland spigot (Figs. 30, 34, 64, 66); PMS with a single spigot in *Africepheia* and *Synaphris* (Fig. 31; see Discussion), with two aciniform gland spigots in *Cepheia longiseta* (Lopardo and Hormiga, in press; Lopardo et al. 2007; see also Discussion); cylindrical gland spigot absent in female *Africepheia* and *Synaphris* (Figs. 31, 64), one present in *Cepheia longiseta* (Lopardo and Hormiga, in press; Lopardo et al. 2007).

Male palpal tibia with one dorsal trichobothrium; sometimes with small dorsal tibial process; no other apophyses on the male palpal tibia, patella, or femur (Figs. 22, 59, 74). Paracymbium present. Tegulum with membranous conductor grooved to receive embolus and terminating in one or two apophyses (Figs. 20, 58, 73; Lopardo and Hormiga, in press: fig. 46). Embolus filiform, moderately to very long, arises from the proximal part of the palp (Figs. 5, 39, 67).

Female palp complete, tarsal claw absent (Figs. 10, 43). Entelegyne, with one pair of spermathecae. Copulatory duct loops around itself or spermathecae at least one time (Figs. 7, 41, 69).

Circumscription.— *Africepheia* gen. nov., *Cepheia* Simon, 1894, *Synaphris* Simon, 1894. Wunderlich (1986) included the genus, *Iardinis* Simon, 1899 in his original circumscription of Synaphridae (which he considered a subfamily of a broadly circumscribed Anapidae). The type species of *Iardinis* is considered *nomen dubium* (Forster and Platnick 1977; Platnick 2007). However, Wunderlich's (1986) placement of *Iardinis* was based on his assessment of two species described from Nepal and India by Brignoli, not the type species. Wunderlich later added his new genus *Crassignatha* Wunderlich, 1995a (see also Wunderlich 1995b) and *Iardinidis* Wunderlich 2004, a fossil from Baltic amber, to Synaphridae. Marusik and Lehtinen (2003) suggested that *Crassignatha* might belong to Symphytognathidae; Wunderlich (2004) suggested Anapidae; Platnick (2007) has cataloged it under Mysmenidae. The placement of *Iardinidis* has not been critically evaluated.

Distribution.— Mediterranean Europe and Africa, Central Asia, Canary Islands, Madagascar.

Genus *Africepheia* Miller, gen. nov.

Type species: *Africepheia madagascariensis* Miller, sp. nov.

Etymology.— The generic name is a contraction of African *Cepheia*; the gender is feminine.

Diagnosis.— Male *Africepheia* distinguished from other synaphrids by the form of the paracymbium, which nearly covers the retrolateral face of the bulb and is lightly sclerotized and glabrous except along the ventral margin, which is more sclerotized and hirsute (Figs. 6, 18, 21), smaller and not less sclerotized than the adjacent cymbium in other synaphrids (Fig. 56); further distinguished from *Synaphris* by the conductor, which nearly covers the prolateral face of the cymbium and bulb (Fig. 17), smaller, not obscuring the cymbium in *Synaphris* (Fig. 55), and by the absence of both a lamella (see Fig. 57) and a glabrous, membranous, basal region on the prolateral side of the cymbium (see Fig. 70) in *Africepheia*; further distinguished from *Cepheia* by having the carapace longer than wide (Fig. 3), as long as wide in both sexes of *Cepheia* (Lopardo and Hormiga, in press: fig. 9), and by the form of the cymbium, which is several times longer than wide in *Cepheia* (Brignoli 1970: fig. 13; Thaler and Noflatscher 1990: figs. 25, 27; Lopardo and Hormiga, in press: figs. 46–49), only slightly longer than wide in *Africepheia* (Fig. 22).

Female distinguished from other synaphrids by the copulatory duct, which loops around itself about a dozen times in *Africepheia* (Fig. 7); no more than four loops in other synaphrids (Figs. 41, 69; Lopardo and Hormiga, in press: fig. 40), and by the anterolateral position of the copulatory openings in *Africepheia* (Figs. 23–24), ventral (Fig. 60; Lopardo and Hormiga, in press: fig. 57) or lateral (Fig. 78) in other synaphrids.

Circumscription.— *Africepheia madagascariensis* Miller, sp. nov.

Justification of Monotypy.— In the absence of a phylogenetic study, it is not clear how synaphrid genera are related and a thorough reexamination of symphytognathoid relationships is beyond the scope of this study. To avoid creation of a new monotypic genus, *Africepheia madagascariensis* could arguably be placed in *Cepheia* with a revised genus diagnosis based on the form of the conductor and its interaction with the embolus; no characters of the female are known that would diagnose such a circumscription. The weak and untested evidence for a sister taxon relationship between *Cepheia* and *Africepheia* combined with the few characters available to diagnose such a group argues against their synonymy. The case for placing *Africepheia* in *Synaphris* is even weaker. Although *Africepheia* and *Synaphris* share some features, including similarities in the form of the conductor apophyses, similar spinneret spigot morphologies, and (in some *Synaphris*) an epigynum in the form of a bulb rather than a flat plate, *Africepheia* lacks a lamella and a membranous basal region on the prolateral side of the cymbium, both key diagnostic characters and possible synapomorphies for *Synaphris* (Lopardo et al. 2007). It therefore seems preferable to establish a new monotypic genus rather than complicate the diagnoses of the existing genera.

Africepheia madagascariensis Miller, sp. nov.

Figures 1–27, 29–34.

Material Examined.— Holotype: Male from Madagascar, **Antsiranana**: Réserve Spéciale de l'Ankarana, 22.9 km 224° SW Anivorano Nord, 12°54′32″S, 49°6′35″E, 80 m, 10–16 February 2001, EF19 sifted litter tropical dry forest, in tsingy, BLF 2972, Fisher, Griswold et al. (CASENT 9001446), deposited in CAS. Paratypes: Madagascar: **Antsiranana**: Réserve Spéciale de l'Ankarana, 22.9 km 224° SW Anivorano Nord, 12°54′32″S, 49°6′35″E, 80 m, 10–16 February 2001, EF19 sifted litter tropical dry forest, in tsingy, BLF 2972, Fisher, Griswold et al. (CASENT 9001446), 9♂, 20♀; Réserve Spéciale de l'Ankarana, 22.9 km 224° SW Anivorano Nord, Camp Anglaise, 12.90889°S, 49.10983°E, 80 m, 10–16 February 2001, general collecting, L.J. Boutin (CASENT 9003704) , 1♂, 3♀.

Etymology.— Named for the island of Madagascar, where this species was discovered. The epithet is in the form of a Latin adjective.

Diagnosis.— Monotypic genus; see diagnosis for genus.

Description.— Carapace and sternum dark yellow to brown, paler specimens with darker margin, darker specimens nearly uniform color. Legs yellow to orange. Abdomen medium gray to black.

Male palp: Male palpal tibia with short distal process on the prolateral side (Fig. 22). Cymbium slightly longer than wide, distal margin rounded with arc of setae (Fig. 22). Paracymbium a large, glabrous, lightly sclerotized plate on the retrolateral side with a hirsute, moderately sclerotized ventral margin (Fig. 21). Tegulum with elaborate membranous conductor nearly covering the prolateral face of the palp and grooved to receive filiform embolus (Figs. 5, 19). Embolic tip and conductor apophyses with proximal orientation, located near origin of the very long, filiform embolus in unexpanded palp (Figs. 5, 20).

Epigynum: Ventral plate bulbous, with large anterolateral copulatory openings (Figs. 23–24). Copulatory duct loops around itself about a dozen times (Fig. 7). Spermathecae separated by more than two times their diameter.

Male (holotype): Total length 0.99, carapace 0.48 long, 0.40 wide, clypeus 0.17, sternum 0.29 long, 0.29 wide, coxa IV separated by 1.50 times their width. Leg measurements:

	I	II	III	IV	Palp
Femur	0.49	0.45	0.38	0.43	0.13
Patella	0.13	0.12	0.12	0.13	0.05
Tibia	0.45	0.38	0.31	0.39	0.15
Metatarsus	0.31	0.28	0.26	0.29	–
[Tm position	0.47	0.46][1]	–	–	–
Tarsus	0.27	0.27	0.24	0.24	0.27
Total	**1.65**	**1.50**	**1.31**	**1.48**	**0.60**

Female (paratype, CASENT 9001446): Total length 1.11, carapace 0.41 long, 0.36 wide, clypeus 0.12, sternum 0.26 long, 0.28 wide, coxa IV separated by 2.00 times their width. Leg measurements:

	I	II	III	IV	Palp
Femur	0.41	0.39	0.35	0.42	0.07
Patella	0.13	0.13	0.12	0.11	0.03
Tibia	0.33	0.30	0.26	0.33	0.09
Metatarsus	0.26	0.24	0.22	0.25	–
[Tm position	0.49	0.42]	–	–	–
Tarsus	0.25	0.22	0.21	0.21	0.09
Total	**1.38**	**1.28**	**1.16**	**1.32**	**0.28**

Variation.— *Male* (4): Total length 0.99–1.06 (1.03), carapace length 0.43–0.48 (0.45), carapace width 0.38–0.40 (0.39), clypeus height 0.14–0.17 (0.16), sternum length 0.26–0.29 (0.28), sternum width 0.29–0.30 (0.29), coxa IV separated by 1.50–1.93 (1.72) times their width.

Female (4): Total length 0.97–1.11 (1.05), carapace length 0.40–0.41 (0.40), carapace width 0.36–0.37 (0.36), clypeus height 0.10–0.12 (0.11), sternum length 0.26–0.28 (0.27), sternum width 0.25–0.28 (0.27), coxa IV separated by 1.57–2.00 (1.74) times their width.

Distribution.— Known from Antsiranana province, northern Madagascar (Fig. 80).

Genus *Synaphris* Simon, 1894

Synaphris Simon 1894:589. Type species by monotypy and original designation *Grammonota letourneuxi* (Simon 1884). Levi and Levi 1962:29. Wunderlich 1980: 260; 2004:1083. Marusik and Lehtinen 2003: 148. Lopardo, Hormiga and Melic 2007:15.

Diagnosis.— Male *Synaphris* distinguished from those of *Cepheia* and *Africepheia* by the conductor, which does not obscure the cymbium in prolateral view (Fig. 55) as it does in *Cepheia* (Lopardo and Hormiga, in press: fig. 42) and *Africephia* (Fig. 17), and by the presence of both a lamella (Fig. 57) and a glabrous, membranous, basal region on the prolateral side of the cymbium (Fig. 70), both absent in *Cepheia* and *Africepheia*.

Female distinguished from *Africepheia* by having no more than 4 coils of the copulatory duct around itself (Figs. 41, 69), about a dozen in *Africepheia* (Fig. 7); from *Cepheia* by the copulatory duct, which loops around itself in *Synaphris* (Fig. 69), around the spermathecae in *Cepheia* (Lopardo and Hormiga, in press: fig. 40), and by having the carapace longer than wide (Fig. 37), as long as wide in both sexes of *Cepheia* (Lopardo and Hormiga, in press: fig. 3).

Description.— Male palpal tibia with nearly straight distal margin (Figs. 59, 74). Cymbium with retrolateral paracymbium (Figs. 40, 56, 68, 71), with a glabrous, membranous, basal region on the prolateral side (Figs. 55, 70). A membranous lamella arises from the embolus base (Figs. 57, 72; possibly absent in species from the Comoros, see Marusik and Lehtinen 2003); conductor with a

[1] In the measurement tables that follow, Tm position refers to the position of the metatarsal trichobothrium (see Methods, p. 22). Its values are not included in the column totals.

groove that receives the embolus on the prolateral side (Figs. 55, 70), sometimes extending around the front of the bulb onto the retrolateral side (Marusik et al. 2005: fig. 8); conductor with a subterminal apophysis near the distal part of the bulb (Figs. 58, 73).

Circumscription.— *Synaphris agaetensis* Wunderlich, 1987, *S. calerensis* Wunderlich, 1987, *S. dalmatensis* Wunderlich, 1980, *S. franzi* Wunderlich, 1987, *S. lehtineni* Marusik, Gnelitsa and Kovblyuk, 2005, *S. letourneuxi* (Simon, 1884; type species), *S. orientalis* Marusik and Lehtinen, 2003, *S. schlingeri* Miller, sp. nov, *S. saphrynis* Lopardo, Hormiga and Melic, 2007, *S. toliara* Miller, sp. nov.

Distribution.— Mediterranean Europe and Africa, Central Asia, Canary Islands, Madagascar.

Synaphris schlingeri Miller, sp. nov.

Figures 28, 35–52, 55–66

Material Examined.— Holotype: Male from Madagascar, **Toliara**, Parc National de Tsimanampetsotsa, Mitoho Cave, 6.4 km 77° ENE Efoetse, 17.4 km 170° S Beheloka, 24°2′50″S, 43°45′11″E, 40 m, 18–22 March 2002, spiny forest/thicket, EH18 pitfall trap, BLF 6161, B.L. Fisher (CASENT 9000566), deposited in CAS. Paratype: Madagascar: **Antsiranana**: Forêt d'Orangea, 3.6 km 128° SE Remena 12°15′32″S, 49°22′29″E, 90 m, 22–28 February 2001, littoral rainforest, EG21 pitfall trap, BLF3127, Fisher, Griswold et al. (CASENT 9007105) 1♂. *Toliara:* Forêt de Tsinjoriaky, 6.2 km 84° E Tsifota, 22°48′8″S, 43°25′14″E, 70 m, 6–10 March 2002, spiny forest/thicket, EH11 sifted litter (leaf mold, rotten wood), BLF 5966, B.L. Fisher et al. (CASENT 9012956), 1♂; [same locality] (CASENT 9014413) 1♀; Mahafaly Plateau, 6.2 km 74° ENE Itampolo, 24°39′13″S, 43°59′48″E, 80 m, 21–25 February 2002, spiny forest/thicket, EH18 pitfall trap, BLF 5758, B.L. Fisher et al. (CASENT 9013288), 1♀; Réserve Spéciale de Cap Sainte Marie, 12.3 km 262° W Marovato, 25°34′54″S, 45°10′6″E, 200 m, 11–15 February 2002, spiny forest/thicket, EH11 sifted litter (leaf mold, rotten wood), BLF 5500, B.L. Fisher et al. (CASENT 9000318), 1♀.

Etymology.— Epithet a patronymic in honor of Evert Schlinger, whose foundation supported this research and has contributed greatly to arachnological and entomological research, especially in Madagascar.

Diagnosis.— Male of *S. schlingeri* and *S. toliara* distinguished from *S. agaetensis* and *S. calerensis* (Canary Islands) by the presence of a grooved conductor that accommodates the embolus (Figs. 55, 70; Marusik and Lehtinen 2003); from *S. orientalis* (Turkmenistan), *S. lehtineni* (Ukraine), *S. dalmatensis* (Croatia), and *S. letourneuxi* (Egypt) by the much shorter embolus and at least from *S. orientalis* and *S. lehtineni* by the lack of a cymbial groove that conducts the embolus (Fig. 55; unknown for *S. dalmatensis* and *S. letourneuxi*) and the form of the lamella, which is much narrower at its base than at its widest point in *S. orientalis* (Marusik et al. 2005: fig. 15) and *S. lehtineni* (Marusik et al. 2005: fig. 7), nearly as wide at the base as the widest point in *S. schlingeri* (Fig. 57) and *S. toliara* (Fig. 72). Male of *S. schlingeri* distinguished from *S. toliara* by the much smaller cheliceral keel (Fig. 48) than either the female of *S. schlingeri* (Fig. 49) or either sex of *S. toliara* (Figs. 53–54), by having more strongly developed TA and SA in *S. toliara* (Fig. 73), and by the form of the embolus, which is shorter and continuous with the embolic base in *S. schlingeri* (Fig. 55), longer with a clearly defined base in *S. toliara* (Fig. 70). Also, *S. toliara* have a tegular membrane with a fringed tip running parallel to the lamella (Figs. 72–73); this appears to be unique among synaphrids.

Female of *S. schlingeri* distinguished from *S. agaetensis*, *S. calerensis*, and *S. franzi* (Canary Islands) by the lack of an oval depression in the epigynal area (Marusik and Lehtinen 2003); from *S. lehtineni* by the much narrower, loosely coiled copulatory ducts (Fig. 41); from *S. toliara* by the larger spermathecae separated by less than their diameter (Fig. 28), 4× coil of the copulatory duct around itself (Fig. 41; 2× in *S. toliara*), ventral copulatory openings and lack of a Y-shaped plate in *S. schlingeri* (Fig. 60; lateral copulatory openings at the base of a Y-shaped plate in *S. toliara*).

Description.— Carapace brown. Sternum brown. Chelicerae dusky yellow to brown, keel on anterior margin relatively small. Legs yellow to brown. Abdomen medium to dark gray with four round dorsal sigilla.

Male palp: Cymbium without a groove that guides the embolus (compare Fig. 55 with fig. 6 in Marusik et al. 2005). Conductor with deep groove (compare Fig. 55 with fig. 11 in Marusik et al. 2005). Embolus continuous with the base (Fig. 55). Lamella with a wide base (Fig. 57).

Epigynum: Ventral plate flat with ventral copulatory openings (Fig. 60). Copulatory duct loops around itself four times (Fig. 41). Ducts narrow, loosely coiled. Spermathecae separated by less than half their diameter (Fig. 28).

Male (holotype): Total length 0.85, carapace 0.41 long, 0.35 wide, clypeus 0.07, sternum 0.29 long, 0.25 wide, coxa IV separated by 1.64 times their width. Leg measurements:

	I	II	III	IV	Palp
Femur	0.33	0.31	0.26	0.33	0.09
Patella	0.11	0.11	0.10	0.11	0.04
Tibia	0.26	0.24	0.20	0.27	0.06
Metatarsus	0.19	0.18	0.17	0.19	–
[Tm position	0.46	0.44]	–	–	–
Tarsus	0.21	0.21	0.19	0.19	0.09
Total	**1.10**	**1.05**	**0.92**	**1.09**	**0.28**

Female (paratype): Total length 0.92, carapace 0.36 long, 0.31 wide, clypeus 0.07, sternum 0.23 long, 0.22 wide, coxa IV separated by 1.54 times their width. Leg measurements:

	I	II	III	IV	Palp
Femur	0.28	0.28	0.23	0.30	0.08
Patella	0.10	0.10	0.09	0.09	0.03
Tibia	0.20	0.19	0.15	0.23	0.05
Metatarsus	0.16	0.15	0.14	0.17	–
[Tm position	0.45	0.48]	–	–	–
Tarsus	0.18	0.18	0.17	0.18	0.06
Total	**0.92**	**0.90**	**0.78**	**0.97**	**0.22**

Variation.— *Male* (4): Total length 0.73–0.85 (0.78), carapace length 0.37–0.41 (0.38), carapace width 0.30–0.35 (0.33), clypeus height 0.04–0.07 (0.06), sternum length 0.23–0.29 (0.25), sternum width 0.21–0.25 (0.23), coxa IV separated by 1.50–1.92 (1.64) times their width.

Female (4): Total length 0.71–0.92 (0.85), carapace length 0.36–0.37 (0.36), carapace width 0.31–0.34 (0.32), clypeus height 0.04–0.07 (0.06), sternum length 0.23–0.24 (0.23), sternum width 0.22–0.23 (0.23), coxa IV separated by 1.50–1.69 (1.54) times their width.

Distribution.— Known from coastal parts of Antsiranana province in the north and Toliara province in the south of Madagascar (Fig. 80). Presumably, this species can also be found in intervening parts of Madagascar. *Synaphris schlingeri* and *S. toliara* are syntopic at least in southern Madagascar, but *S. toliara* is much more abundant in collections.

Synaphris toliara Miller, sp. nov.

Figures 53–54, 67–79.

Material Examined.— Holotype: Male from Madagascar, **Toliara**, Forêt de Tsinjoriaky, 6.2 km 84° E Tsifota, 22°48′8″S, 43°25′14″E, 6–10 March 2002, 70 m, spiny forest/thicket, EH11 sifted litter (leaf mold, rotten wood), BLF5966, B.L. Fisher, et al. (CASENT 9012956), deposited in CAS. Paratypes: Madagascar: **Toliara**: Forêt de Beroboka, 5.9 km 131° SE Ankidranoka, 22°13′59″S, 43°21′59″E, 80 m, 12–16 March 2002, tropical dry forest, EF19 sifted litter (leaf mold, rotten wood), BLF 6070, B.L. Fisher et

al. (CASENT 9000643), 1♂, 1♀; [same locality] (CASENT 9000645), 1♀; Forêt de Tsinjoriaky, 6.2 km 84°E Tsifota, 22°48′8″S, 43°25′14″E, 70 m, 6–10 March 2002, spiny forest/thicket, EH11 sifted litter (leaf mold, rotten wood), BLF 5966, B.L. Fisher et al. (CASENT 9012956), 8♂, 11♀; Parc National de Tsimanampetsotsa, Mitoho Cave, 6.4 km 77° ENE Efoetse, 17.4 km 170° S Beheloka, 24°2′50″S, 43°45′11″E, 40 m, 18–22 March 2002, spiny forest/thicket, EH18 pitfall trap, BLF 6161, B.L. Fisher (CASENT 9000566), 1♀; Mahafaly Plateau, 6.2 km 74° ENE Itampolo, 24°39′13″S, 43°59′48″E, 80 m, 21–25 February 2002, spiny forest/thicket, EH18 pitfall trap, BLF 5763, B.L. Fisher et al. (CASENT 9014273), 1♂; Parc National d'Andohahela, Forêt de Manantalinjo, 33.6 km ENE Amboasary, 7.6 km 99° E Hazofotsy, 24°49′1″S, 46°36′36″E, 150 m, 12–16 January 2002, spiny forest/thicket, EH11 sifted litter (leaf mold, rotten wood), BLF 4810, B.L. Fisher et al. (CASENT 9012035), 1♂; Réserve Spéciale de Cap Sainte Marie, 12.3 km 262° W Marovato, 25°34′54″S, 45°10′6″E, 200 m, 11–15 February 2002, spiny forest/thicket, EH11 sifted litter (leaf mold, rotten wood), BLF 5500, B.L. Fisher et al. (CASENT 9000318), 5♂, 11♀.

Etymology.— Named for the province in Madagascar from which all known specimens of this species were collected. The epithet a noun in apposition.

Diagnosis.— For male, see diagnosis of *S. schlingeri*.

Female of *S. toliara* distinguished from *S. agaetensis*, *S. calerensis*, and *S. franzi* Wunderlich, 1987 (Canary Islands) by the lack of an oval depression in the epigynal area (Marusik and Lehtinen 2003); from *S. lehtineni* and *S. schlingeri* by having a 2× coil of the copulatory duct around itself (Fig. 69; 3–4× in *S. lehtineni* and *S. schlingeri*); further distinguished from *S. schlingeri* by having smaller spermathecae separated by more than their diameter (Fig. 79), and by the presence of a Y-shaped plate with the copulatory openings at the base (Figs. 77–78).

Synaphris toliara is the smallest synaphrid (carapace length 0.31–0.33); only *S. schlingeri* (carapace length 0.36–0.41) and *S. agaetensis* (carapace length 0.38) have a carapace length less than 0.4.

Description.— Carapace dark yellow with darker margin. Sternum dark yellow to brown, chelicerae dark yellow. Legs dark yellow. Abdomen dark gray to black with four round dorsal sigilla.

Male palp: Cymbium without a groove that guides the embolus (compare Fig. 70 with fig. 6 in Marusik et al. 2005). Conductor with deep groove (compare Fig. 70 with fig. 11 in Marusik et al. 2005). Embolus narrow with bulbus base (Figs. 67, 70). Lamella with a wide base (Fig. 72). Tegular membrane with terminal fringe runs parallel to lamella (Figs. 72–73). Apophysis near tip of conductor strong (Figs. 68, 73).

Epigynum: Ventral plate with a pair of ventrolaterally projecting keels, lateral copulatory openings (Figs. 77–78). Copulatory duct loops around itself two times (Fig. 69). Ducts thick, loosely coiled. Spermathecae separated by about their diameter (Fig. 79).

Male (holotype): Total length 0.63, carapace 0.31 long, 0.30 wide, clypeus 0.07, sternum 0.22 long, 0.22 wide, coxa IV separated by 1.33 times their width. Leg measurements:

	I	II	III	IV	Palp
Femur	0.33	0.30	0.26	0.33	0.09
Patella	0.11	0.11	0.09	0.09	0.04
Tibia	0.25	0.24	0.20	0.26	0.07
Metatarsus	0.20	0.20	0.17	0.20	–
[Tm position	0.43	0.44]	–	–	–
Tarsus	0.22	0.22	0.19	0.21	0.12
Total	**1.11**	**1.07**	**0.91**	**1.09**	**0.32**

Female (paratype, CASENT 9012956): Total length 0.81, carapace 0.33 long, 0.31 wide, clypeus 0.08, sternum 0.24 long, 0.23 wide, coxa IV separated by 1.69 times their width. Leg measurements:

	I	II	III	IV	Palp
Femur	0.33	0.30	0.27	0.33	0.06
Patella	0.10	0.11	0.11	0.11	0.03
Tibia	0.25	0.24	0.20	0.26	0.06
Metatarsus	0.20	0.19	0.18	0.19	–
[Tm position	0.49	0.40]	–	–	–
Tarsus	0.22	0.21	0.19	0.19	0.07
Total	**1.10**	**1.05**	**0.95**	**1.08**	**0.22**

Variation.— *Male* (4): Total length 0.63–0.67 (0.66), carapace length 0.31–0.32 (0.31), carapace width 0.29–0.30 (0.29), clypeus height 0.07–0.09 (0.08), sternum length 0.22–0.23 (0.22), sternum width 0.19–0.22 (0.21), coxa IV separated by 1.33–1.58 (1.45) times their width.

Female (4): Total length 0.68–0.81 (0.72), carapace length 0.31–0.33 (0.32), carapace width 0.30–0.33 (0.31), clypeus height 0.07–0.08 (0.08), sternum length 0.23–0.24 (0.24), sternum width 0.22–0.23 (0.23), coxa IV separated by 1.36–1.75 (1.62) times their width.

Distribution.— Known from the southern coast of Madagascar, Toliara province (Fig. 80).

Discussion

Anatomy and Synapomorphy.— Recent anatomical work on *Synaphris*, based largely on scanning electron microscopy, has been impressive (Lopardo et al. 2007; Marusik et al. 2005; Marusik and Lehtinen 2003), providing a solid basis for comparing these tiny, obscure spiders to their relatives. Until recently (Lopardo and Hormiga, in press), the same could not be said for *Cepheia*. Schütt (2003) included *Cepheia* in her cladistic analysis of higher symphytognathoid spiders. Although some important observations were documented in the data matrix, precious few images were published.

The form of the tibial bothrium was proposed as a putative synapomorphy for Synaphridae based on scanning electron microscopy of a central Asian *Synaphris* species (Marusik and Lehtinen 2003). This bothrium has a deep central notch and small pit (Marusik and Lehtinen 2003: fig. 23). However, no synaphrid subsequently studied using scanning electron microscopy has been found to exhibit such a bothrium (Figs. 15, 51; Lopardo and Hormiga, in press; Lopardo et al. 2007; Marusik et al. 2005). Clearly, the bothrium form discussed in Marusik and Lehtinen (2003) is not a synapomorphy for Synaphridae or even universal within *Synaphris*. The typical bothrium form in Synaphridae is hooded, a characteristic shared at least with Anapidae (Platnick and Forster 1989: fig. 15), Micropholcommatidae (Forster and Platnick 1984: figs. 374–375), Mysmenidae (Griswold 1985: fig. 8), Theridiosomatidae (unpublished data), Malkaridae (Platnick and Forster 1987: fig. 18), Linyphiidae (Hormiga 2002: fig. 46G), Synotaxidae (Forster et al. 1990: figs. 144, 260), and many non-araneoid spider families (Forster and Platnick 1984; Griswold et al. 2005); bothria in other araneoid families including araneids (Griswold et al. 1998: fig. 22E), theridiids (Agnarsson 2004: figs. 31G, 69E, 74D), cyatholipids (Griswold 2001: fig. 6B), and mimetids (Griswold et al. 2005: fig. 149G) are evenly rounded and lack a hood.

Marusik et al. (2005) showed that the tarsi of a central Asian *Synaphris* species are divided into two pseudosegments. They suggested that this could be synapomorphic for Synaphridae. Malagasy *Synaphris* and *Africepheia* also have pseudosegmented tarsi (Fig. 13). However, this feature is not universal among synaphrids (Lopardo and Hormiga, in press; Lopardo et al. 2007).

Marusik and Lehtinen (2003) mentioned (but provided no figures of) a prominent subdistal lyriform organ on the metatarsus, noting that it is unique among the higher araneoids. However, such an organ is actually found in several araneoid families (Lopardo et al. 2007). Lopardo et al.

(2007) suggest that the contraction at the metatarsus-tibia joint could be synapomorphic for the family. The presence of such a contraction in Malagasy *Synaphris* and *Africepheia* corroborates the hypothesis that this feature is synapomorphic for the family (Fig. 12).

The conformation of the cheliceral dentation, only one large keel on the anterior margin (Figs. 11, 47–49, 53–54), is a useful character for diagnosing Synaphridae (Wunderlich 1995a). Anapids, micropholcommatids, symphytognathids, mysmenids, theridiosomatids, cyatholipids, and synotaxids (among others) all have more teeth (Forster et al. 1990; Griswold et al. 1998; Griswold 2001; Schütt 2003). The enigmatic six-eyed genera *Iardinis* and *Crassignatha* may have synaphrid-type cheliceral dentation (Brignoli 1978: fig. 6; Wunderlich 1995b: fig. 16).

The labral spur was considered a synapomorphy of Anapidae until it was discovered in Micropholcommatidae (Schütt 2000: fig. 5D–F, 2003; but see Platnick and Forster 1986). Schütt (2003) coded *Cepheia* as lacking the labral spur (Fig. 46); *Africepheia* and *Synaphris* (Fig. 46; Lopardo et al. 2007: fig. 5) also lack the spur.

Male and female *Synaphris* appear to have a small pore plate on the prosoma above the endite. The sulcus is shallow and has a single pore (Figs. 42, 45); no such structure was seen in *Africepheia*. Similar (often more elaborate) structures are known in some anapids and micropholcommatids (Platnick and Forster 1986, 1989; Schütt 2003).

Spinneret Spigot Morphology.— Male and female synaphrids have one aggregate gland spigot and one flagelliform gland spigot on the PLS (Figs. 30, 34, 64, 66). A triplet of two aggregate gland spigots plus a flagelliform gland spigot on the PLS is a key synapomorphy of araneoid spiders (Coddington 1986; Griswold et al. 1998) although reductions and losses are not uncommon (Agnarsson 2004; Miller and Hormiga 2004). The loss of one aggregate gland spigot appears to be synapomorphic for Synaphridae. In most araneoids, the triplet is lost or vestigial in adult males, although it remains functional in some groups including cyatholipids (Griswold 2001), some linyphiids (Miller and Hormiga 2004), and the symphytognathoid families (Griswold et al. 1998; Schütt 2003).

Synaphrids have only one cylindrical gland spigot located on the PLS of females (Figs. 30, 64), a character state shared with cyatholipids and many synotaxids; other araneoids typically have two on the PLS (Griswold et al. 1998). Lopardo et al. (2007) note several other similarities between cyatholipids and synaphrids that may be phylogenetically significant. This contradicts Schütt's (2003) cladistic hypothesis that synaphrids belong among the symphytognathoid families; cyatholipids were not included in Schütt's study.

Cepheia longiseta is the only synaphrid with a cylindrical gland spigot on the PMS (Lopardo and Hormiga, in press; Lopardo et al. 2007). Two other enigmatic objects, one on the PMS and one on the PLS of *Cepheia longiseta*, were identified by Lopardo and collaborators (Lopardo and Hormiga, in press; Lopardo et al. 2007) as chemosensory setae, not spigots. To my knowledge, chemosensory setae have not been previously identified on spider spinnerets. Schütt (2003) identified the questionable object on the PMS as a minor ampullate gland spigot, even though the object is located on the anterior median part of the spinneret rather than the posterior part as is typical for this spigot (Coddington 1989). The questionable object on the PLS could alternatively be interpreted as an aciniform gland spigot.

Males and females of *Synaphris* and *Africepheia* have only one spigot on the PMS. This is tentatively identified as a minor ampullate gland spigot based on its relatively large size and the observation that the number of aciniform gland spigots is often homoplasious, whereas changes in the number of ampullate gland spigots are rare in araneoid evolution (Griswold et al. 1998; Miller and Hormiga 2004). However, if *Cepheia longiseta* has aciniform gland spigots and no minor ampullate gland spigot (Lopardo and Hormiga, in press; Lopardo et al. 2007), perhaps the spigot in

Synaphris and *Africepheia* is actually an aciniform gland spigot. This would imply that the loss of the minor ampullate gland spigot is synapomorphic for the family and is more parsimonious than independent losses of one kind of spigot in *Cepheia* and another kind in the other synaphrid genera.

Araneoid spiders typically have the spinning field of the ALS divided into two distinct sections, the piriform gland spigot region and the major ampullate gland spigot region (e.g., Griswold et al. 1998: fig. 28B). The reduction or loss of this separation is a putative synapomorphy for Synaphridae (Fig. 32; Lopardo et al. 2007; Schütt 2003).

Conclusion

A sustained, large scale effort to inventory arthropods in Madagascar has provided a wealth of raw material facilitating new discoveries about the fauna of this biodiversity hotspot (Fisher 2005). Nearly all of the specimens studied for this research were collected by Fisher and collaborators as part of his inventory initiative. The detection of synaphrids in Madagascar represents a major range extension for the family. Until recently, synaphrids were an obscure group with few useful illustrations or descriptions. Now, Synaphrids are enjoying a great deal of attention from morphologists (Lopardo and Hormiga, in press; Lopardo et al. 2007; Marusik et al. 2005; Marusik and Lehtinen 2003). As arachnologists become more familiar with synaphrids, it becomes much more likely that they will be discovered in other parts of the world.

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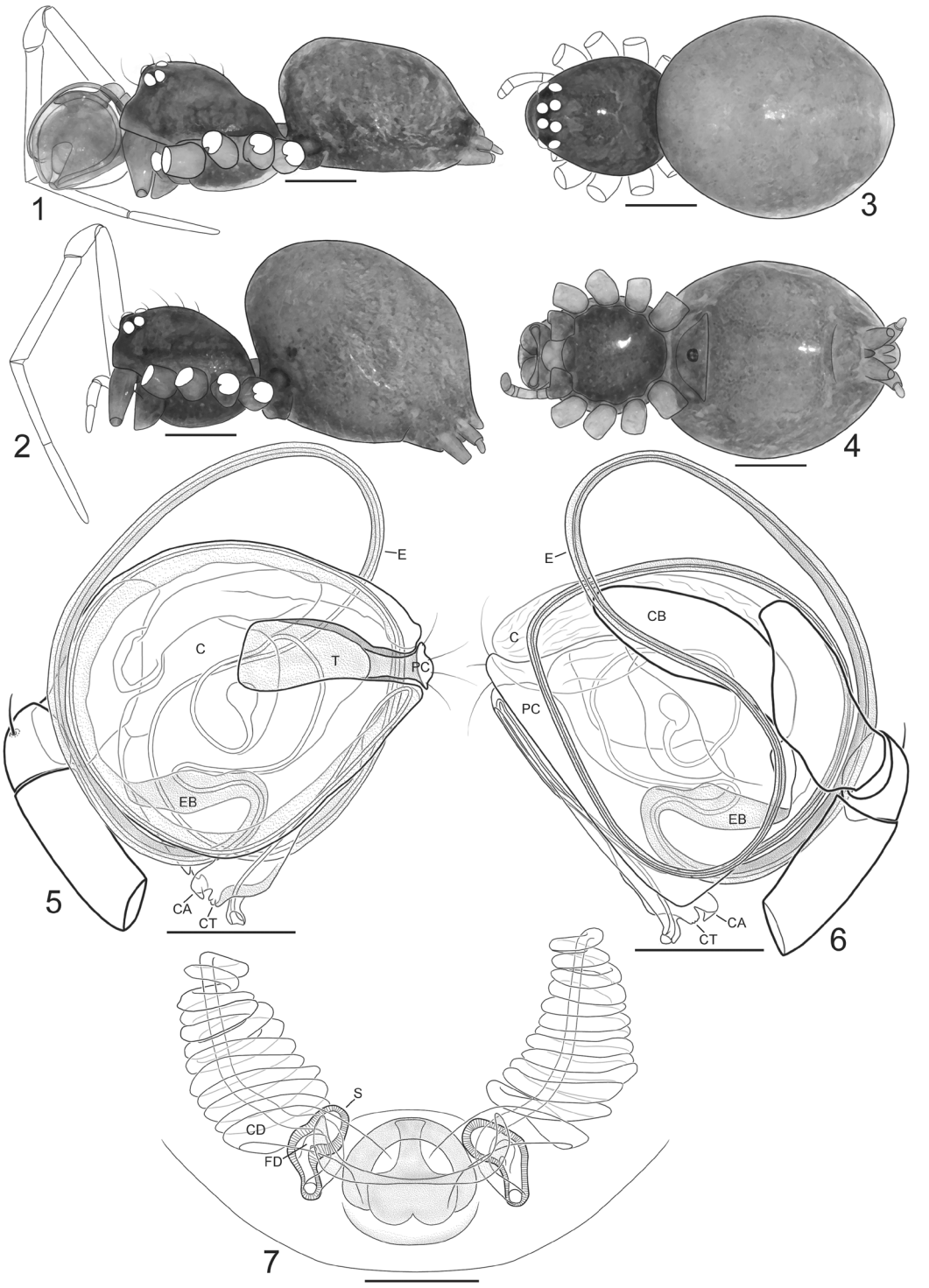
FIGURES 1–7 (right). *Africepheia madagascariensis*. 1, 5–6, male; 2–4, 7–8, female. 1–2. Habitus, lateral. 3. Habitus, dorsal. 4. Habitus, ventral. 5–6. Palp. 5. Prolateral. 6. Retrolateral. 7. Cleared epigynum, dorsal. Scale bars: 1–4 = 0.2 mm; 5–6 = 0.1 mm; 7 = 0.05 mm. For abbreviations see Table 1 (p. 22).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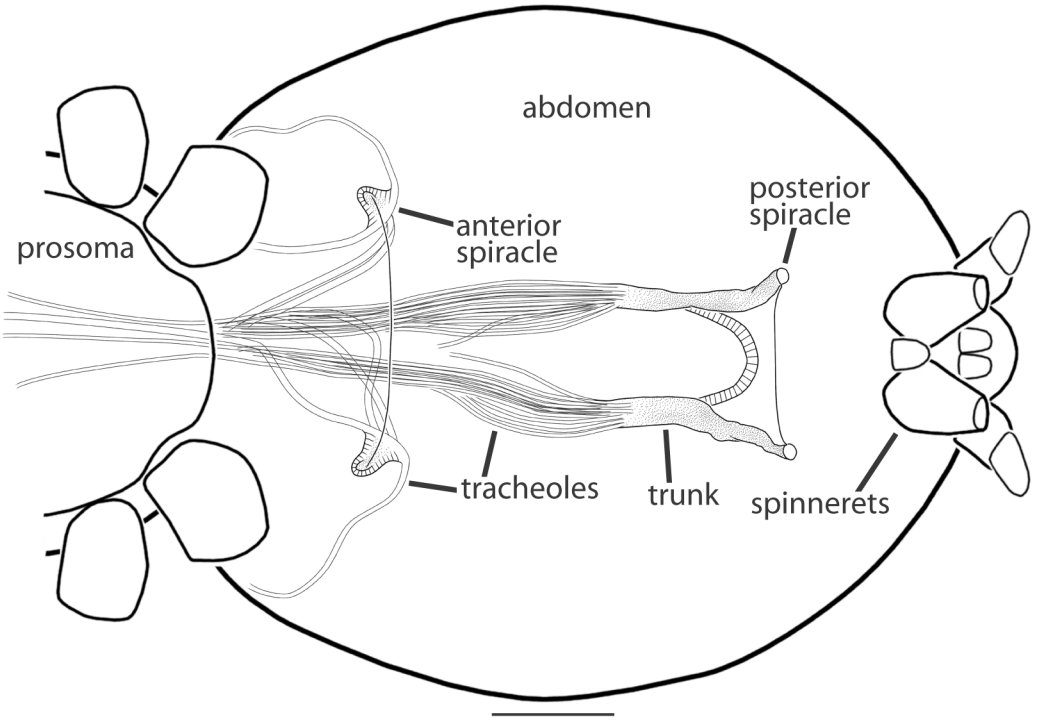
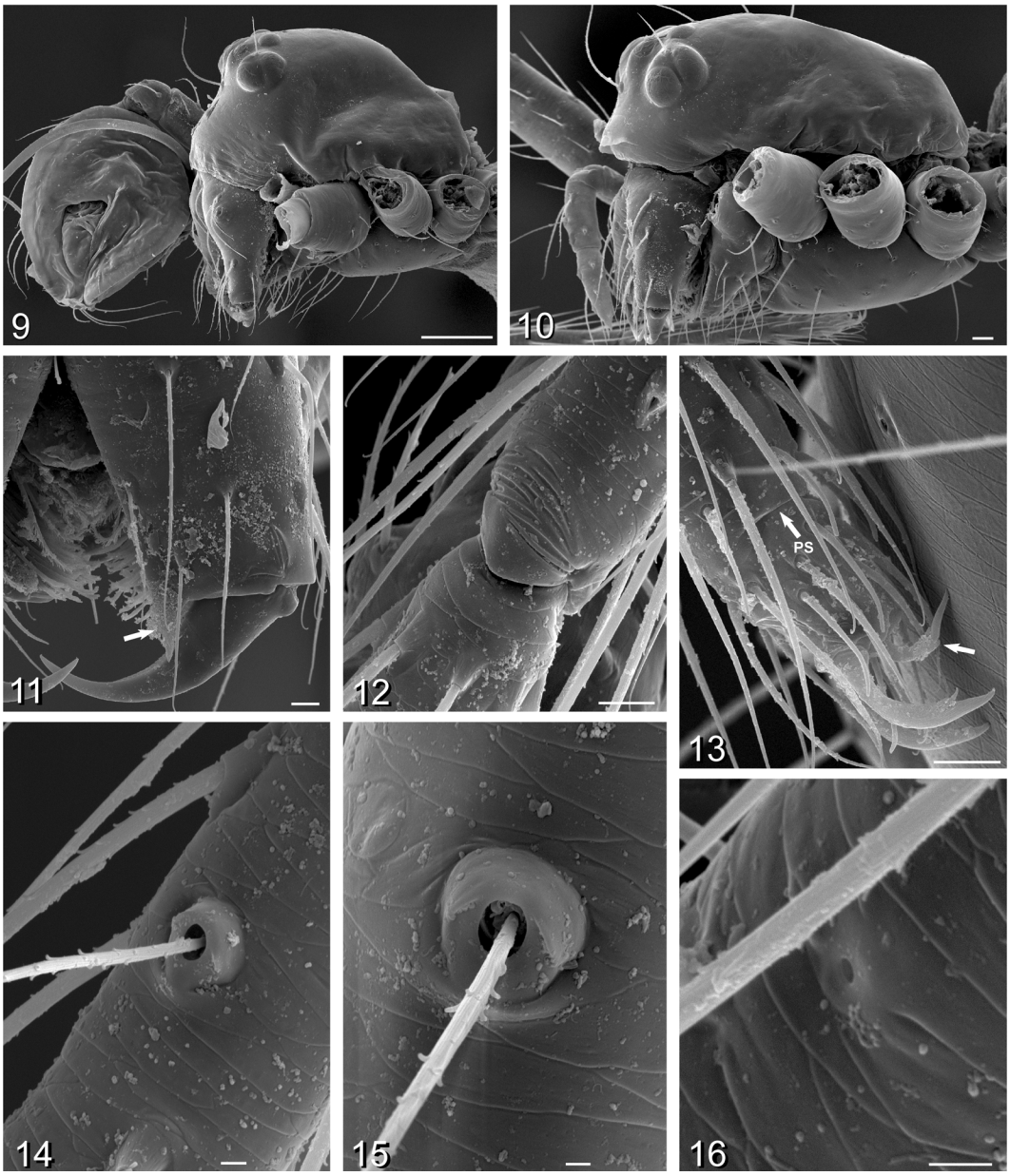
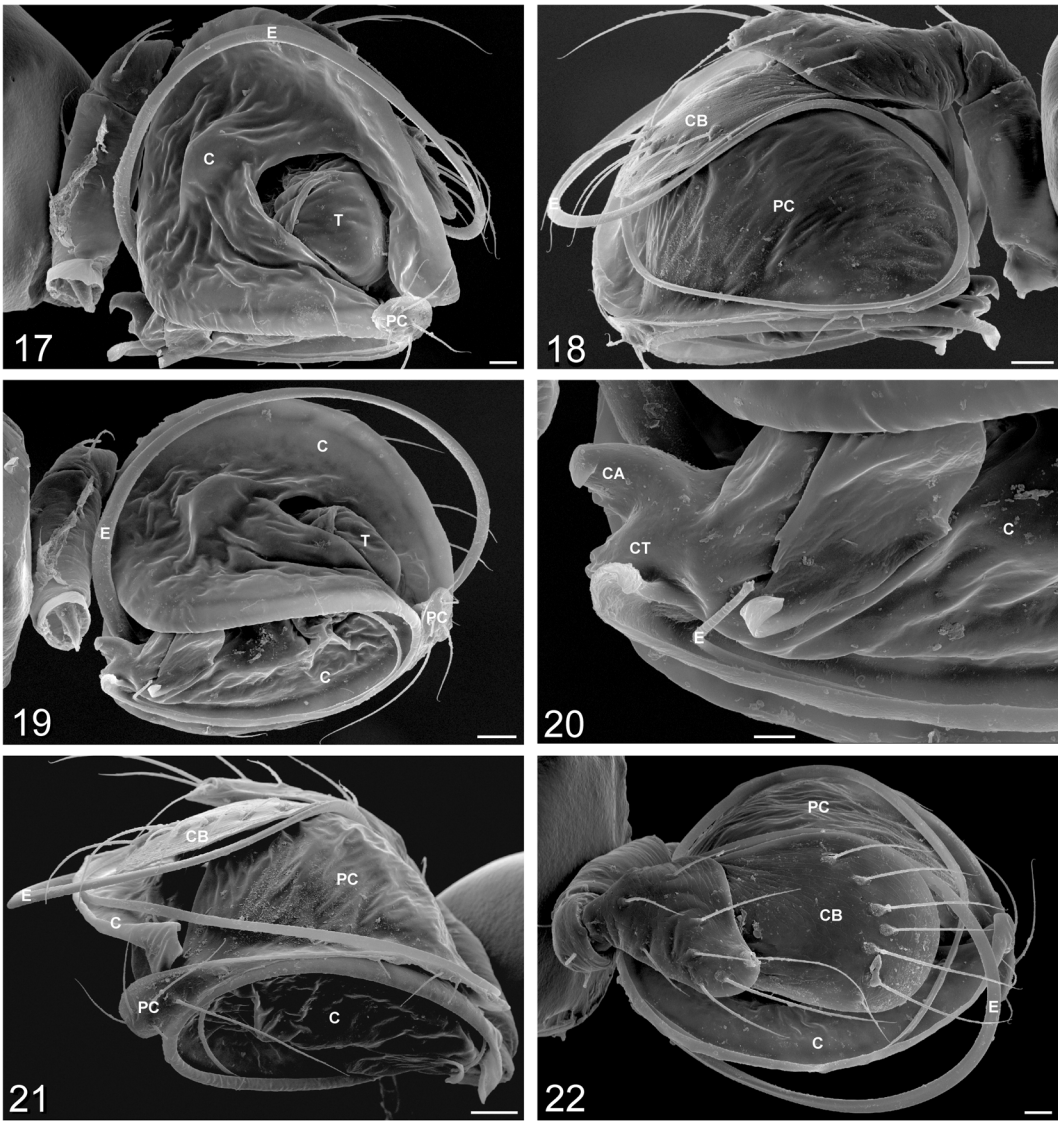


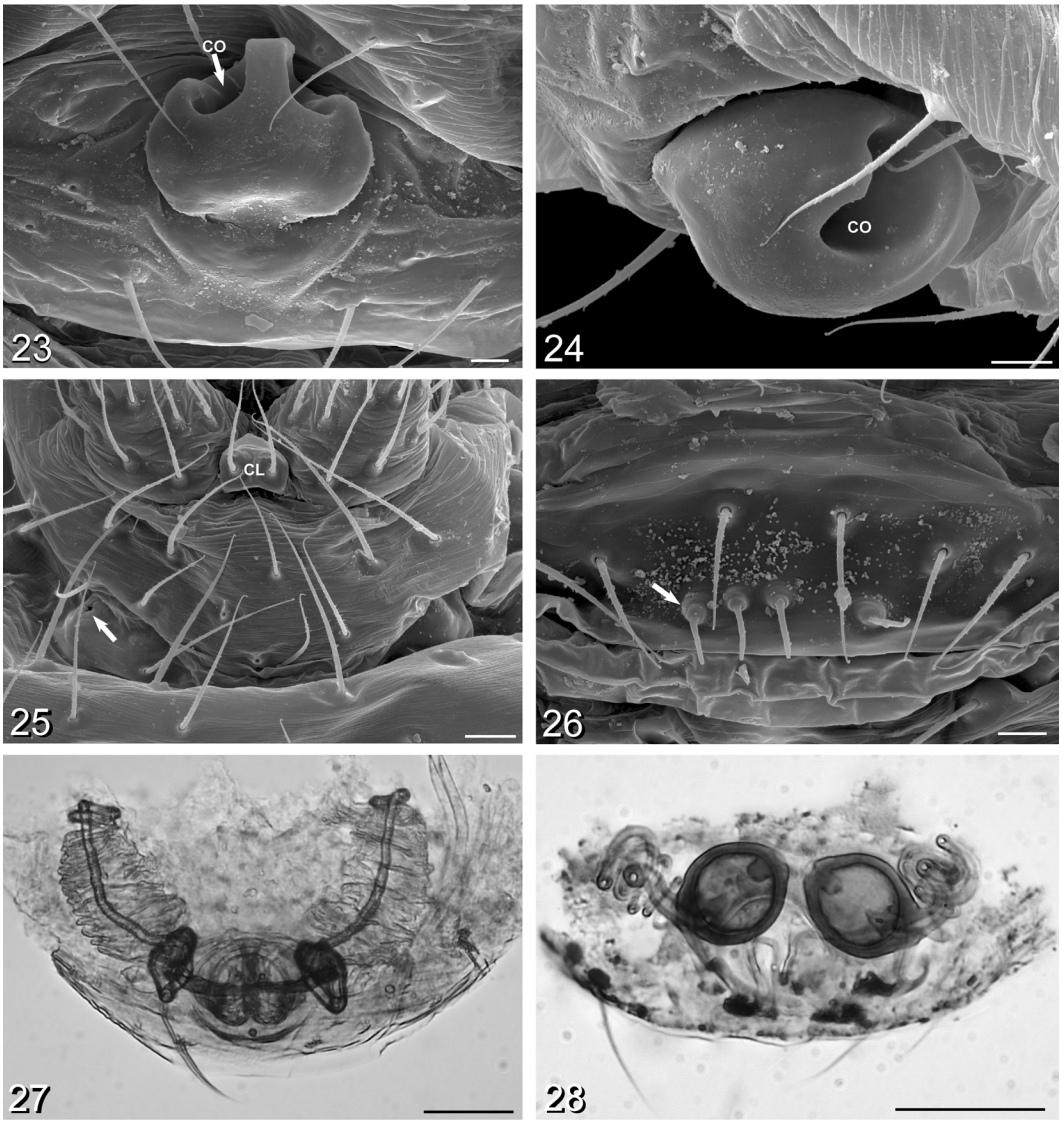
FIGURE 8. *Africepheia madagascariensis*. Cleared female showing respiratory system, ventral view. Scale bar = 0.01 mm.



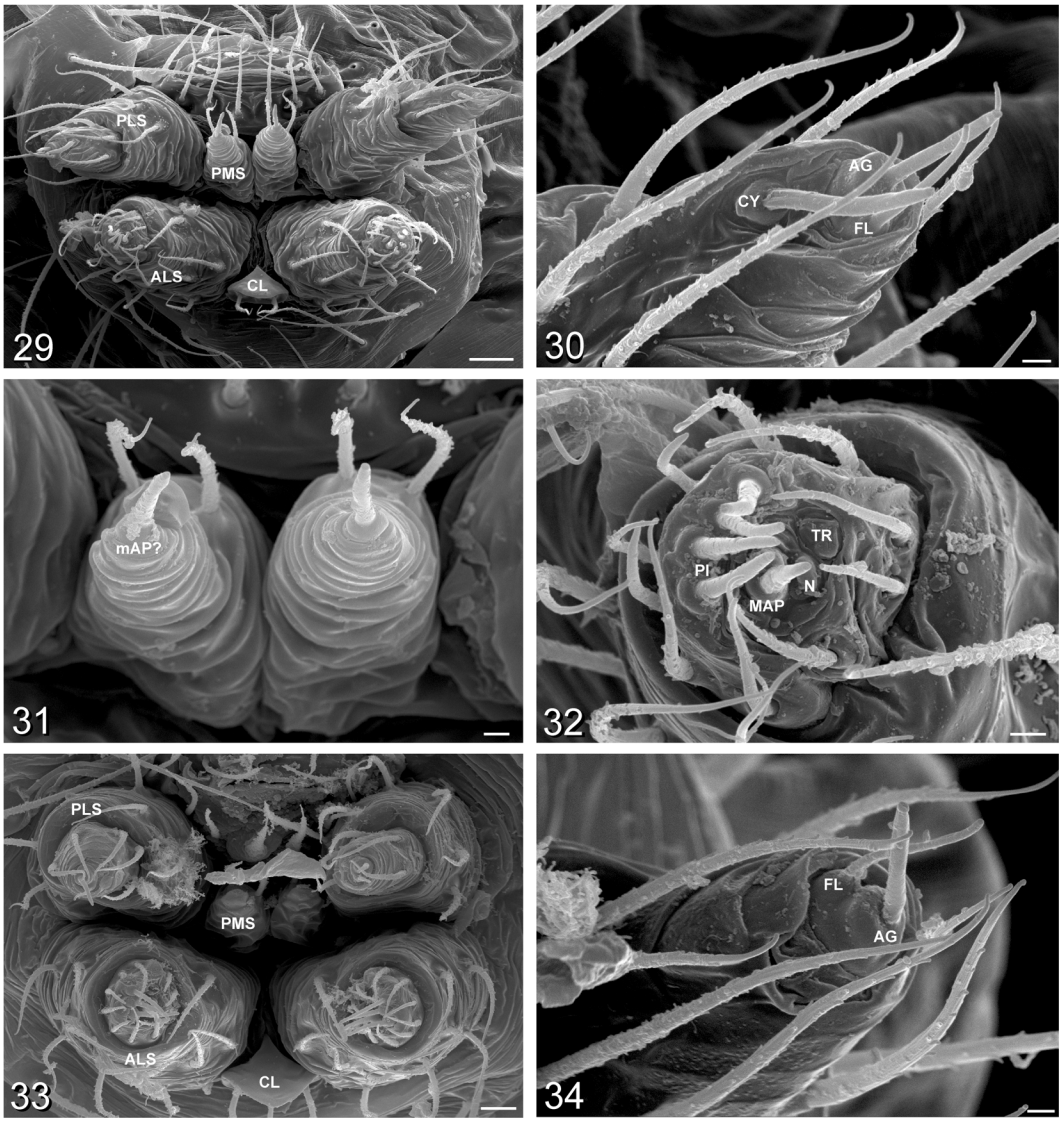
FIGURES 9–16. *Africepheia madagascariensis*. 9, male; 10–16, female. 9–10, Prosoma, lateral. 11. Chelicera, anterior, arrow indicates keel. 12. Junction of metatarsus and tibia I, note tapered tip of metatarsus and transverse ridges. 13. Tarsus I, note pseudosegmentation, unlabelled arrow indicates dorsal denticle on inferior claw. 14. Trichobothrium on metatarsus I. 15. Trichobothrium on tibia I. 16. Tarsal organ. Scale bars: 9 = 100 µm; 10 = 20 µm; 11–13 = 10 µm; 14, 16 = 3 µm; 15 = 2 µm. For abbreviations see Table 1 (p. 22).



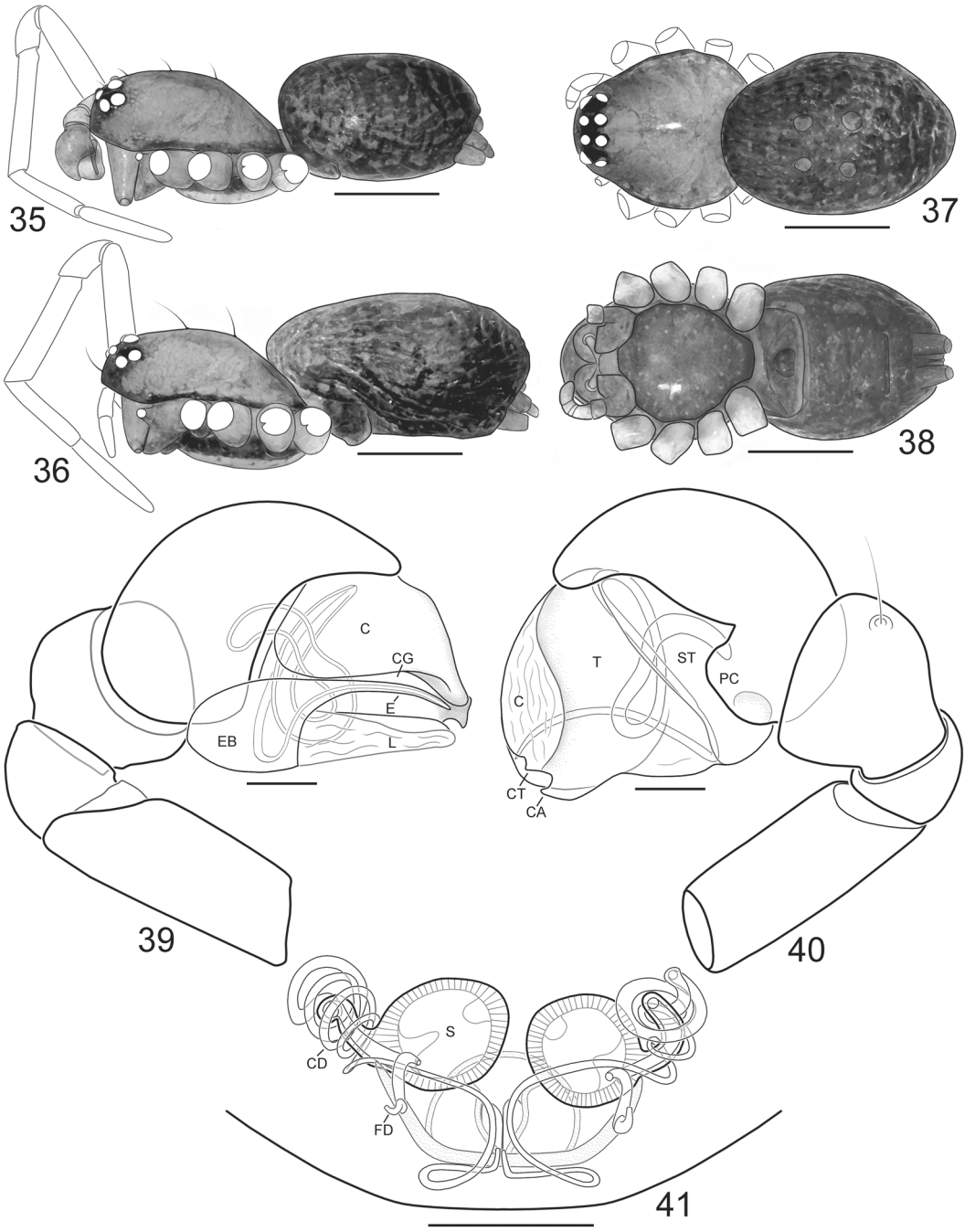
FIGURES 17–22. *Africepheia madagascariensis*, male palp. 17. Prolateral. 18. Retrolateral. 19. Ventral. 20. Proximal part of tegulum showing terminal and subterminal apophyses and embolic tip. 21. Apical. 22. Dorsal. Scale bars: 17, 22 = 20 µm; 18–19, 21 = 30 µm; 20 = 10 µm. For abbreviations see Table 1 (p. 22).



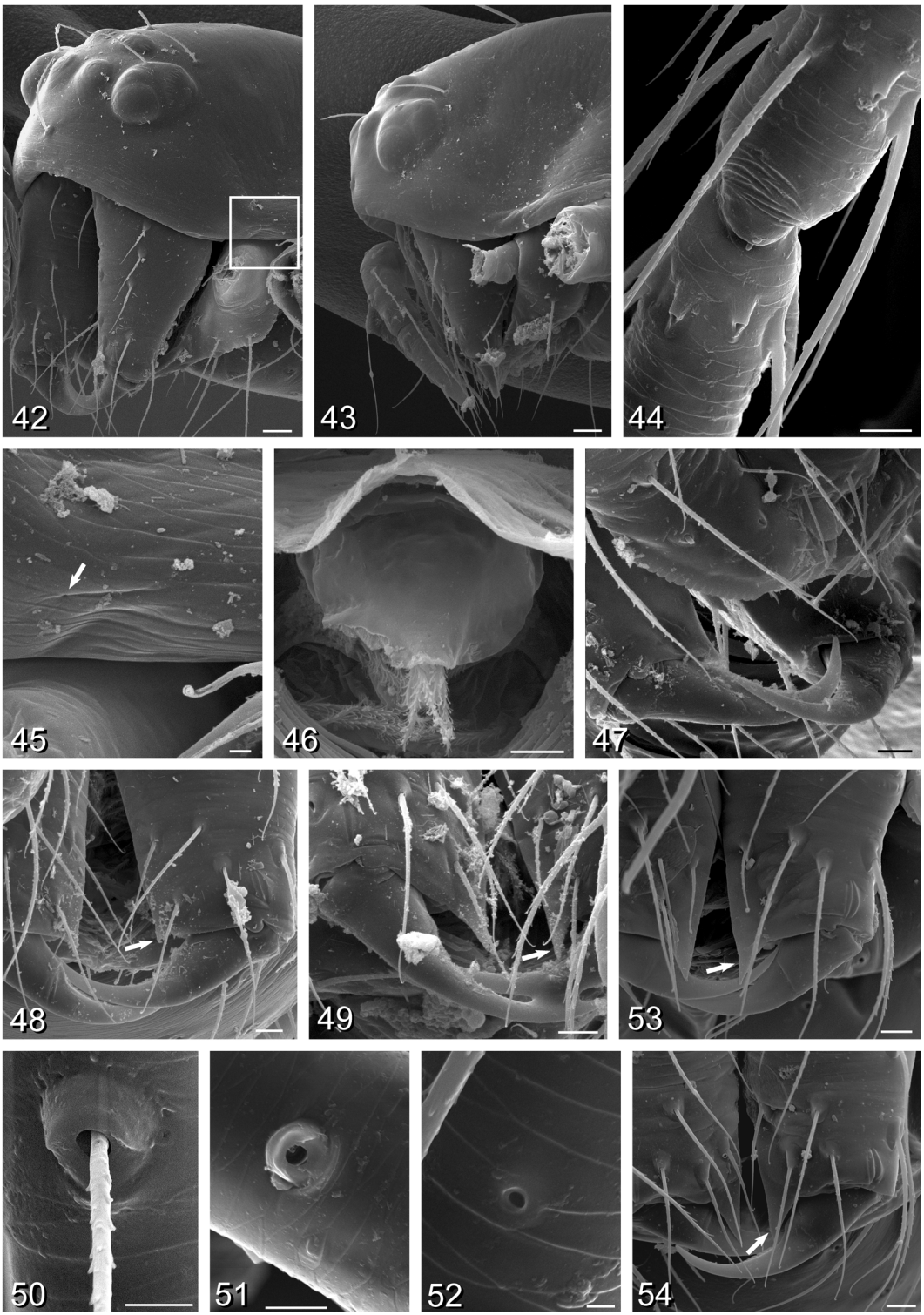
FIGURES 23–28. 23–27. *Africepheia madagascariensis*; 28. *Synaphris schlingeri*. 23–25, 27–28, female; 26, male. 23–24. Epigynum. 23. Ventral. 24. Lateral. 25. Posterior part of abdomen, ventral view, arrow indicates one of two tracheal openings. 26. Epiandrous gland spigots, one of four indicated by arrow. 27–28. Cleared epigynum, dorsal. Scale bars: 23–24, 26 = 10 μm; 25 = 20 μm; 27–28 = 0.05 mm. For abbreviations see Table 1 (p. 22).



FIGURES 29–34. *Africepheia madagascariensis*. 29–32, female; 33–34, male. 29, 33. Spinnerets. 30, 34. Posterior lateral spinneret. 31. Posterior median spinnerets. 32. Anterior lateral spinneret. Scale bars: 29 = 20 µm; 30–32 = 3 µm; 33 = 10 µm; 34 = 2 µm. For abbreviations see Table 1 (p. 22).



FIGURES 35–41. *Synaphris schlingeri*. 35, 39–40, male; 36–38, 41, female. 35–36. Habitus, lateral. 37. Habitus, dorsal. 38. Habitus, ventral. 39–40. Palp. 39. Prolateral. 40. Retrolateral. 41. Cleared epigynum, dorsal. Scale bars: 35–38 = 0.2 mm; 39–41 = 0.05 mm. For abbreviations see Table 1 (p. 22).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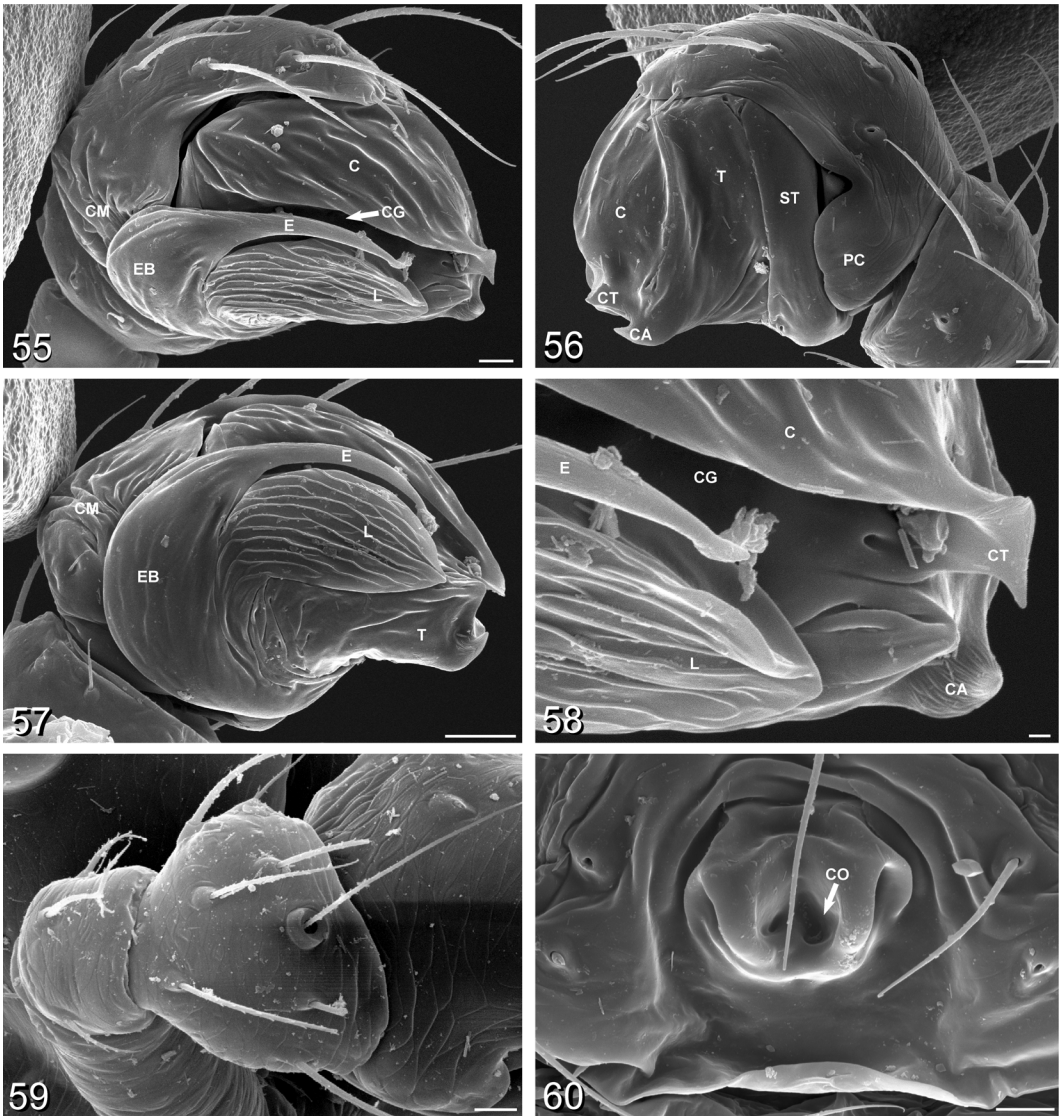
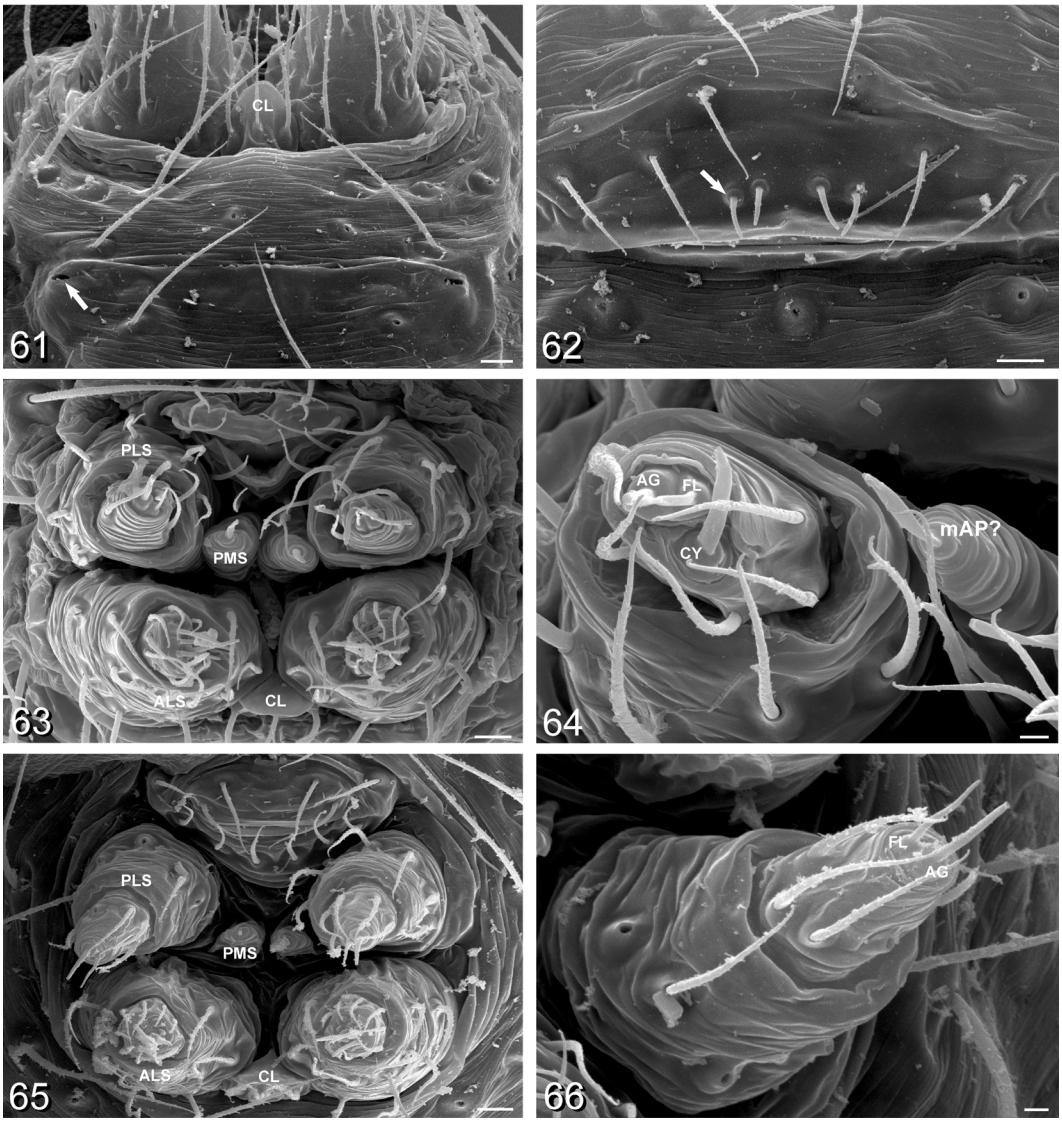
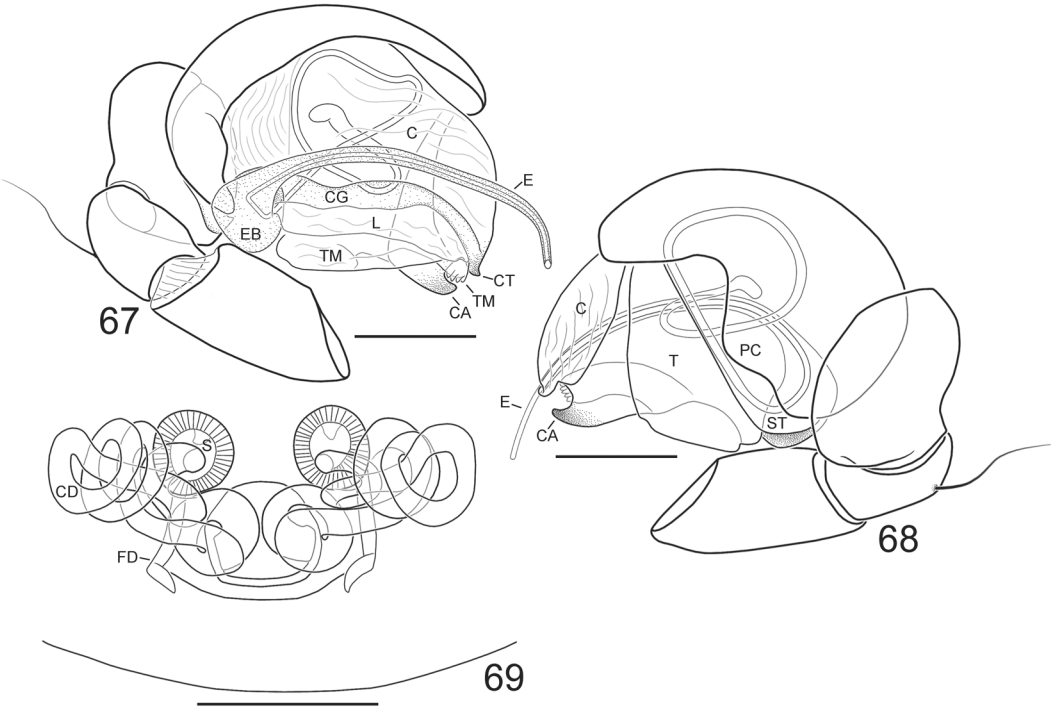


FIGURES 55–60. *Synaphris schlingeri*. 55–59, male palp; 60, epigynum. 55. Prolateral. 56. Retrolateral. 57. Ventral. 58. Distal part of tegulum showing terminal and subterminal apophyses and embolic tip. 59. Palpal tibia, dorsal. 60. Ventral. Scale bars: 55–56, 59–60 = 10 µm; 57 = 20 µm; 58 = 2 µm. For abbreviations see Table 1 (p. 22).

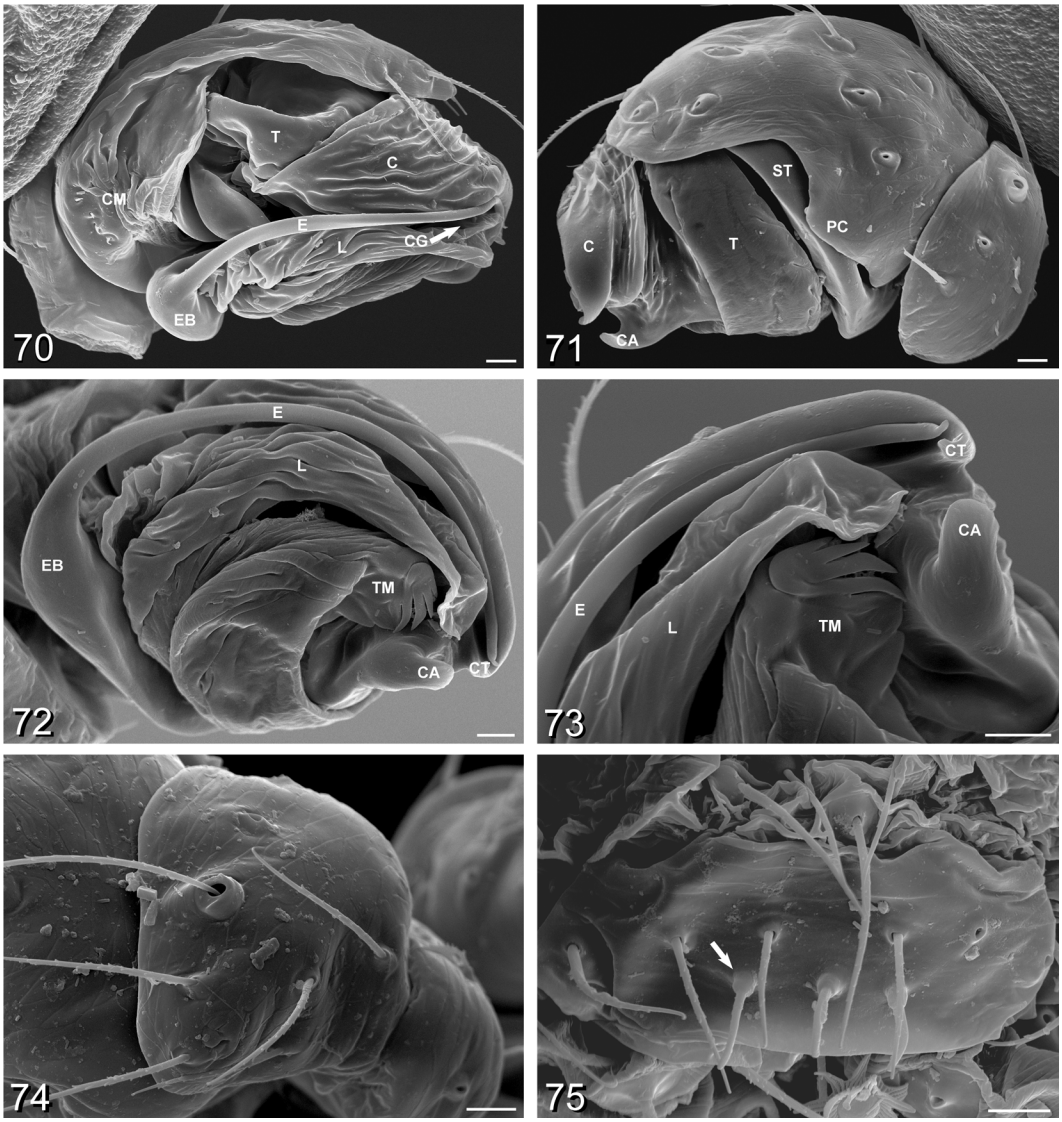
FIGURES 42–54 (left). 42–52, *Synaphris schlingeri*; 53–54, *Synaphris toliara*. 42, 45, 47–48, 53, male; 43–44, 46, 49–52, 54, female. 42–43. Anterior part of prosoma, lateral. 44. Junction of metatarsus and tibia I, note tapered tip of metatarsus and transverse ridges. 45. Sulcus, detail of area indicated by box in 42, arrow indicates pore. 46. Labrum. 47. Chelicerae, posterior view. 48–49, 53–54. Chelicera, anterior, arrow indicates keel. 50. Trichobothrium on metatarsus I. 51. Bothrium (hair lost) on tibia I. 52. Tarsal organ. Scale bars: 42–43 = 20 µm; 44, 46–51, 53–54 = 10 µm; 45 = 3 µm; 52 = 2 µm.



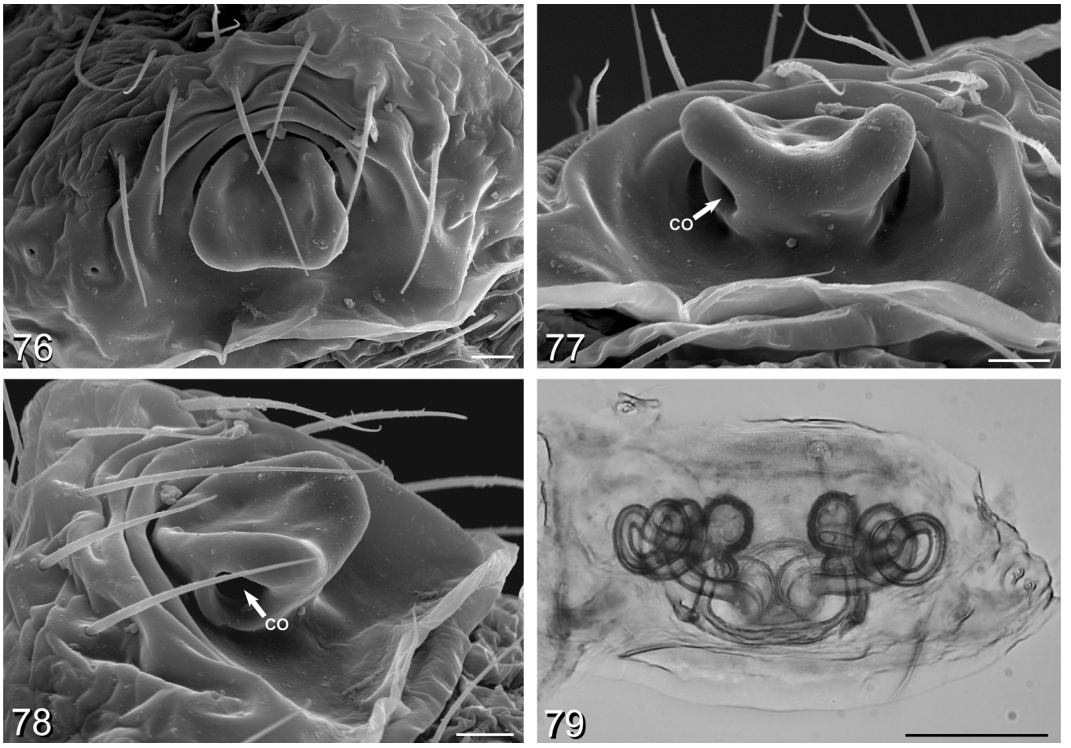
FIGURES 61–66. *Synaphris schlingeri*. 61, 63–64, female; 62, 65–66, male. 61. Posterior part of abdomen, ventral view, arrow indicates one of two tracheal openings. 62. Epiandrous gland spigots, one of four indicated by arrow. 63, 65. Spinnerets. 64. Posterior lateral and posterior median spinnerets. 66. Posterior lateral spinneret. Scale bars: 61–63, 65 = 10 µm; 64, 66 = 3 µm. For abbreviations see Table 1 (p. 22).



FIGURES 67–69. *Synaphris toliara*. 67. Male palp, prolateral. 68. Male palp, retrolateral. 69. Cleared epigynum, dorsal. Scale bars = 0.05 mm. For abbreviations see Table 1 (p. 22).



FIGURES 70–75. *Synaphris toliara*, male. 70–74, palp; 75, epiandrous region. 70. Prolateral. 71. Retrolateral. 72. Ventral. 73. Distal part of tegulum showing terminal and subterminal apophyses and tips of lamella and embolus. 74. Palpal tibia, dorsal. 75. Epiandrous gland spigots, one of three indicated by arrow. Scale bars = 10 µm. For abbreviations see Table 1 (p. 22).



FIGURES 76–79. *Synaphris toliara*, epigynum. 76. Ventral. 77. Posterior. 78. Lateral. 79. Cleared, dorsal. Scale bars: 76–78 = 10 μm; 79 = 0.05 mm. For abbreviations see Table 1 (p. 22).

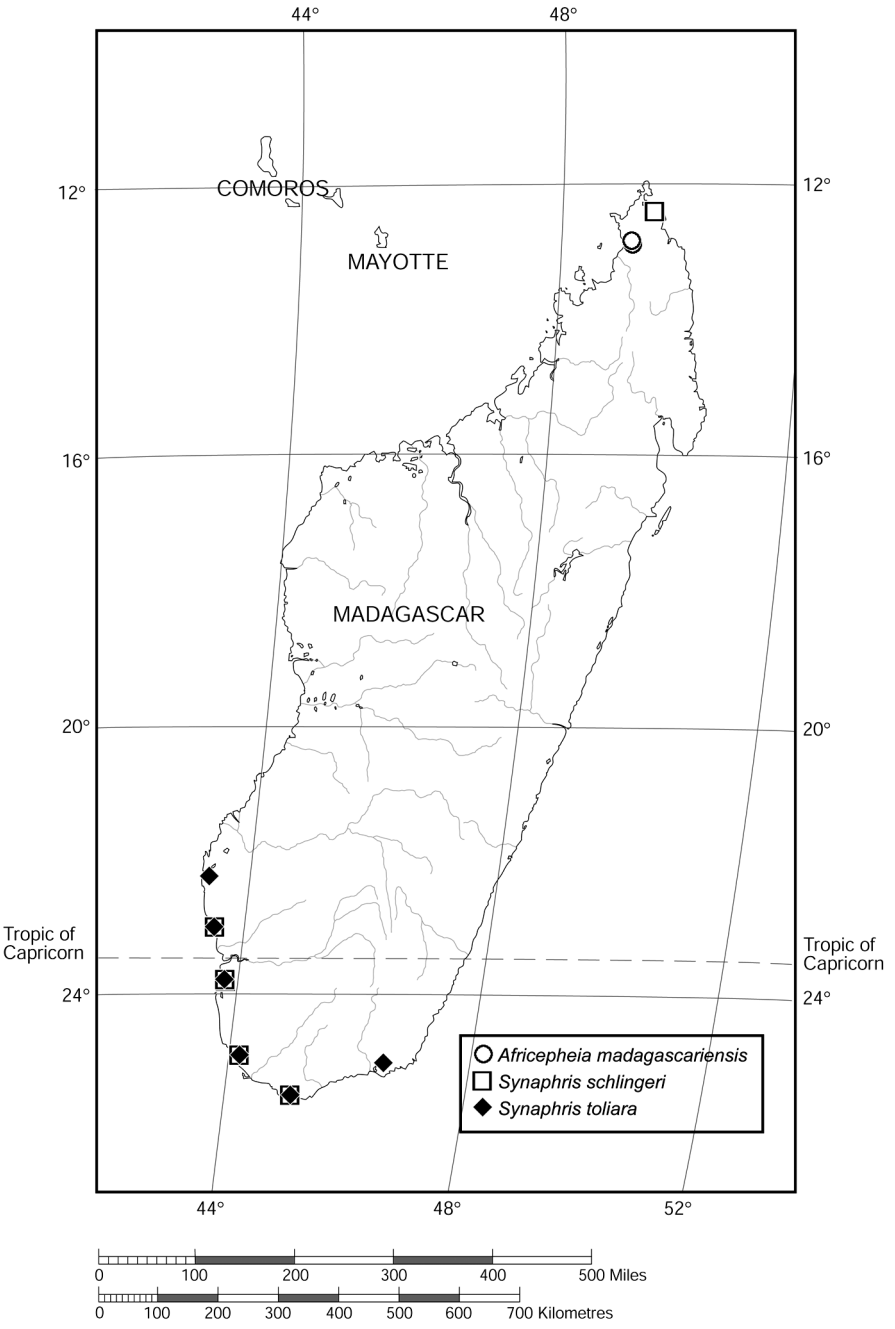


FIGURE 80. Distribution of synaphrid species in Madagascar.