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Research article

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On the genus *Ammonius* Thorell, 1899 (Mygalomorphae, Barychelidae): description of the female of *A. pupulus*, a new species and new distribution records

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Abstract. Among the 40 genera of Barychelidae, only nine genera are described from the African continent. Thorell (1899) described *Ammonius* Thorell, 1899 based on a male from Cameroon. In 1965 Benoit added more information from the holotype, with detailed illustrations of the male palp bulb and the eye group. Since then, few taxonomic revisions or new species of Barychelidae have been proposed from the African continent. *Ammonius* can be distinguished by the strongly pronounced retrolateral lobe of the male cymbium and the aspect of the bilobed spermathecae of the female. We redescribe the holotype male of *A. pupulus* Thorell, 1899 and describe the female for the first time. Additionally, a new species is described: *Ammonius benoiti* sp. nov., from Ivory Coast. The morphology of the tarsal setae is presented through SEM photographs. New distribution records of the genus are provided.

Keywords. Arachnid, Cameroon, Western Africa, new records.

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Introduction

Barychelidae Simon, 1889 comprises the spiders known as brush-footed trapdoor spiders, due to the dense patch of hairs under their claws (claw tufts), which resemble brushes (Raven 1994; Mori & Bertani 2020). Currently, Barychelidae includes 40 genera and 282 species, among these, 38 species from 9 different genera are described from Sub-Saharan African countries: *Ammonius* Thorell, 1899 (1 sp.), *Cyphonisia* Simon, 1889 (13 spp.); *Eubrachycercus* Pocock, 1897 (1 sp.); *Idioctis* L. Koch, 1874 (9 spp.); *Pisenor* Simon, 1889 (9 spp.); *Sason* Simon, 1898 (1 sp.); *Sipalolasma* Simon, 1889 (9 spp.); *Tigidia* Simon, 1892 (11 spp.); *Zophoryctes* Simon, 1902 (1 sp.) (World Spider Catalog 2022).

Until the mid-1960s, the African fauna of Barychelidae was poorly known until Pierre L.G. Benoit began his studies on some Mygalomorphae Pocock, 1892 from Central Africa while working at the Royal Museum for Central Africa (RMCA). During the years 1964–1966, Benoit published several works reviewing and proposing new species of African barychelids. Since then, no new species have been described and much of the information available is present only in the original descriptions.

The genus *Ammonius* Thorell, 1899 was proposed based on a single male specimen from Cameroon without precise locality. Later in 1965, Benoit redescribed the holotype in more detail, adding informative new illustrations of the male palp bulb and the eye group. Raven (1985), in his comprehensive revision of Mygalomorphae, reported the barychelid intrarelationships, which presented that *Ammonius* is related to *Eubrachycercus* Pocock, 1897 and *Thalerommata* Ausserer, 1875, forming a monophyletic group with other subfamilies, however no subfamily has been assigned to them.

In the present paper, we present a redescription and provide new multifocal and SEM photos of *A. pupulus* Thorell, 1899. Also, based on specimens of Barychelidae deposited in the Royal Museum for Central Africa, Tervuren, Belgium, we describe the female of *A. pupulus* for the first time. Furthermore, we describe a new species from the Ivory Coast, report, characterize and discuss morphological setae present on leg and extend the distribution of the genus to the Ivory Coast.

Material and methods

Repositories

The material examined is deposited in the following institutions (curators in parentheses):

NHRS = Swedish Museum of Natural History, Stockholm, Sweden (Anna Gauffin)
RMCA = Royal Museum of Central Africa, Tervuren, Belgium (Didier Van den Spiegel)

Measurements

The specimens were examined under a LEICA S8AP0 stereo microscope. All measurements are in millimeters. Total body length includes carapace and abdomen without chelicerae and spinnerets. Length and width of carapace, eye tubercle, labium and sternum are maximum values obtained. The length measurement of leg segments was obtained between joints in dorsal view. Terminology for number and disposition of spines follow Petrunkevitch (1925), with the modifications proposed by Bertani (2001).

Illustrations

Digital multifocal photos were taken with a Leica DFC500 digital camera attached to a Leica MZ16A stereoscopic microscope. Extended focal range images were composed with Leica Application Suite ver. 2.5.0. The specimens were prepared for scanning electron microscopy (SEM) following Galleti-Lima & Guadanucci (2019). SEM photos were taken on a FEI Quanta 250 SEM at the Laboratório de Biologia Celular, Instituto Butantan and a Hitachi TM-1000 at the Laboratório de Microscopia Eletrônica of the Institute of Biosciences of São Paulo State University, Rio Claro, São Paulo.

The spermathecae were dissected and submitted to digestion of the non-chitinous tissue by Ultrazyme® Enzymatic Cleaner for 24 hrs, where a tablet was diluted in 5 mL of distilled water. The internal structure was illustrated in dorsal view. The male palpal bulb was removed from the cymbium and illustrated.

Geographical data

Geographic coordinates were obtained through information on the original museum labels. Localities from museum samples without coordinates were georeferenced using Google Earth®. The geographic distribution of the species was created using SimpleMappr (Shorthouse 2010).

Morphological abbreviations

ap	=	apical
AME	=	anterior median eyes
ALE	=	anterior lateral eyes
Ch	=	chemosensory setae
ChM	=	chemosensory setae male
CT	=	claw tufts
d	=	dorsal
Em	=	embolus
FS	=	frictional setae
ITC	=	inferior tarsal claw
Ms	=	megaspine
p	=	prolateral
PL	=	prolateral lobe
PLE	=	posterior lateral eyes
PLS	=	posterior lateral spinnerets
PME	=	posterior median eyes
PMS	=	posterior median spinnerets
r	=	retrolateral
RL	=	retrolateral lobe
STC	=	superior tarsal claws
So	=	slit organ
Tc	=	tibia concavity
Tt	=	tibial thorns
v	=	ventral

Results

Taxonomy

Class Arachnida Cuvier, 1812
Order Araneae Clerck, 1757
Infraorder Mygalomorphae Pocock, 1892
Family Barychelidae Simon, 1889

Genus ***Ammonius*** Thorell, 1899

Ammonius Thorell, 1899: 10.

Ammonius – Simon 1903: 915. — Benoit 1965: 7. — Raven 1985: 113.

Type species

Ammonius pupulus Thorell, 1899, by monotypy.

Diagnosis

Ammonius can be distinguished from the other barychelids by the apical segment of the PLS digitiform (Fig. 1F); compact eye group rectangular in shape (Figs 1D, 4B, 5D, 9B), eye tubercle flat; *A. pupulus* with eight eyes (Figs 1D–E, 4B, 5D); absence of AME in *A. benoiti* sp. nov. (Fig. 9B); male cymbium unequal, with prolateral lobe inconspicuous and retrolateral lobe strongly projected (Figs 2, 3C–D, 8C–E). Males resemble *Pisenor notius* Simon, 1889 (see Benoit 1966: figs 24, 26) by the strongly pronounced retrolateral lobe of the cymbium but differ by the lack of a spur on tibia I, and the modified palpal tibia, with a tibial concavity in the ventro-prolateral side of the palp on *A. pupulus* (Fig. 3A–B), and by the presence of a tibial thorn on the retrolateral side of the palp on *A. benoiti* (Figs 8D–E, 9D). Females of the genus can be distinguished from the other genera by the bilobed spermathecae, with the external stalk small and emerging from the basal region of the receptacle (Fig. 5E).

Description

Very small spiders, total length between 3.9–7.3. General coloration yellowish light brown (Figs 1A–B, 5A–B, 8A–B). Abdomen dorsally pale without pattern and spinnerets pale with some brown light setae on dorsal side (Figs 1F, 8A). Carapace ovate (Figs 1A, 5A, 8A, 9A). Thoracic fovea small and straight (Figs 1A, 5A, 8A). Clypeus narrow (Figs 1D, 4B, 5D, 9B). Eye tubercle black and flat (Figs 1D, 5D). Eye group in rectangular shape, anterior and posterior eye rows straight (Figs 1D, 4B, 5D, 9D). *Ammonius pupulus* with eight eyes (Figs 1D–E, 4B, 5D); *A. benoiti* sp. nov. with six eyes, AME absent (Fig. 9A–B). Labium rectangular, 2–6 cuspules rounded. Maxillae rectangular with 3–20 cuspules on inner corner, maxillary hell reduced. Anterior lobe short, not projected (Figs 1C, 4C, 5C). Maxillary lyra absent. Rastellum absent, distal edge of maxilla with thick setae (Figs 1C, 5C). Intercheliceral tumescence in males absent. Labiosternal groove shallow, flat, with pair of sigilla (Fig. 4C). Book lungs semi-circular, opening elliptical, and book lung combs absent. Plumose clavate trichobothria in two rows on distal half on all tarsi (Fig. 4D). Claws: ITC absent. STC with parallel row of teeth present on lateral edge on males and absent in females (Figs 4E, 6A, 7A). Frictional setae present in all tarsi, very evident, longer and inserted below the claw tuft plate (Figs 4E–F, 6A–B, 7A). Scopulae: on metatarsi I–II scopulate and absent on metatarsi III–IV; on tarsi I fully scopulate and tarsi II–IV slightly scopulate. Four spinnerets, PMS very small, PLS long with apical segment digitiform (Fig. 1F), with several spigots on apical half (Fig. 4A). Male palpal tibia with a ventral concavity in *A. pupulus* (Figs 2E, 3A–B), absent in *A. benoiti.* Tibial thorns on the retrolateral side of the palp in *A. benoiti* (Figs 8D–E, 9D). Tibial spur absent. Megaspine on the tibia I in *A. benoiti* (Figs 8J, 9E). Male palpal bulb with globose subtegulum, with thin and sinuous embolus in *A. pupulus* (Fig. 2A–G), and slightly curved embolus in *A. benoiti* (Fig. 8F–I). Spermathecae with two straight receptacles, external receptacle with globose lobe, emerging from the internal receptacle (Fig. 5E).

Included species

Ammonius pupulus Thorell, 1899; *A. benoiti* sp. nov.

Distribution

Cameroon and Ivory Coast (Fig. 10).

Ammonius pupulus Thorell, 1899
Figs 1–7, 10

Ammonius pupulus Thorell, 1899: 10.

Ammonius pupulus – Benoit 1965: 76, figs 1–2.

Amended diagnosis

Ammonius pupulus differs from *A. benoiti* sp. nov. by having eight eyes (Figs 1D–E, 4B, 5D); by the male palpal bulb with a thin and sinuous embolus (Fig. 2A–D), and by the presence of a tibial concavity in the ventro-prolateral side of the palp (Figs 2E, 3A–B).

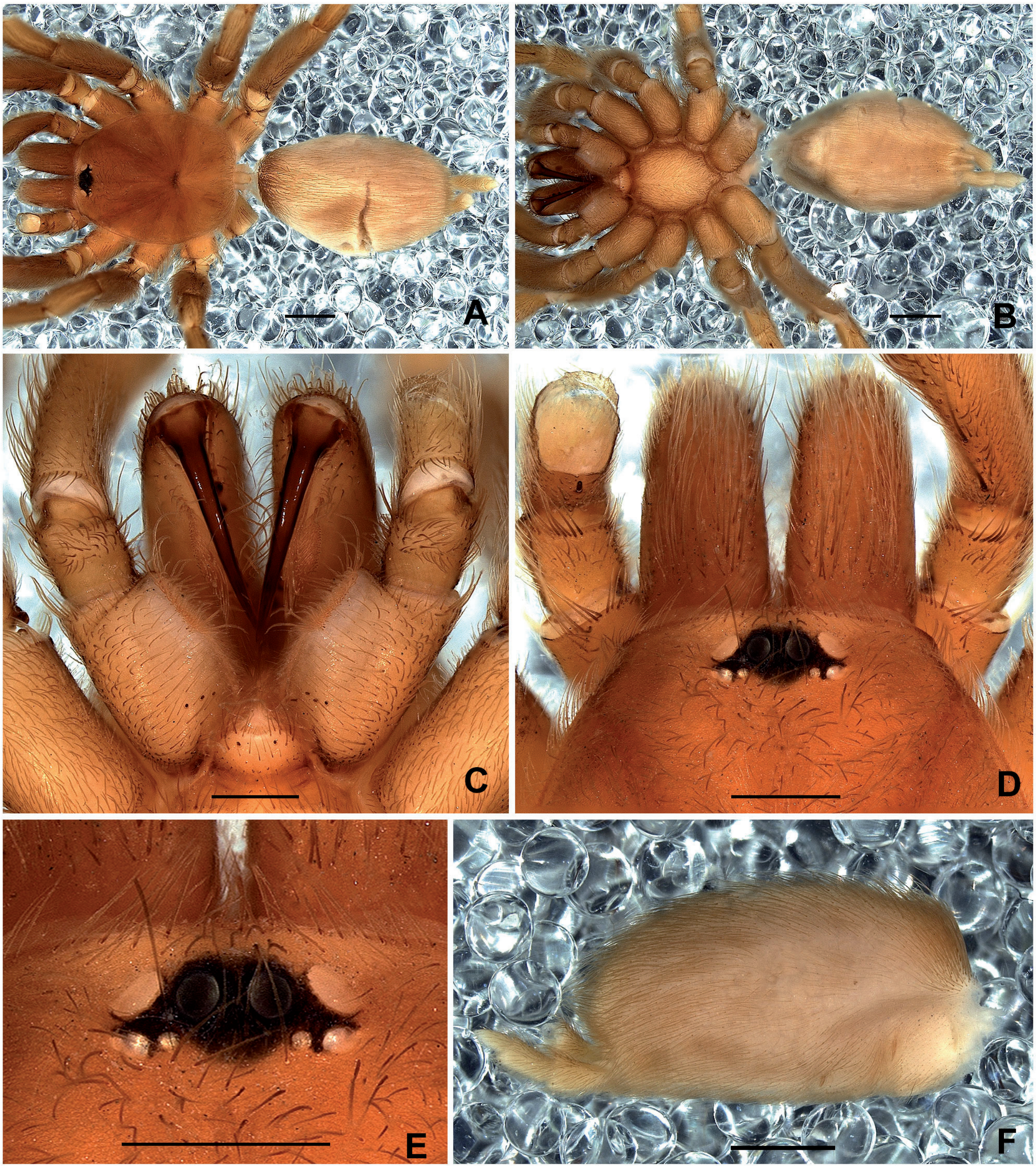

Fig. 1. *Ammonius pupulus* Thorell, 1899, holotype, ♂ (NHRS-GULI37848). **A**. Habitus dorsal. **B**. Habitus ventral. **C**. Maxillae and labium, ventral view. **D–E**. Eye group. **D**. Dorsal view. **E**. Detail of the eye arrangement. **F**. Abdomen, lateral view. Scale bars: A–B, F = 1 mm; C–E = 0.5 mm.

Type material

Holotype

CAMEROON • ♂; no locality specified; 1891; Y. Sjöstedt leg.; collection Thorell, number 17, now NHRS-GULI37848.

Other material examined

IVORY COAST • 6 ♂♂, 1 ♀; Gagnoa; 6° 8′59.73″ N, 5°57′8.07″ W; 19 Mar. 1993; A. Russell-Smith leg.; pitfall trap, upland rice; RMCA 227221 • 1 ♀ juv.; Kossou; 7°2′12.07″ N, 5°28′56.47″ W; 14 Oct.–11 Nov. 1974; R. Jocqué leg.; RMCA 151844 • 1 ♂; Bouaflé, Koudougou; 6°55′56.20″ N, 5°40′24.15″ W; 26 Feb. 1981; J. Everts leg.; RMCA 169417 • 1 ♀; same collection data as for preceding; 30 Dec. 1980; RMCA 169416.

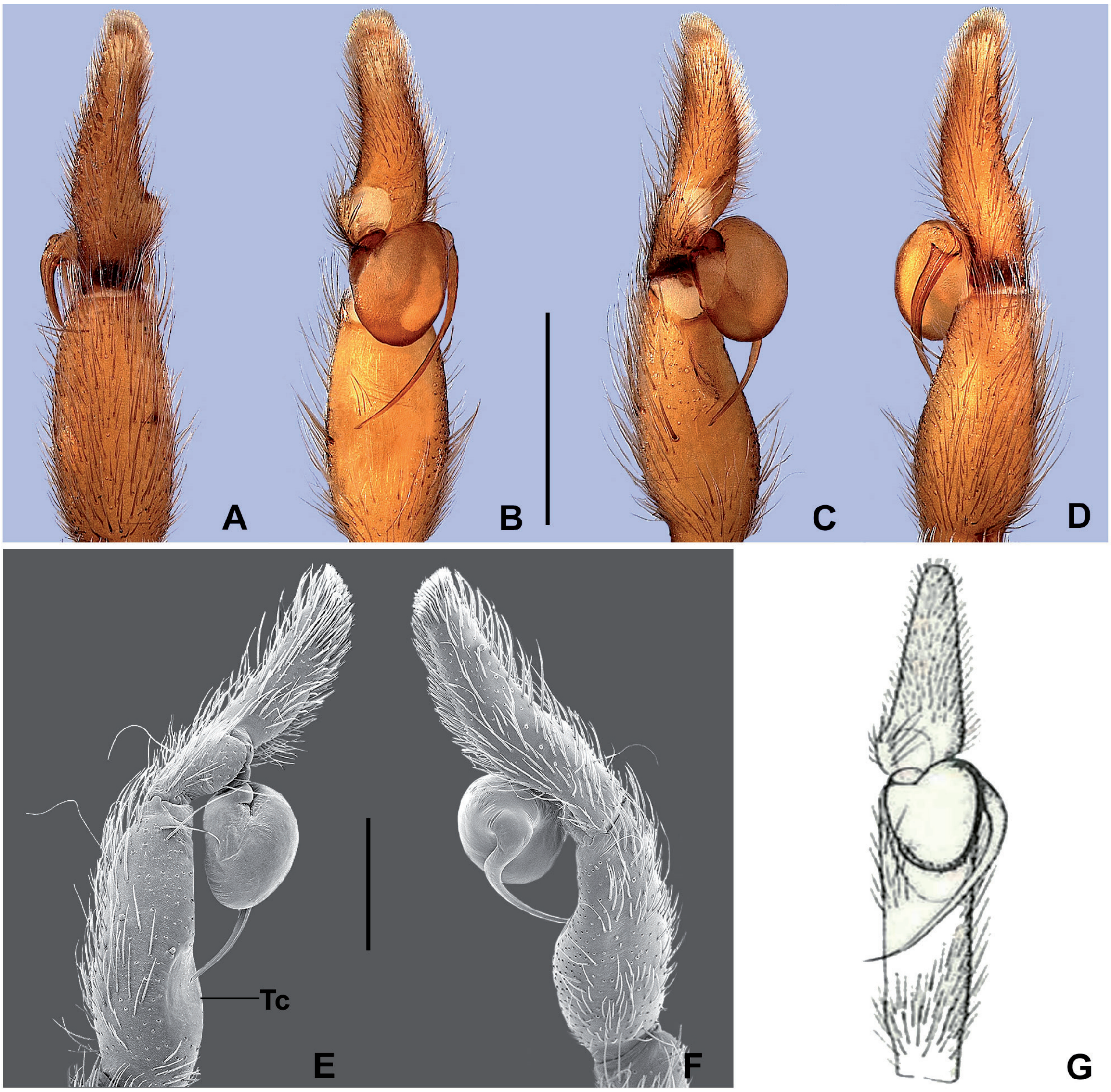

Fig. 2. Male palp of *Ammonius pupulus* Thorell, 1899. **A–D**. Holotype, ♂ (NHRS-GULI37848). **A**. Dorsal view. **B**. Ventral view. **C**. Prolateral view. **D**. Retrolateral view. **E–F**. SEM micrographs of the male palp of *Ammonius pupulus* (RMCA 227221). **E**. Prolateral view. **F**. Retrolateral view. **G**. Drawing from Benoit (1965: fig. 1), ventral view. Abbreviation: Tc = Tibial concavity. Scale bars: A–D = 1 mm; E–F = 0.5 mm.

Description

Male (holotype NHRS-GULI37848)

Total length: 7.43. Carapace: 3.3 long, 2.66 wide. Thoracic fovea: 0.38 wide, straight. Clypeus 0.08 long. Eye tubercle flat 0.29 long, 0.69 wide. Anterior and posterior eyes row straight (Fig. 1D). Eyes diameters and interdistances: AME 0.10, ALE 0.14, PME 0.04, PLE 0.09; ALE–ALE 0.37, ALE–AME 0.06, AME–PME 0.06, PME–PME 0.29, PLE–PME 0.03, AME–AME 0.07, ALE–PLE 0.04. Labium: rectangular, 0.28 long, 0.51 wide, having two cuspules rounded (Fig. 1C). Chelicerae: 9 prolateral teeth and 4 tiny on inner edge. Labiosternal groove shallow, flat, with a pair of sigilla. Maxillae: 1.08 long, 0.66 wide, with 3 cuspules. Heel reduced. Anterior lobe short, not projected (Fig. 1C). Sternum 1.75 long, 1.41 wide.

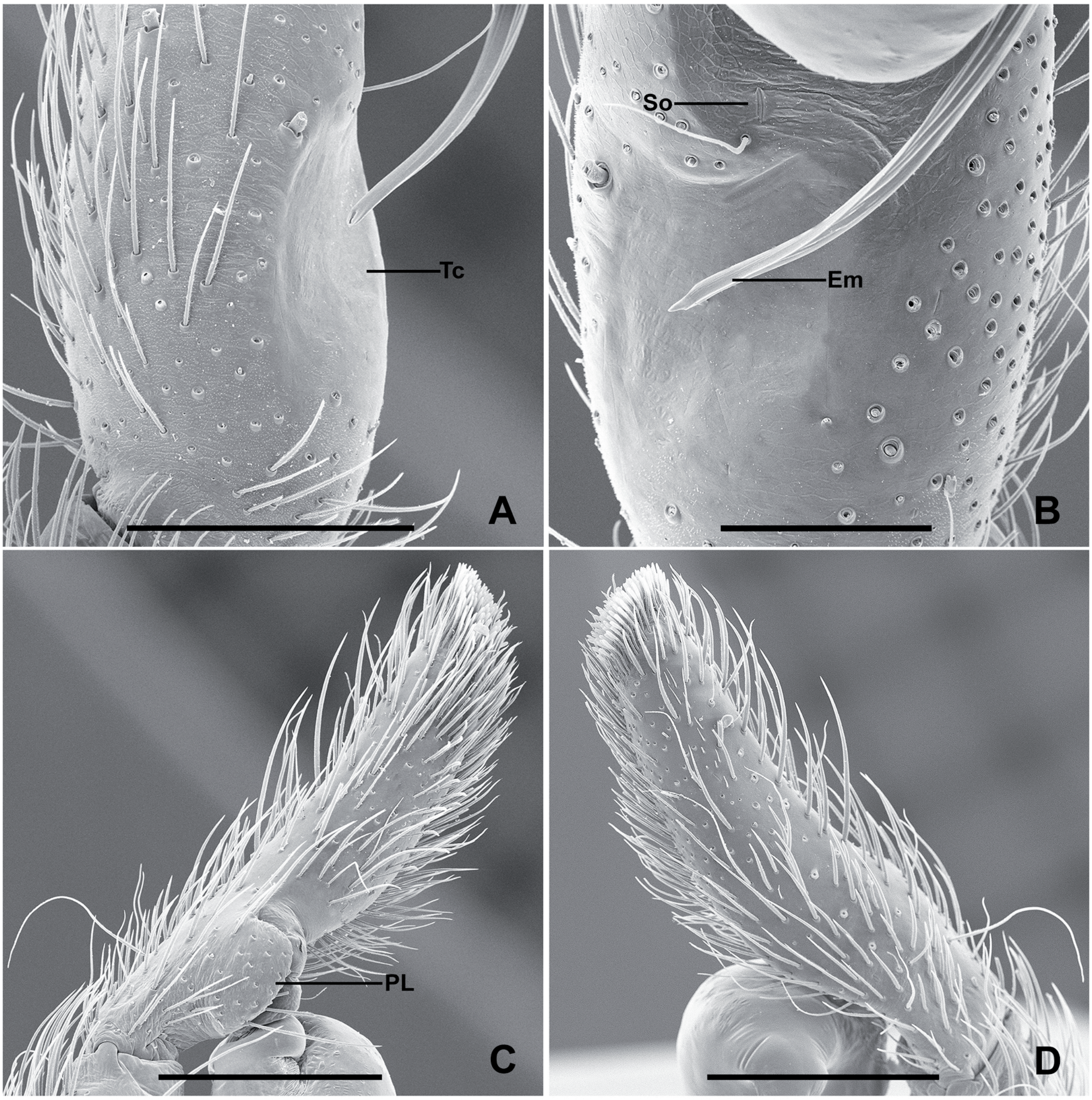

Fig. 3. SEM micrographs of the male palp of *Ammonius pupulus* Thorell, 1899 (RMCA 227221). **A–B**. Tibial concavity. **A**. Prolateral view. **B**. Retrolateral view. **C–D**. Cymbium. **C**. Prolateral view. **D**. Retrolateral view. Abbreviations: Em = embolus; PL = prolateral lobe; So = slit organ; Tc = tibial concavity. Scale bars: A = 400 µm; B = 200 µm; C–D = 400 µm.

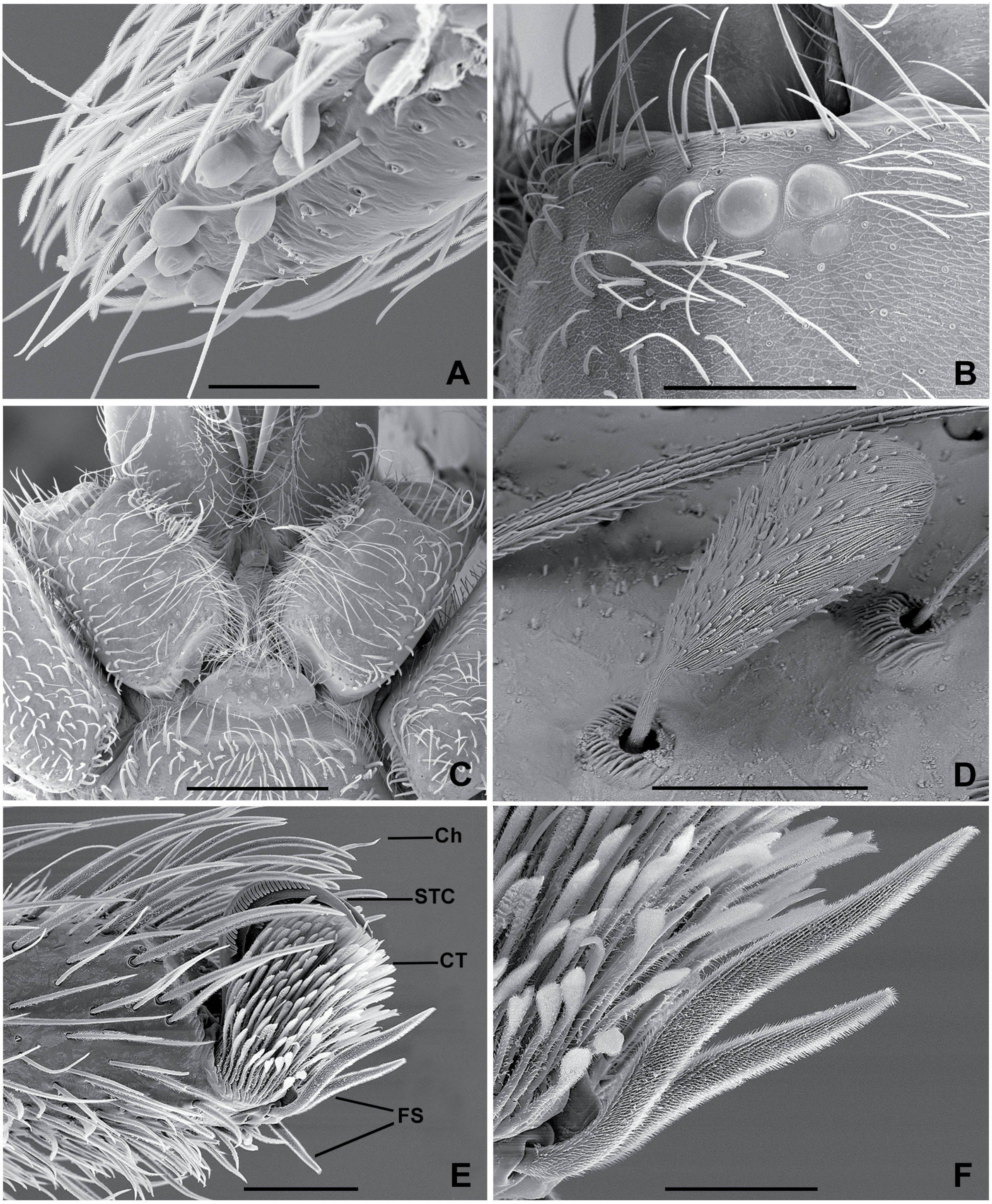

Fig. 4. SEM micrographs of *Ammonius pupulus* Thorell, 1899, ♂ (RMCA 227221). **A**. Apical segment of PLS. **B**. Eye group, lateral view. **C**. Maxillae and labium, ventral view. **D**. Clavate trichobothria. **E**. Apical of the tarsus I, lateral view. **F**. Detail of frictional setae, lateral view. Abbreviations: Ch = chemosensory setae; CT = claw tufts; FS = frictional setae; STC = superior tarsal claws. Scale bars: A, F = 50 µm; B = 300 µm; C = 500 µm; D = 5 µm; E = 100 µm.

Abdomen: partially damaged, 3.93 long, with book lungs semi-circular, with elliptical aperture, and book lungs combs absent. Measurements: palp (femur, patella, tibia, cymbium, total): 1.9, 1.1, 1.3, 1, 5.3. Legs (femur, patella, tibia, metatarsus, tarsus, total): I: 2.7, 1.7, 1.7, 1.8, 1.2, 9; II: 2.2, 1.2, 1.6, 1.4, 1, 7.4; III: 2.2, 1, 1.2, 1.8, 1, 7.2; IV: 2.6, 1.1, 1.9, 2.4, 1.5, 9.5. Spination: palp: tibia d0-1-0-2. Leg I: femur d0-0-1, tibia v0-2-0-1-, d0-2-0-2, metatarsus v0-2-0-2ap; II: femur d-0-1-0-1, tibia v0-1p-0-1-0-2ap, metatarsus v0-0-2-0-2ap; III: femur d-0-1-0-1, patella p0-1-1, tibia v0-3-0-2-1r-1p-0-1p-3ap, metatarsus v0-2-0-1-1-

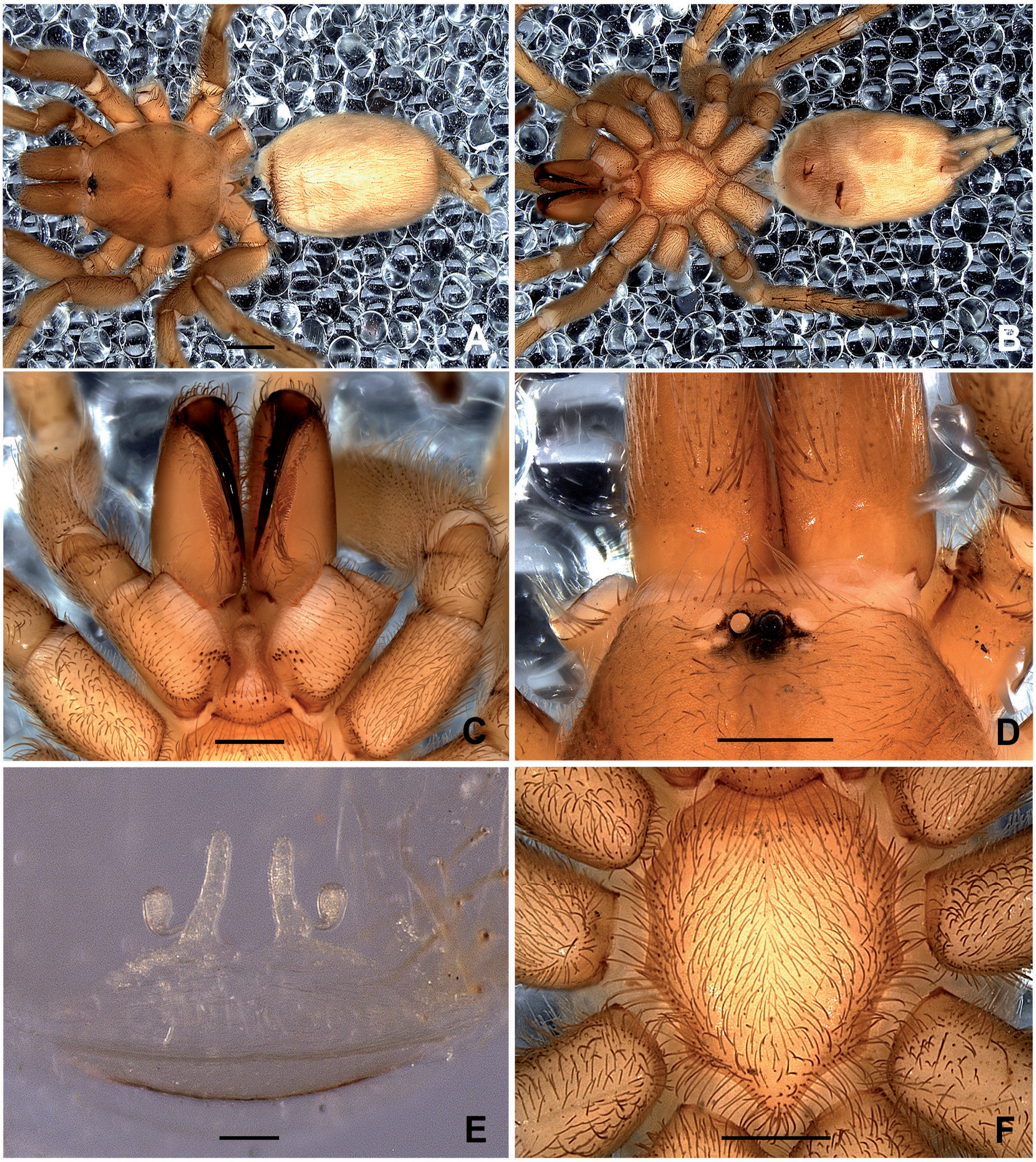

Fig. 5. *Ammonius pupulus* Thorell, 1899, ♀ (RMCA 227221). **A**. Habitus dorsal. **B**. Habitus ventral. **C**. Maxillae and labium, ventral view. **D**. Eye group, dorsal view. **E**. Spermathecae. **F**. Sternum, ventral view. Scale bars: A–B = 1 mm; C–D, F = 0.5 mm; E = 0,02 mm.

1, d0-2-1-2-1-2-1-4ap; IV: femur d0-2-0-1, patella p0-1-1, tibia v0-2-0-1p-0-1r-2-2p-0-1-3ap, metatarsus v2-2p-1-0-1-2-1r-, d0-2-0-2-0-1-3ap. Plumose clavate trichobothria in two rows on distal half on all tarsi. Claws: ITC absent. STC on tarsi with teeth on both lateral edges. Scopulae: on metatarsi I ¼ scopulate, metatarsi II–IV absent; on tarsi I fully scopulate, tarsi II ⅓ and III–IV $^{1}/_{5}$ scopulate. Spinnerets: PMS: 0.47 long. PLS: basal 0.6 long, median 0.5 long, apical 0.36 long, with pumpkiniform spigots on apical half (Fig. 4A). Apical segment digitiform (Fig. 1F). Tibial apophysis absent.

Palp: tibia with concavity on the ventro-prolateral side of the palp (Figs 2E, 3A–B). Cymbium with retrolateral lobe triangular, strongly projected, and with slight prolateral curve (Figs 2, 3C–D). Bulb globose with a thin embolus, embolar base sinuous (Fig. 2F).

Habitus as in Fig. 1A–B. Color in alcohol: Carapace and legs dorsally yellowish light brown. Eye tubercle black. Abdomen pale with some brown light setae on dorsal side, abdomen pattern absent (Fig. 1F). Spinnerets pale.

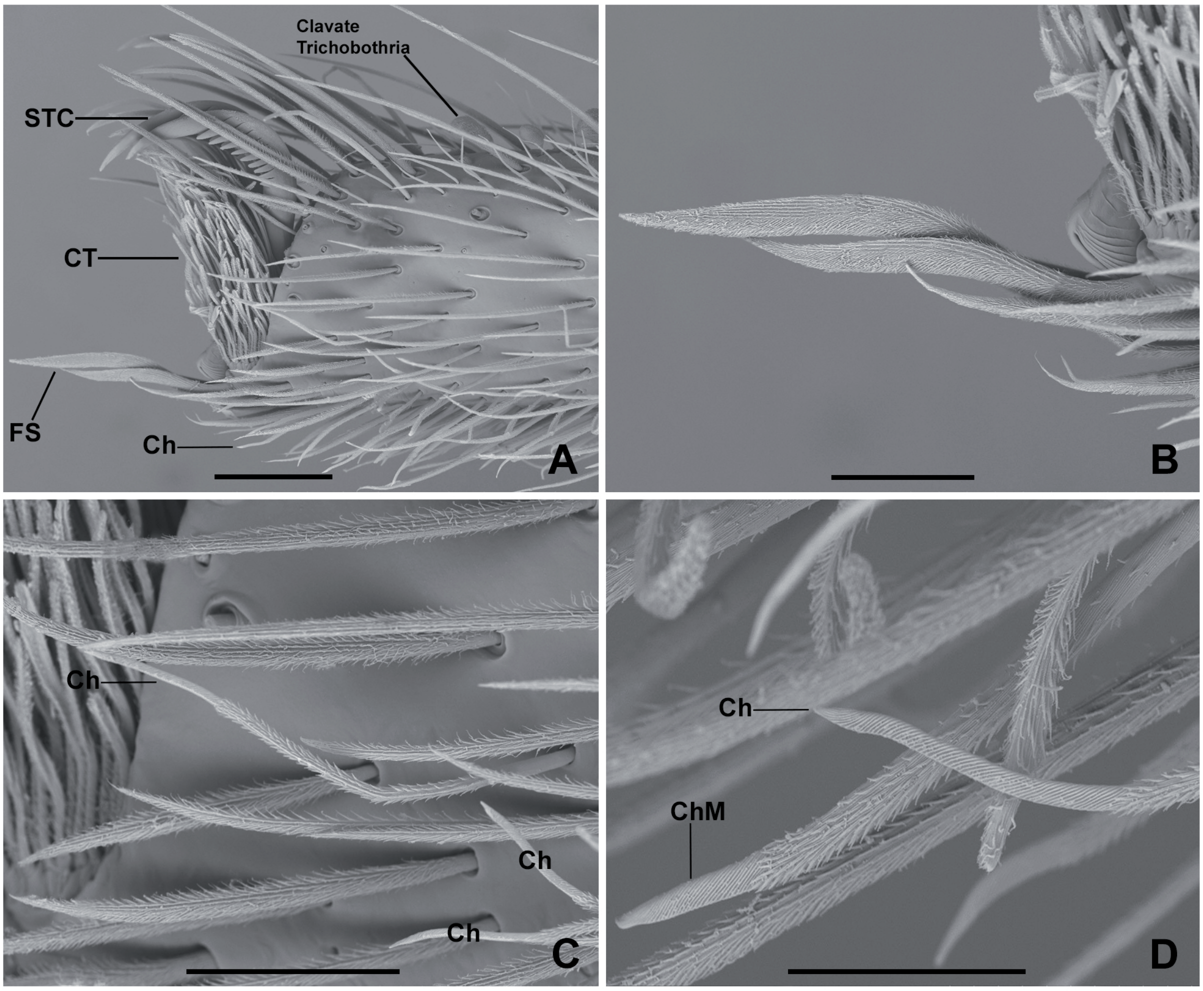

Fig. 6. SEM micrographs of *Ammonius pupulus* Thorell, 1899, ♂ (RMCA 169417), tarsus I. **A**. Lateral view. **B**. Detail of frictional setae, lateral view. **C–D**. Detail of the chemosensory setae. Abbreviations: Ch = chemosensory setae; ChM = chemosensory setae male; CT = claw tufts; FS = frictional setae; STC = superior tarsal claws. Scale bars: A = 100 µm; B–C = 50 µm; D = 30 µm.

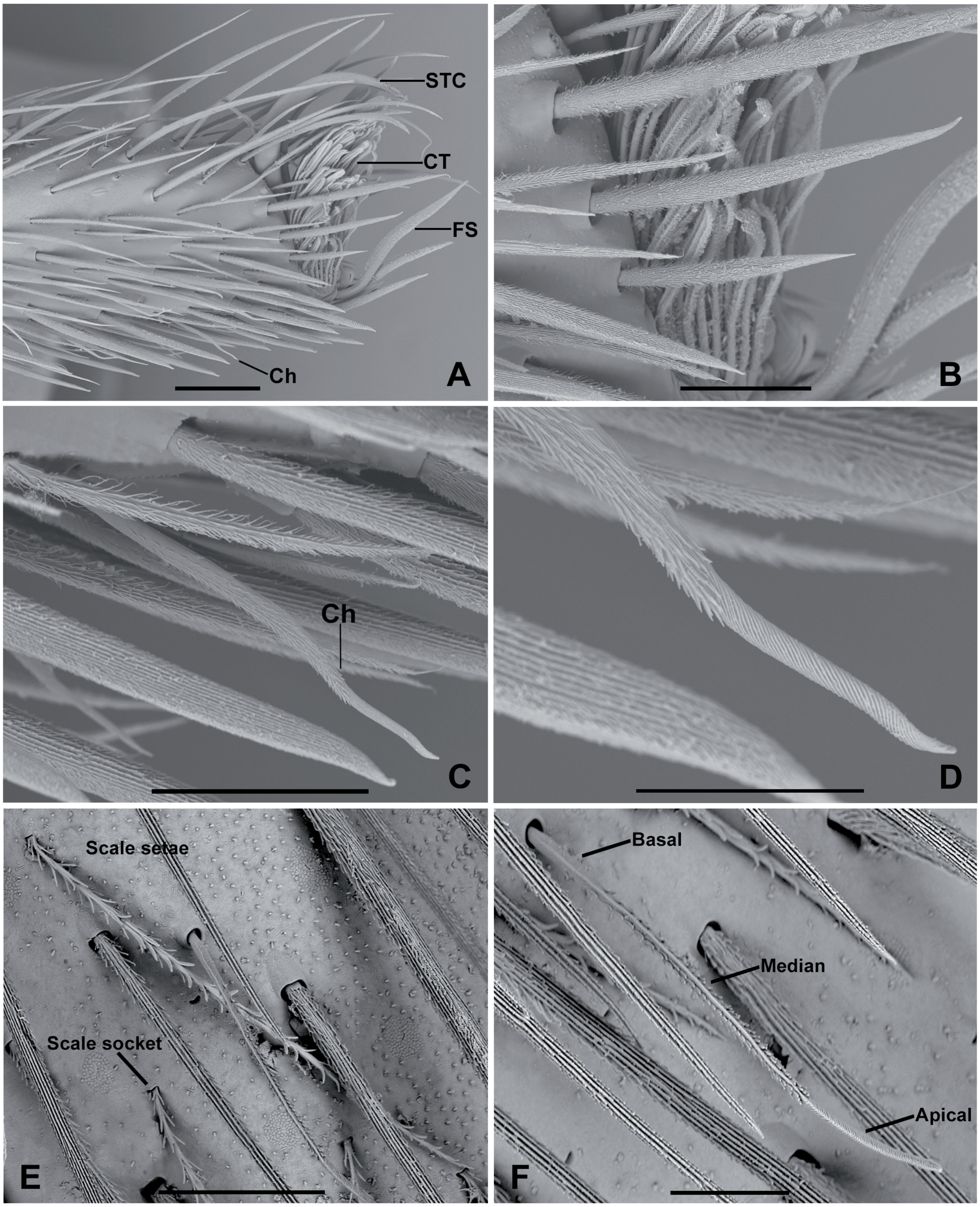

Fig. 7. SEM micrographs of *Ammonius pupulus* Thorell, 1899, ♀ (RMCA 169416), tarsus IV. **A**. Lateral view. **B**. Detail of macrosetae, lateral view. **C**. Chemosensory setae. **D**. Apical detail of the chemosensory setae. **E**. Scale setae. **F**. Chemosensory setae. Abbreviations: Ch = chemosensory setae; CT = claw tufts; FS = frictional setae; STC = superior tarsal claws. Scale bars: A = 100 µm; B–C = 50 µm; D = 20 µm; E = 50 µm; F = 30 µm.

Female (RMCA 227221)
Total length: 7.3. Carapace 3.1 long, 2.45 wide. Thoracic fovea: 0.38 wide, straight. Clypeus 0.06 long. Eye tubercle flat 0.17 long, 0.54 wide (Fig. 5D). Anterior and posterior eyes row straight. Eyes diameters and interdistances: AME 0.1, ALE 0.14, PME 0.06, PLE 0.08; ALE–ALE 0.02, ALE–AME 0.02, AME–PME 0.04, PME–PME 0.2, PLE–PME 0.01, AME–AME 0.04, ALE–PLE 0.02. Labium: ellipsoid, 0.23 long, 0.58 wide, having 5 cuspules rounded, two of then lost (Fig. 5C). Chelicerae: 8 prolateral teeth and 11 tiny on inner edge. Labiosternal groove shallow, flat, with pair of sigilla. Maxillae: 0.95 long, 0.65 wide, with 13–20 cuspules in the inner corner. Heel reduced. Anterior lobe short, not projected (Fig. 5C). Sternum 1.86 long, 1.44 wide (Fig. 5F). Abdomen: 4.2 long, with book lungs semi-circular, elliptical aperture, and book lungs combs absent. Measurements: palp (femur, patella, tibia, cymbium, total): 1,7,1.1, 1.3, 1.3, 5.4. Legs (femur, patella, tibia, metatarsus, tarsus, total): I: 2.4, 1.6, 1.8, 1.5, 1.3, 8.7; II: 2.5, 1.3, 1.5 1.5, 1.3, 8.1; III: 1.7, 1.1, 1.3, 1.4, 1.2, 6.7; IV: 2.4, 1.3, 1.9, 2.2, 1.6, 9.4. Spination: palp: femur d-0-1, tibia v1-0-1-1-0-2ap. Leg I: femur d0-0-1, tibia v1-0-1-0-2ap, metatarsus v0-1-0; II: tibia v1-0-1-0-2ap, metatarsus v0-1-0-1ap; III: tibia v1-1p-0-1-1p-0-4ap, d-0-1-0-1, metatarsus v0-1-0-2-1p-1p-0-1-3ap, d0-0-1-2; IV: tibia v1-1p-0-1-2-0-3ap, d-0-2-0-1r, metatarsus v0-0-2-0-1r-1-0-3ap,d0-2-0-2. Plumose clavate trichobothria in two rows on distal half on all tarsi. Claws: ITC absent. Teeth absent on STC of all legs. Scopulae: on metatarsi I ¼ scopulate, metatarsi II–IV absent; on tarsi I fully scopulate, tarsi II–III ⅓ and IV ¼ scopulate. Spinnerets: PMS: 0.4. PLS: basal 0.55, median 0.5, apical 0.55. Apical segment digitiform (Fig. 5A–B).

Spermathecae: two long receptacles with wide base; each with a globose lobe on the outer side (Fig. 5E).

Habitus as in Fig. 5A–B. Color in alcohol: same as male.

Distribution
Cameroon and Ivory Coast (Fig. 10).

Ammonius benoiti sp. nov.
urn:lsid:zoobank.org:act:6F93B423-FFD3-411C-89BB-DBF8A2C620A0
Figs 8–10

Diagnosis
Ammonius benoiti sp. nov. is differentiated most readily by having six eyes, AME is absent (Fig. 9A–B). Males of *A. benoiti* can be additionally distinguished from *A. pupulus* by the thickened embolus with a slight curve at the tip (Fig. 8F–I), the presence of the tibial thorns on the retrolateral side of the palp (Figs 8D–E, 9D), and an apical megaspine on the tibia I (Figs 8J, 9C). Female unknown.

Etymology
The specific name is a patronym in honor of the Belgian arachnologist Pierre L.G. Benoit, for his great contributions to the knowledge of African Barychelidae.

Type material
Holotype
IVORY COAST – **Appouesso** • ♂; 06°35′ N, 003°28′ W; 29 Sep. 1993, R. Jocqué & N. Séabé leg.; RMCA 202482.

Paratype
IVORY COAST – **Appouesso** • 1 ♂; same collection data as for preceding; 1 Dec.1994; RMCA 202354.

Only type material known.

Description

Male (holotype RMCA 202482)
Total length: 3.92. Carapace: 1.66 long, 1.32 wide. Thoracic fovea: 0.08 wide, straight. Clypeus 0.03 long. Eye tubercle flat 0.14 long, 0.21 wide. Anterior and posterior eyes row straight (Fig. 9B). Eyes diameters and interdistances: AME absent, ALE 0.08, PME 0.04, PLE 0.05; ALE–PME 0.01, PME–PME 0.01, PLE–PME 0.01, ALE–ALE 0.01. Labium: rectangular, 0.09 long, 0.311 wide, having two

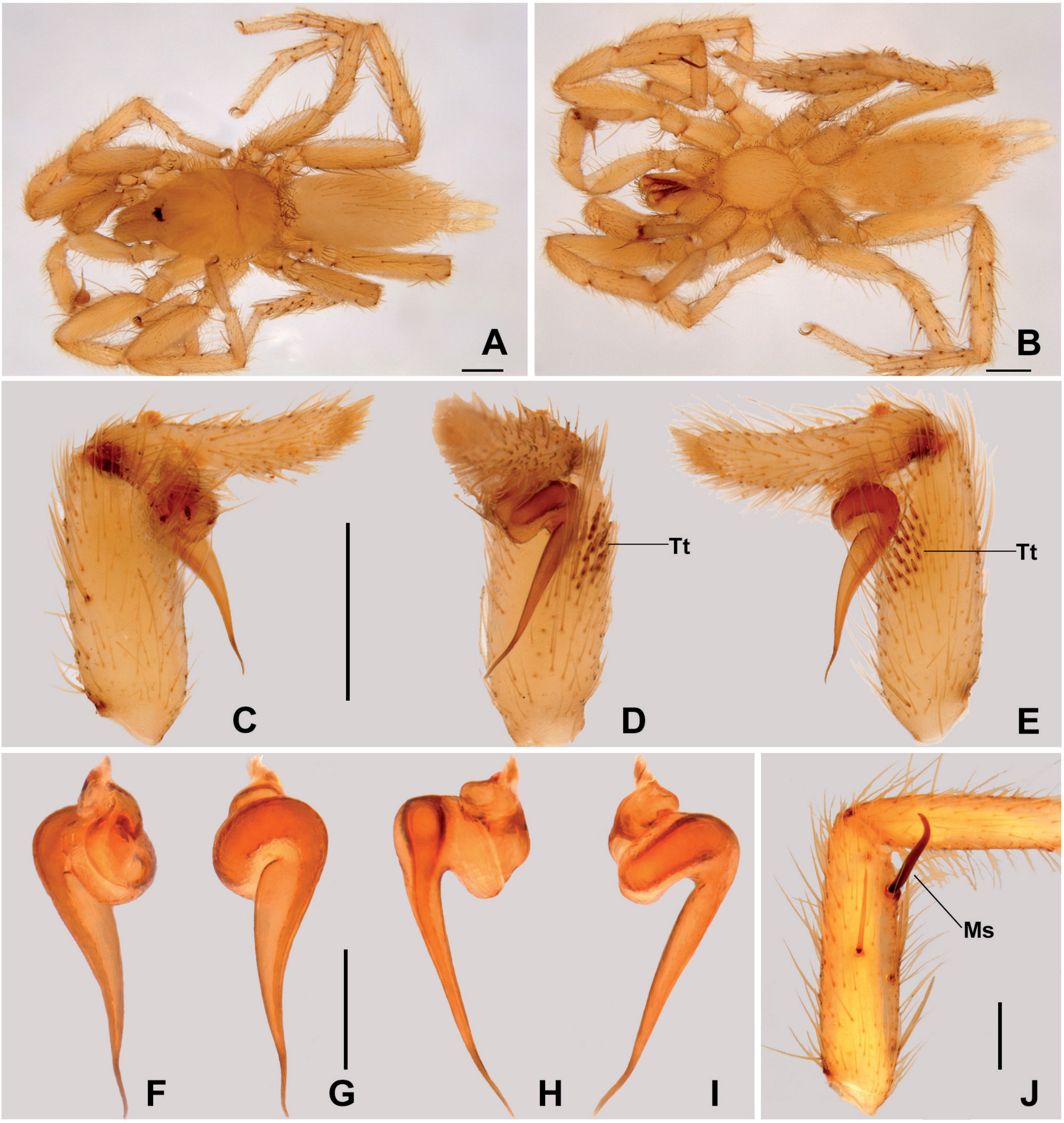

Fig. 8. *Ammonius benoiti* sp. nov. **A–E**. Holotype, ♂ (RMCA 202482). **A**. Habitus dorsal. **B**. Habitus ventral. **C–E**. Male palp. **C**. Prolateral view. **D**. Ventral view. **E**. Retrolateral view. **F–J**. Paratype, ♂ (RMCA 202354), male palpal bulb. **F**. Ventral view. **G**. Dorsal view. **H**. Prolateral view. **I**. Retrolateral view. **J**. Tibia I, prolateral view. Abbreviations: Ms = Megaspine; Tt = Tibial thorns. Scale bars: A–E, J = 0.5 mm; F–**I** = 0.2 mm.

cupules rounded (Fig. 8B). Chelicerae: 9 prolateral teeth and 7 tiny on inner edge. Labiosternal groove shallow, flat, with pair of sigilla. Maxillae: 0.52 long, 0.27 wide, with 20 cuspules. Heel reduced. Anterior lobe short, not projected (Fig. 8B). Sternum 0.97 long, 0.82 wide. Abdomen: 2.26 long, with book lungs semi-circular, elliptical aperture, and book lungs combs absent. Measurements: palp (femur, patella, tibia, cymbium, total): 0.8, 0.4, 0.6, 0.7, 2.5. Legs (femur, patella, tibia, metatarsus, tarsus, total): I: 1.3, 0.6, 1, 0.9, 0.7, 4.5; II: 1.1, 0.6, 0.9, 0.9, 0.6, 4.1; III: 1, 0.6, 0.7, 0.8, 0.6, 3.7; IV: 1.5, 0.7, 1.1, 1.1, 0.8, 5.2. Spination: Leg I: femur d1-1-1-0, patella v0-1-0, tibiav0-1-1-1p-1p-1ap, metatarsus

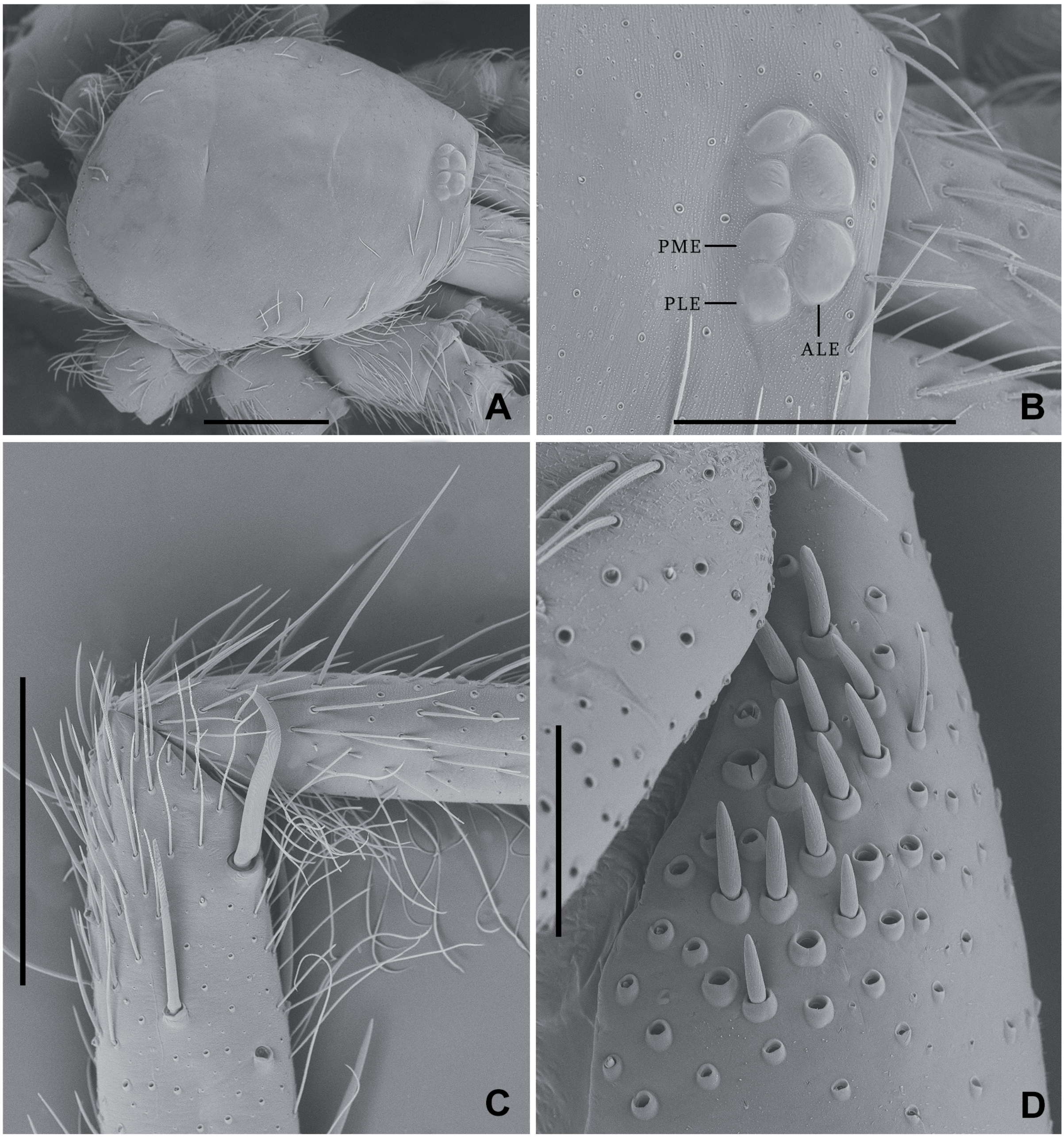

Fig. 9. SEM micrographs of *Ammonius benoiti* sp. nov. (RMCA 202354). **A**. Carapace, dorsal view. **B**. Eye tubercle, dorsal view. **C**. Tibia I, prolateral view. **D**. Detail of tibial thorns, retrolateral view. Abbreviations: ALE = anterior lateral eyes; PLE = posterior lateral eyes; PME = posterior median eyes. Scale bars: A = 0.5 mm; B–C = 0.3 mm; D = 0.1 mm.

v0-1-1ap; II: femur d0-1-0, patella v0-0-1, tibia v0-1-1-0, d0-1p-1, metatarsus v0-1-0-1-1ap; III: femur d0-1-0-1-1p-1ap, patella v0-1p, tibia v0-1-1-1r, p0-1-1-2ap, metatarsus v0-2-1-1p-2-1r-4ap; IV: femur d0-1-1-1p, patella d0-1, tibia v0-1-1-1p-1r-0-1ap, d0-1-0-0-1, metatarsus v0-1-1p-1-2-1-0-0-3ap, d0-1r-0-1p-1ap. Claws: ITC absent. STC on tarsus with teeth on both lateral edges. Scopulae: on metatarsi I–II ⅓ scopulate, metatarsi III–IV absent; on tarsi I fully scopulate, tarsi II ⅓ scopulate and tarsi III–IV $^1/_5$ scopulate. Spinnerets: PMS: 0.28 long. PLS: basal 0.33 long, median 0.31 long, apical 0.23 long. Apical segment digitiform. Tibia I with megaspine curved at apical end on the prolateral side (Figs 8J, 9C).

Palp without tibial concavity. Tibial thorns forming a group of 15 conical spines on the retrolateral side of the tibia (Figs 8D–E, 9D). Cymbium with retrolateral lobe triangular, strongly projected, slightly curved (Fig. 8C–E). Bulb with long embolus slightly curved at the tip, embolar base narrow (Fig. 8F–I).

Habitus as in Fig. 8A–B. Color in alcohol: Carapace and legs dorsally yellowish brown. Eye tubercle black.

Female

Unknown.

Distribution

Ivory Coast (Fig. 10).

Discussion

Barychelidae Simon, 1899 is subdivided into two subfamilies: Barychelinae Simon, 1889 and Sasoninae Simon, 1892 (Mori & Bertani 2020). The position of the eyes on the carapace is one of the key traits that distinguishes the two subfamilies: Sasoninae presents an eye group that is wider than long (rectangular) while Barychelinae presents anterior lateral eyes displaced towards the anterior carapace margin (quadrate or trapezoid).

Thorell (1899) commented that *Ammonius pupulus* is closely related to the genus *Leptopelma* Ausserer, 1871 due to the close proximity of the AME and PME in a rectangular shape. Benoit (1965) supported the

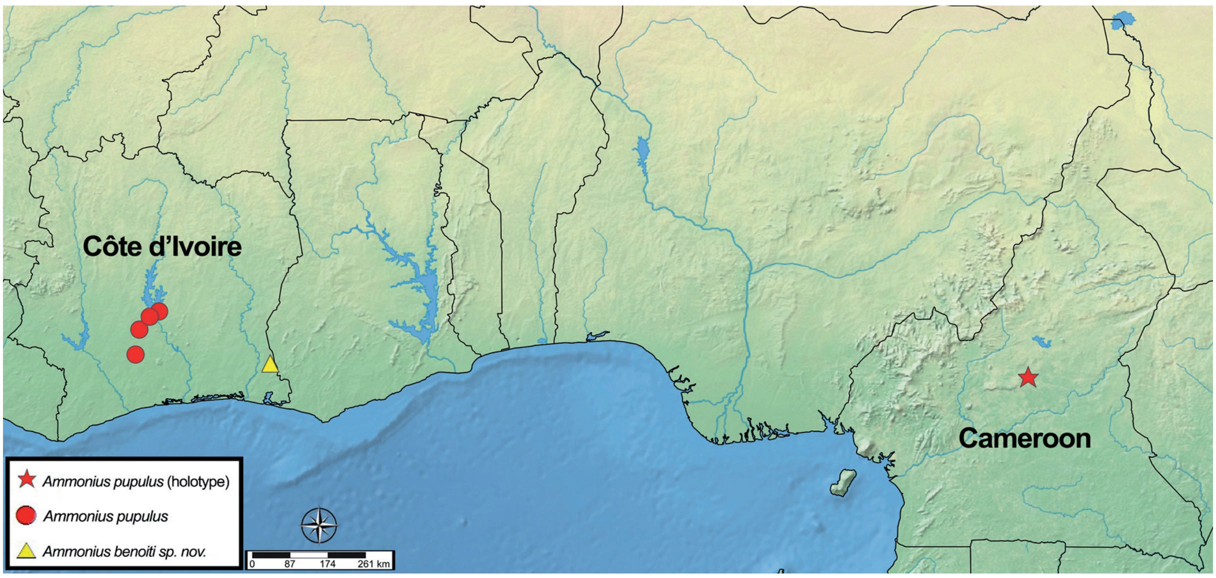

Fig. 10. Distribution map of the presently known species of the genus *Ammonius* Thorell, 1899.

proposed relationship between the two genera and included *Ammonius* in the subfamily Leptopelmatinae Simon, 1892. It is worth mentioning that Raven (1990) transferred *Leptopelma* to *Nemesia* Audouin, 1826 (Nemesiidae), thus the subfamily name no longer applies to Barychelidae. Furthermore, Raven (1985) left some genera, including *Ammonius*, as incertae sedis in Barychelidae. Although *Ammonius* possess the rectangular eye group (Figs 1 D–E, 4B, 5D, 9A–B), a character that supports Sasoninae, the genus was not assigned in Sasoninae due to the digitiform apical segment of the PLS (Fig. 1F).Therefore, in addition to the eye group shape and eye arrangement, the apical segment of PLS may generate an ambiguous interpretation in different cladistic analyses, which require further study to evaluate the morphological variety of these structures.

Some mygalomorph genera in other families show a loss or reduction of the eyes, like in the genera *Troglodiplura* Main, 1969 (Anamidae); *Troglothele* Fage, 1929 (Barychelidae); *Masteria* L. Koch, 1873, *Striamea* Raven, 1981, *Siremata* Passanha & Brescovit, 2018 (Dipluridae); *Euagrus* Ausserer, 1875 (Euagridae); *Tonton* Passanha *et al*., 2019 (Microstigmatidae); *Hemirrhagus* Simon, 1903 (Theraphosidae); as well as the species *Acontius stercoricola* (Denis, 1955) (Cyrtaucheniidae); *Harmonicon cerberus* Pedroso & Baptista, 2014 (Dipluridae); *Hexathele carvenicola* Forster, 1968 (Hexathelidae), *Speloctenizа ashmolei* Gertsch, 1982 (Microstigmatidae) and *Tmesiphantes hypogeus* Bertani, Bichuette & Pedroso, 2013 (Theraphosidae). *Ammonius benoiti* sp. nov. is notable for having six eyes (Fig. 9B), but in Barychelidae and most spider groups the normal condition is eight eyes. *Synothele subquadrata* Raven, 1994 and *Mandjelia galmarra* Raven, 1994 have seven eyes, but Raven (1994) considered that condition as aberrant. In general, the reduction or absence of eyes is more common in cave dwelling species or in aphotic habitats (lack of light), such as spiders of the genus *Masteria* which are found deep into the leaf litter (Pedroso & Baptista 2014; Passanha & Brescovit 2018). However, it cannot be confirmed that *A. benoiti* is a cave species, since the original label does not give any information about the specific location of collection.

The cymbium of barychelids is in general bilobed, with the two lobes (prolateral and retrolateral) distally cleaved into similar or dissimilar lobes (Raven 1994). However, in *Ammonius* these lobes are unequal, and the retrolateral lobe is strongly projected (Figs 2, 3C–D, 8C–E). Within the monophyletic group Barychelidae + Theraphosidae, this condition could be considered a homoplastic synapomorphy shared with *Pisenor* Simon, 1889, *Thalerommata* Ausserer, 1875 (Barychelidae), *Cyrtogrammomma* Pocock, 1895 and *Trichopelma* Simon, 1888 (Theraphosidae). However, in *Thalerommata*, *Cyrtogrammomma* and *Trichopelma* the retrolateral and prolateral lobes are almost the same size (Raven 1985; Mori & Bertani 2020; Gonzalez-Filho *et al*. 2022), which distinguishes them from *Ammonius* and *Pisenor*.

The general aspect of the male palpal bulb in *Ammonius* is a globose subtegulum, thin and long embolus with a strong constriction at the basal portion (Figs 2, 8C–I). Although in most barychelid genera the embolus is short with a conical aspect (Raven 1994), the species of *Ammonius* have an embolus thin and sinuous, which could be related to the basal constriction. Moreover, in *A. pupulus*, the embolus is thinner and has a strong curvature (Fig. 2), different from *A. benoiti* sp. nov., which has a thicker embolus and a slight curve at the tip (Fig. 8F–I).

In addition to the morphology of the male palpal bulb, two other distinct morphological characters in the male palp can be observed in *Ammonius*, that are unique to each species and remain a high value in species recognition. First, the presence of a concavity on the ventro-prolateral side of the tibial, in *A. pupulus* (Figs 2E, 3A–B). The tibial concavity (Tc) is a depression localized in the basal portion of the palp tibia, and seems to be a place where the embolus is accommodated due to its strong curvature (Fig. 3A–B). Also, in *A. benoiti* sp. nov., on the retrolateral side, a group of strong conical spines is present, named here as Tibial thorns (Tt) (Figs 8D–E, 9D). Compared to the surrounding spines, these spines are shorter and thicker.

Moreover, *A. benoiti* sp. nov., has a curved apical megaspine on the prolateral side of the tibia I (Figs 8J, 9C). This megaspine is in the same position as the spur found in the other barychelids, and potentially could be associated with mating (Raven 1985, 1994). However, this hypothesis cannot be confirmed yet because no barychelids mating has been registered (Raven 1994).

In *Ammonius*, the frictional setae (Fs) are observed in the tarsus tip below the claw tufts (Figs 4E–F, 6A–B, 7A) (Wolff *et al*. 2013; Guadanucci *et al*. 2020). These setae are conical with no-spatulate microtrichia, similar to those observed in theraphosid spiders (Guadanucci *et al*. 2020: fig. 11a–f). These setae are longer than claw tufts and inserted below the claw tufts plate (Figs 4E–F, 6A–B, 7A).

Ramírez (2014) named these setae as pseudotenent setae to dionychan spiders, which share some similarities, as well as the morphology and position of insertion. In contrast, Pérez-Miles *et al*. (2017) treated these as conical setae, however, Guadanucci *et al*. (2020) highlights some differences such as the condition of the length and width of this band of conical seta.

Other setae are distributed along the tarsi and cymbium, with a greater amount of chemosensory setae on the forelegs. These setae have an open tip, which has a shaft with an internal cuticular tube enclosing the dendrites (see Ramírez 2014: fig. 84f). The structure of chemosensory setae present in *Ammonius* can be divided into three types: basal, median, and apical (Fig. 7F). The basal portion has a grooved surface; the median portion has sharp barbs, and the apical portion has a cord like appearance with a slightly curved tip, which makes contact with the substratum (Fig. 7F). These setae can be found in both sexes. However similar chemosensory setae were only observed in the ventral section of the male, which presents a shorter distal portion (ChM Chemosensory setae male, Fig. 6D). Several scale setae can be observed distributed on the cuticular surface. They are crimped in a small socket, bent at an angle immediately after the insertion, so that they lay parallel to the cuticular surface (Ramírez 2014). We also observed a scale seta with the small barbs interspersed on its stem (Fig. 7E).

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