

New species and records of gall mites of the genus *Aceria* (Eriophyoidea, Eriophyidae) associated with *Tamarix* in Egypt and South Africa

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Original research

ABSTRACT

This paper reports on eriophyoid mites of the genus *Aceria* Keifer (Eriophyoidea, Eriophyidae) associated with Tamarisk plants (*Tamarix* spp., Tamaricaceae) in Egypt and South Africa. Three new *Aceria* species are described: *A. aegyptytamaricis* n. sp. causing green galls on buds and twigs of *Tamarix senegalensis* DC. in Egypt, *A. noorspoortiensis* n. sp. causing bright pink galls on young shoots of *T. usneoides* E. Mey. ex Bunge in South Africa, and *A. benhaiensis* n. sp. living under scaly leaves and causing small green galls and deformation of twigs on *T. senegalensis* in Egypt and *T. usneoides* (in South Africa). Sequences of three genes, Cox1, D1D2 28S, and ITS1-5.8S-ITS2, were obtained for *A. noorspoortiensis* n. sp. and *A. benhaiensis* n. sp. Blastx search for Cox1 sequences of both new species against *Aceria* from GenBank (a) indicated the sequence AIT38252.1 of *Aceria* sp. from *Tamarix* sp. from India as the most similar with 87–90% identity and 55–56% coverage and (b) revealed one codon deletion about 500 bp in the 3' direction from the Cox1 start codon, which is the first documented case of a codon deletion in the middle part of this gene in Eriophyinae. Additionally, supplementary descriptions of three other *Aceria* spp. collected from tamarisks in Egypt are given. They are: *A. amrini* Joshi from big brown galls of *T. aphylla* (L.) H. Karst. (first record for Africa), *A. dioicae* (Keifer) from green galls on buds and twigs of *T. senegalensis*, and *A. tamaricis* (Trotter) from green galls on buds and twigs of *T. senegalensis* (first record for Africa).

Keywords *Tamarix usneoides*; *Tamarix senegalensis*; eriophyoid mites; new species; Cox1; D1D2 28S; ITS1-5.8S-ITS2; codon deletion

Zoobank <http://zoobank.org/451893E3-DCEB-45CC-8C31-D51150B867DE>

Introduction

Four-legged or gall-mites (Acariformes, Eriophyoidea) belong to an ancient hyperdiverse lineage of basal acariform mites permanently associated with higher vascular plants (Lindquist 1996, Klimov *et al.* 2018, Bolton *et al.* 2023). Among three currently recognised families of eriophyoid mites (Phytoptidae, Diptilomiopidae and Eriophyidae), Eriophyidae is the largest

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one, comprising about 314 genera and over 4000 described species (Amrine *et al.* 2003; de Lillo and Skoracka 2010). Most eriophyoids are monophages and some of them are of high economic importance, especially those associated with crops (wheat, tomato, mango, etc.) and transmit phytoviruses (Petanović and Kielkiewicz 2010, de Lillo *et al.* 2018, 2021). Eriophyoid mites are distinct in that they have elongated bodies covered with annular cuticular folds, only two pairs of legs, a bunch of needle-like gnathosomal stylets, and a well-developed and typically bilobed anal sucker that they use to attach themselves to their host during feeding and winter diapause (Linguist 1996; Krantz and Walter, 2009; Chetverikov *et al.* 2019a,b, 2022). Eriophyoid mites usually feed on the plant epidermis often causing various growth abnormalities such as galls, russetting of leaves and shortening of shoots (Kiefer 1982; de Lillo *et al.* 2018). These abnormalities are initiated by unknown chemical compounds of the mite saliva injected within plant cells and used by mites for manipulating normal plant cell development processes and initiating gallogenesis (Desnitskiy *et al.* 2023). It is typically accompanied by a change of the cell's pH, suppression of photosynthesis, and changes in the expression levels of meristem-specific genes, and the genes determining adaxial–abaxial polarity and signalling of phytohormones (Petanović and Kielkiewicz 2010, Ivanova *et al.* 2022, Paponova *et al.* 2018, Klimov *et al.* 2022).

Tamarisk or salt-cyder, is a multi-branched evergreen shrub with specialised salt glands in its leaves (Bredenkamp 2003). *Tamarix* is the largest genus in Tamaricaceae comprising 57 species, of which only 57 are valid (The Plant List 2023). This notable bias between the numbers of the species names (204/57) occurred because many species of this genus are morphologically very similar and various botanists have described them under different names that were later synonymized. Tamarisks are widely distributed in temperate and subtropical regions in South Europe, Asia, and Africa, while only some introduced species are known in Northern America and Australia (Harms and Hiebert 2006). In Africa, eighteen species of *Tamarix* are found including those that are non-native (Baum 1978; Marlin *et al.* 2017). Among them, *Tamarix usneoides* E. Mey. ex Bunge is the only one that is native to South Africa (Bredenkamp 2003). Twelve *Tamarix* species have been recorded in Egypt (Boulos 1999; Hosni 2000).

In different countries with dry climates, tamarisks are considered weeds and may become highly invasive due to their outstanding salt and water resistance and competition with local plants (Marlin *et al.* 2017; Byrne *et al.* 2021). Different phytophagous arthropods have been tested for biological control of tamarisks including several gall-forming species of eriophyid mites (Marlin *et al.* 2017; Mayonde *et al.* 2019). All currently known species of eriophyoids associated with *Tamarix* belong to four genera of the two subfamilies (Eriophyinae and Phyllocoptinae) of the family Eriophyidae (Table 1): *Aceria* (8 spp., including three new species described in this paper), *Eriophyes* (4 spp.), *Phyllocoptes* (2 spp.), and *Dicruvasates* (1 sp.). The species of the first two genera are capable of inducing various galls on twigs and buds, whereas all three phyllocoptine species are exclusively vagrant. Remarkably, one of them, *Phyllocoptes bilobospinosus*, possesses a well-developed anal secretory apparatus (ASA) that is homologous to ASA of the silk-producing eriophyoid mites of the genus *Aberoptus* living under web mats on leaves of their hosts (Chetverikov *et al.* 2023). Up to now, only five *Aceria* species have been recorded on *Tamarix* worldwide: *A. amrini* Joshi 2013, *A. arboresi* (Cotte 1924) *A. dioicae* (Keifer 1979), *A. tamaricis* (Trotter 1901), and *A. tlaiae* (Trabut 1917). In this paper, we describe three new *Aceria* species associated with *Tamarix* spp. in Egypt and South Africa and provide supplementary descriptions of *A. amrini*, *A. dioicae*, and *A. tamaricis* based on material from Egypt.

Material and methods

Collection and morphological measurements

Plant materials (branches of *Tamarix* spp.) were collected in South Africa (near Noorspoort farm in the Western Cape and near Dwayka River in the Eastern Cape), and in Egypt (in the Qalyubia governorate) in spring, summer and winter seasons in 2016 – 2022. Plant material was kept cool and shipped to the laboratory the day after collection. In the laboratory the mites were collected under a stereomicroscope with a fine minute pin and transferred (a) in Eppendorf tubes filled with 96% ethanol for molecular studies, (b) into a drop of sorbitol-isopropyl solution for slide mounting (Amrine and Manson 1996), or (c) directly onto a double-sided carbon taped stub for scanning electron microscopy (SEM). Later, sorbitol-isopropyl solution was dissolved with distilled water and mites from this solution were mounted without using fibers on slides in modified Berlese medium with Iodine and cleared on a heating block at 90° C for 3–5 hours (Amrine and Manson 1996).

External morphology of the slide-mounted specimens was studied under phase contrast (PC) and differential interference contrast (DIC) light microscopy (LM) using a Carl Zeiss Jena microscope connected with a camera Optika Optikam B3 (in Egypt), a Leica DM4B connected with a camera Leica MC170 HD (in South Africa), and a Leica DM2500 connected with a camera ToupCam E3ISPM05000KPA (in Russia). No fibre was used in the mounting of the SOUTH African specimens. Measurements were obtained using Las Core (LAS V4.12) and *compuEye* software (Bakr 2005). They are given in the descriptions in micrometres (µm) and are lengths except when stated otherwise. In the descriptions of new species the measurements of a holotype female followed by the ranges (in brackets) based on measurements of the paratypes and holotypes are given. In the descriptions of males and immatures as well as in the supplementary descriptions, only ranges are given. Terminology of eriophyoid morphology and classification of Eriophyoidea follow Lindquist (1996) and Amrine *et al.* (1996), respectively.

Table 1 The list of eriophyid mite species associated with *Tamarix* spp. worldwide.

Subfamily	Species	Host	Type locality	Habitat	References
Eriophyinae, Aceriaiini	<i>Aceria aegyptitamaricis</i> Elhalawany n. sp.	<i>Tamarix senegalensis</i> DC.	Egypt	Green galls on buds and twigs	this paper
	<i>Aceria amrini</i> Joshi, 2013	<i>Tamarix aphylla</i> (L.) H.Karst.	India and Egypt	Brown big gall	Joshi et al. 2013 and this paper
	<i>Aceria arbores</i> (Cotte, 1924)	<i>Tamarix africana</i> Poir.	France	Twig and leaf deformation.	Cotté 1924
	<i>Aceria benhaiensis</i> Elhalawany, Ngubane-Ndhlovu et Situngu, n. sp.	<i>Tamarix senegalensis</i> DC.; <i>Tamarix usneoides</i> E. Mey. ex Bunge	Egypt and South Africa	Green galls on buds and twigs	this paper
	<i>Aceria dioicae</i> (Keifer, 1979)	<i>Tamarix dioica</i> Roxb.	Pakistan	Bud galls	Keifer 1979
Eriophyini	<i>Aceria noorspoortiensis</i> Situngu, Ngubane-Ndhlovu et Chetverikov n. sp.	<i>Tamarix usneoides</i> E. Mey. ex Bunge	South Africa	Bright pink galls	this paper
	<i>Aceria tamaricis</i> (Trotter, 1901)	<i>Tamarix</i> spp.	Turkey	Leaf and twig galls	Trotter 1901
	<i>Aceria tlaiae</i> (Trabut, 1917)	<i>Tamarix aphylla</i>	Morocco	Round galls	Trabut 1917
	<i>Eriophyes aegyptitamarix</i> Elhalawany, 2023	<i>Tamarix senegalensis</i> DC.	Egypt	Causes rusting	Elhalawany et al. 2023
	<i>Eriophyes gizaensis</i> Elhalawany, 2023	<i>Tamarix senegalensis</i> DC.	Egypt	Rounded green galls on buds and twigs	Elhalawany et al. 2023
Phyllocoptinae, Phyllocoptini	<i>Eriophyes strobilobius</i> Dębski, 1918	<i>Tamarix nilotica</i> (Ehrenb.) Bunge	Egypt	Flower deformation	Dębski 1918
	<i>Eriophyes tetragyna</i> Dębski, 1918	<i>Tamarix tetragyna</i> Ehrenb.	Egypt	Green gall	Dębski 1918
	<i>Phyllocoptes bilobospinosus</i> Chetverikov, 2019	<i>Tamarix ramosissima</i> Ledeb.,	Russia	Vagrant on young shoots	Chetverikov et al. 2019
	<i>Phyllocoptes immigrans</i> Keifer, 1940	<i>Tamarix gallica</i> L.	USA	Vagrant on leaves and stems	Keifer 1940
	<i>Dicranivasates tamaricis</i> Abou-Awad et El-Borolossy, 1995	<i>Tamarix senegalensis</i> DC.	Egypt	Vagrant, prefers twigs and causing rusting.	Abou-Awad & El-Borolossy 1995

The type materials from Egypt were deposited at the mite reference collection of the Fruit Tree Mites Department, Plant Protection Research Institute, Agricultural Research Centre, Dokki, Giza governorate, Egypt (PPRI-ARC). Some paratypes have been deposited at the Mite Reference Collection of the Egyptian Society of Acarology Museum (ESAM), Zoology and Agricultural Nematology Department, Faculty of Agriculture, Cairo University, Giza governorate, Egypt; the Arthropod/Mite Collection of the Department of Entomology, Nanjing Agricultural University, Jiangsu Province (NJAU), China; College of Agriculture and Forestry, West Virginia University (WVU), USA.; and the mite collection of Department of Plant, Soil and Food Sciences (Di.S.S.P.A.), University of Bari Aldo Moro, Italy (UNIBA, formerly indicated as UBI by Zhang 2018). Type materials from South Africa were deposited in the Department of Agriculture, Land Reform and Rural Development at the Plant Quarantine Station in Stellenbosch, South Africa and paratypes were deposited in the Acarological Collection of Zoological Institute of RAS (ZIN RAS, Saint-Petersburg, Russia).

Scanning Electron microscopy (SEM)

For cryo-fixation and preparing the mite samples for imaging, we followed the methodology used by Rahbani *et al.* (2013). While viewing the mites under a stereomicroscope, live mites were collected from the fresh galls and bud scales with a trimmed paintbrush. They were then transferred to a stub with double-sided carbon tape and immediately frozen using liquid nitrogen at -210°C for a few milliseconds to avoid ice crystal formation. The stub with the specimens was then heated to -100°C for 3 to 5 min to sublimate any water condensed on the surface of the mites, and then cooled again to -140°C . Thereafter, the mites were coated with platinum for 60s. The Zeiss Supra 55VP SEM equipped with a Gatan Alto cryo-stage (Gatan, Pleasanton, CA, USA) was used for viewing the mites and capturing images.

DNA extraction and sequencing

For DNA extraction, 1–3 mite specimens of each species were crushed with a fine pin in a 1 μL drop of distilled water on a microscope slide. The drop was pipetted into a thin-walled PCR tube with 20 μL of 8% solution of Chelex® 100 Resin before being heated twice (10 min at 95°C). The solution above the settled Chelex® granules was used as the DNA template for PCR to amplify a fragment of subunit I of *Cox I* gene, D1D2 region of 28S rDNA gene, and ITS1-5.8S-ITS2 genes. Thermal cycling profiles and primers (for PCR and for sequencing) used were as specified by Klimov *et al.* (2018) and Chetverikov and Bertone (2022). After amplification, 3.5 μL of each reaction product was mixed with 0.5 μL of SYBR Green I (Lumiprobe, Hannover, Germany) and analyzed by electrophoresis in a 1% agarose gel to assess the product size and concentration. Sequences were obtained using BigDye Terminator v.3.1 chemistry in a 3500xl Genetic Analyzer (Applied Bio-systems, Foster City, CA, USA). New sequences were compared with the sequences of Eriophyoidea currently available in GenBank (23 June 2023) using different *blast* algorithms (<http://blast.ncbi.nlm.nih.gov/Blast.cgi>). The voucher specimens were deposited in the Department of Agriculture, Land Reform and Rural Development at Plant Quarantine Station in Stellenbosch, South Africa.

Results

Eriophyidae Nalepa, 1898

Subfamily Eriophyinae Nalepa, 1898

Tribe Aceriini Amrine et Stasny, 1994

Genus *Aceria* Keifer, 1944*Aceria aegyptytamaricis* Elhalawany n. sp.

Zoobank: 82CC1027-A40C-4009-8E32-085002CFFF45

(Figures 2–3)

Description

Female — (n=15). Body vermiform, 184 (150–190) including gnathosoma, 65 (50–67) wide, 65 (50–65) thick, yellowish.

Gnathosoma 21 (21–23), projecting obliquely downwards, *ep* 2 (2–3), *d* 6 (6–7), *v* 1–2, cheliceral stylets 17 (16–18). **Prodorsal shield** 25 (23–30) with short subtriangular frontal lobe 2 (2–4), 45 (42–55) wide. Prodorsal shield ornamentation faint. Median line short, present only near posterior shield margin as a short dark ridge, admedian lines very indistinct, complete; sub-median lines absent. Scapular tubercles on rear shield margin, 25 (23–27) apart, *sc* 40 (30–45), directed backward. **Coxigenital area** smooth, with 4–5 semiannuli between coxae and genitalia, prosternal apodeme 6 (5–6); *lb* 7 (7–9), 13 (13–14) apart; *la* 25 (24–28), 9 (9–10) apart; *2a* 35 (35–42), 27 (27–30) apart.

Leg I 28 (28–31), femur 9 (8–10), *bv* 13 (12–15); genu 4 (3–4), *l''* 20 (18–25); tibia 4 (4–5), *l'* 6 (6–8), located in $\frac{1}{2}$ from dorsal base; tarsus 7 (7–8); tarsal empodium simple 7 (7–10), 8-rayed, tarsal solenidion ω tapered, 8 (7–9), *ft'* 22 (22–24), *ft''* 28 (26–28), *u'* 3 (3–4). **Leg II** 24 (22–24), femur 7 (7–8), *bv* 13 (12–15); genu 3 (3–4), *l''* 10 (10–12); tibia 4 (3–4); tarsus 5 (4–5); tarsal empodium simple 8 (7–9), 8-rayed, ω tapered 7 (7–9), *ft'* 15 (15–17), *ft''* 26 (25–28), *u'* 3 (3–4).

Opisthosoma dorsally evenly flat, with 65 (64–75) dorsal semiannuli and 60 (60–65) ventral semiannuli. Dorsal semiannuli with linear elongate microtubercles on rear annular margins, 4–5 caudal annuli dorsally without microtubercles. Ventral semiannuli with elongate microtubercles on rear annular margins, microtubercles on the last 7–8 ventral semiannuli oval. Setae *c2* 25 (25–30), 45 (42–49) apart, on annulus 7 (7–7) from coxae II; *d* 45 (42–49), 35 (35–37) apart, on annulus 15 (14–15); *e* 40 (38–45), 19 (19–21) apart, on annulus 31 (30–33); *f* 42 (35–48), 25 (25–28) apart, on 8th annulus from rear, *h1* 6 (6–7); *h2* 65 (65–86). **External genitalia.** Genital coverflap subtriangular, smooth, 11 (10–11), 17 (17–18) wide, *3a*, 40 (35–48), 11 (11–12) apart. **Internal genitalia.** Spermathecae globose, oriented postero laterad; spermathecal tubes relatively short about one third of spermathecal diameter; oblique apodeme indistinct.

Male — (n=5). Similar to females, 153–175 including gnathosoma, 48–54 wide and 50–57 thick, whitish when alive.

Gnathosoma 17–20, cheliceral stylets 14–15, *ep* 2–3, *d* 5–6, *v* 1–2. **Prodorsal shield** pattern similar to that of female, 23–25 including frontal lobe, 39–42 wide; Scapular tubercles on rear shield margin, 24–26 apart, *sc* 26–30, directed backward. **Coxigenital area** smooth, prosternal apodeme 5–6; *lb* 7–8, 12–13 apart; *la* 25–28, 8–9 apart; *2a* 30–35, 26–28 apart.

Leg I 20–22, femur 6–7, *bv* 8–12; genu 3–4, *l''* 17–20; tibia 4–5, *l'* 3–5; tarsus 5–6; empodium simple 5–6, 7-rayed, tarsal solenidion ω 7–8 tapered, *ft'* 20–22, *ft''* 20–25, *u'* 3–4. **Leg II** 19–21, femur 6–7, *bv* 8–10; genu 2–3, *l''* 6–9; tibia 3–4; tarsus 4–5; *em* 5–6, 7-rayed, ω 7–8 tapered, *ft'* 7–10, *ft''* 18–22, *u'* 2–3.

Opisthosoma with 58–65 dorsal semiannuli and 58–61 ventral semiannuli, microtubercles shaped as in females. Setae *c2* 18–23, 43–49 apart, on annulus 7 from coxae II; *d* 28–33, 35–38



Figure 1 Galls caused by eriophyoid mites of the genus *Aceria* on *Tamarix* spp. in Africa: A and B: galls on young twigs of *T. senegalensis* DC. caused by *A. dioicae* Keifer (Egypt); C: terminal galls on twigs of *T. senegalensis* caused by *A. aegyptytamaricis* n. sp. (Egypt); D: gall caused by *A. tamaricis* on twigs of *T. senegalensis* (Egypt); E and F: galls caused by *Aceria amrini* on *T. aphylla* (Egypt); G - J: galls on *T. usneoides* caused by *Aceria noorspoortiensis* n. sp. (South Africa). Black arrow in Fig. 1G indicates dry old galls. Scale bar: 5 mm for A-D, G-J; 20 mm for E and F. Photos – A.S. Elhalawany (A-F), P.E.Chetverikov (G-J).

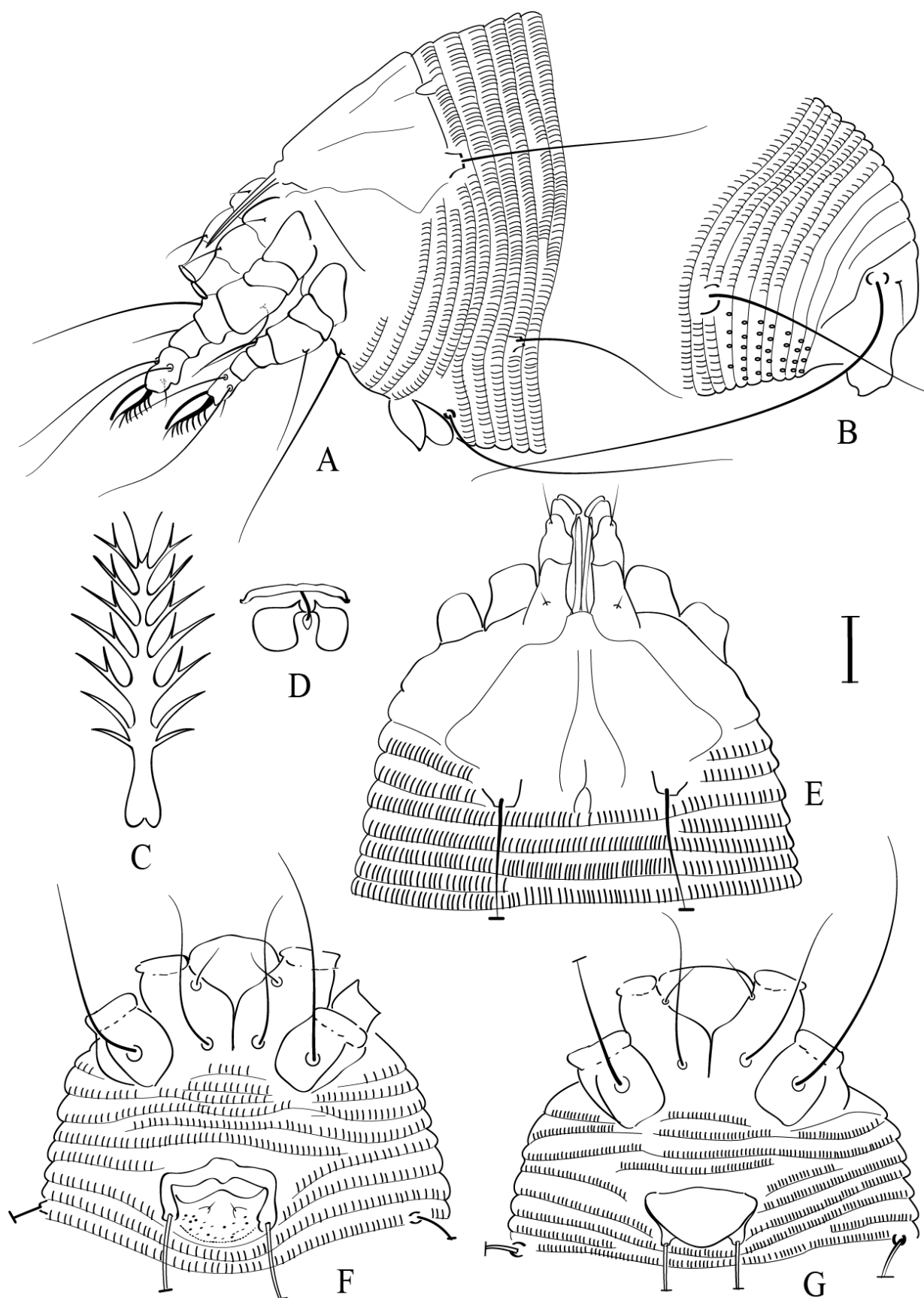


Figure 2 Drawings of *Aceria aegyptytamaricis* Elhalawany n. sp.: A – anterio-lateral view of mite; B – postero-lateral view of mite; C – empodium; D – internal female genitalia; E – prodorsal shield; F – coxi-genital region of male; G – coxi-genital region of female. Scale bar: A,B,D,E,F,G – 10 μ m; C – 2.5 μ m. Drawings – A.S. Elhalawany.

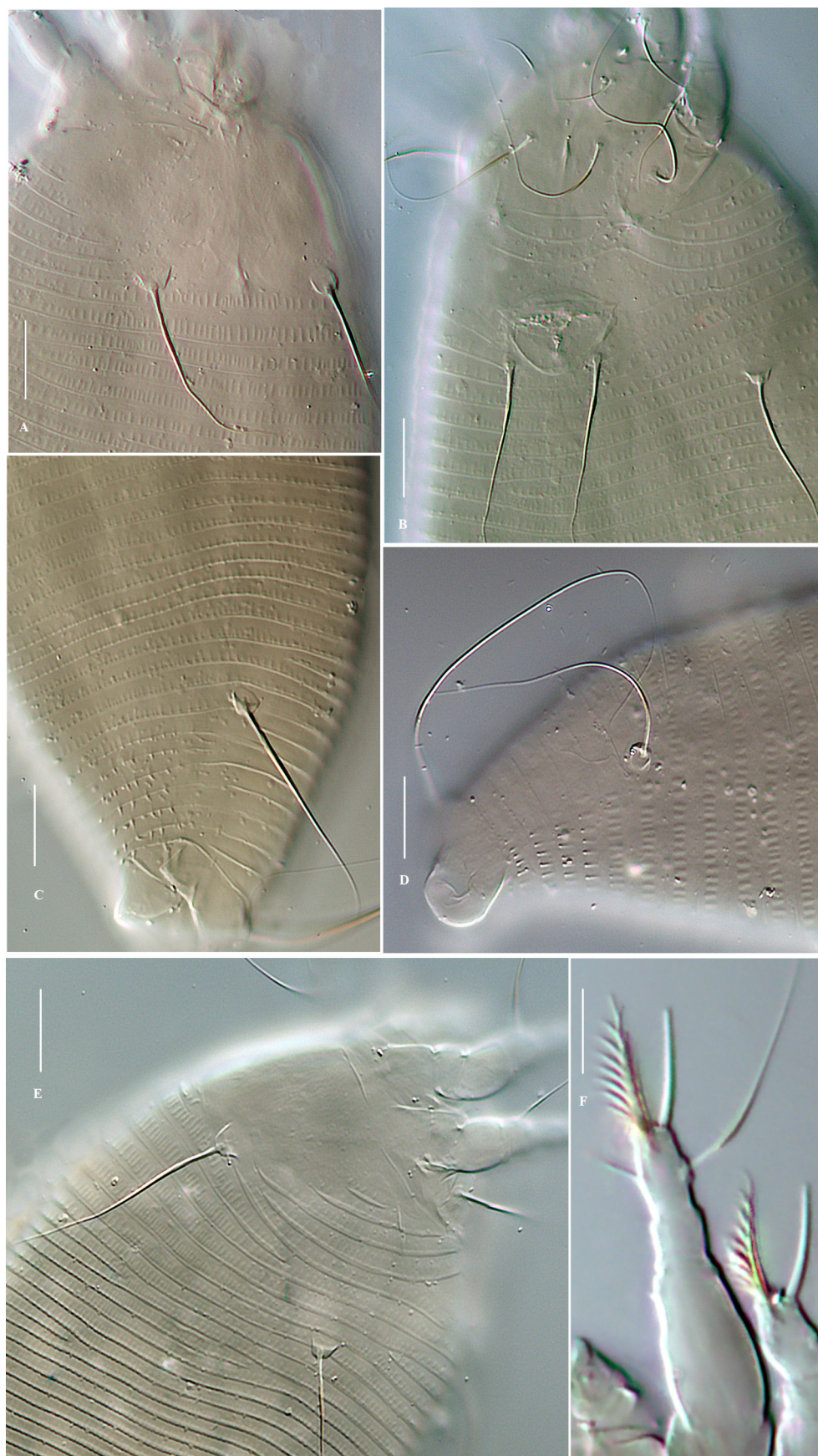


Figure 3 DIC LM photographs of *Aceria aegyptytamaricis* Elhalawany **n. sp.** (female). A – prodorsal shield, B – coxigenital area, C – ventral view of posterior part of opisthosoma, D – lateral view.

apart, on annulus 14–15; *e* 26–28, 20–21 apart, on annulus 27–28; *f* 25–28, 24–28 apart, on 8th annulus from rear, *h1* 3–4; *h2* 55–60. **External genitalia** 12–14, 17–19 wide, genital cuticle behind the tubercles of eugenital setae with microgranulations, *3a* 28–32, 13–14 apart.

Nymph — (n=3). Body vermiform, 145–150 including gnathosoma, 38–40 wide.

Gnathosoma 14–15, cheliceral stylets 12–13, *ep* 1–2, *d* 3–4. **Prodorsal shield** semicircular, smooth, 20–22, 21–23 wide. Scapular tubercles on rear shield margin 16–18 apart, *sc* 11–13, directed backward. **Coxigenital area** smooth; *lb* 2–3, 10–11 apart; *la* 6–8, 6–7 apart; *2a* 9–11, 19–20 apart; *3a* 8–10, 6–7 apart.

Leg I 15–17, femur 3–4, *bv* 3–5; genu 2–4, *l''* 5–7; tibia 3–3, *l'* 2–3; tarsus 3–3; empodium simple 3–4, 4-rayed, solenidion ω 4–5 tapered, *ft'* 8–10, *ft''* 11–13, *u'* 1–2. **Leg II** 13–14, femur 3–4, *bv* 4–5; genu 2–3, *l''* 3–5; tibia 2–3; tarsus 3–3; empodium 3–4, 4-rayed, ω 4–5 tapered, *ft'* 5–6, *ft''* 6–10, *u'* 1–2.

Opisthosoma with 45–48 smooth dorsal semiannuli and 40–42 smooth ventral semiannuli. Setae *c2* 10–11, 39–40 apart, on annulus 6–7 from coxae II; *d* 13–14, 31–32 apart, on annulus 14; *e* 8–9, 14–15 apart, on annulus 23; *f* 15–17, 22–24 apart, on 4–5th annulus from rear, *h1* 1–2; *h2* 21–25.

Host plant

Tamarisk (athel), *Tamarix senegalensis* DC. (= *Tamarix nilotica* (Ehrenb.) Bunge) (Tamaricaceae).

Relation to the host plant — Mites cause green elongate galls on buds and twigs, about 4–6 mm long and 2.5–3.5 in diameter (Figure 1 C).

Etymology

The name “*aegypti*” refers to Egypt; “*tamaricis*” refers to the genus name of the host plant.

Type locality

Benha city (30°26'04.62"N, 31°11'24.22"E), Qalyubia governorate, Egypt, 9 March, 2021, coll. Ashraf Elhalawany.

Type material

Holotype: female (slide no. EGYErio55.1), deposited at ARC-PPRI, Egypt. Paratypes: ten females, five males and five nymphs on five slides (slides no. EGYErio55.2–55.6), 19 February 2021 deposited at ARC-PPRI, Egypt. Five paratypes females on two slides (slide no. EGYErio55.7–55.8), 10 January 2019, with the same data as holotype, deposited at ESAM, Egypt. Two slides (slides no. EgTT09-10), 10 January 2019, with the same data as holotype, deposited at UNIBA, Italy. Four slides, 9 March 2021, with the same data as holotype, deposited at Zoological Institute of the Russian Academy of Sciences (ZIN RAS), Russia. Two slides, 9 March 2019 with the same data as holotype, deposited at the College of Agriculture and Forestry, West Virginia University (WVU), USA.

Differential diagnosis

The new species is close to *Aceria dioicae* (Keifer, 1979) and *A. tamaricis* (Trotter, 1901) that are associated with different *Tamarix* spp. and cause galls resembling those caused by *A. aegyptytamaricis* sp. n. These three species are similar in smooth coxae, and lengths of scapular setae *sc*, setae *e* and *f* but differ in ornamentation of prodorsal shield, shape of microtubercles on opisthosomal annuli, number of empodium rays, and lengths of *c2* and *3a* (Table 2).

Aceria amrini Joshi, 2013

(Figures 4–5)

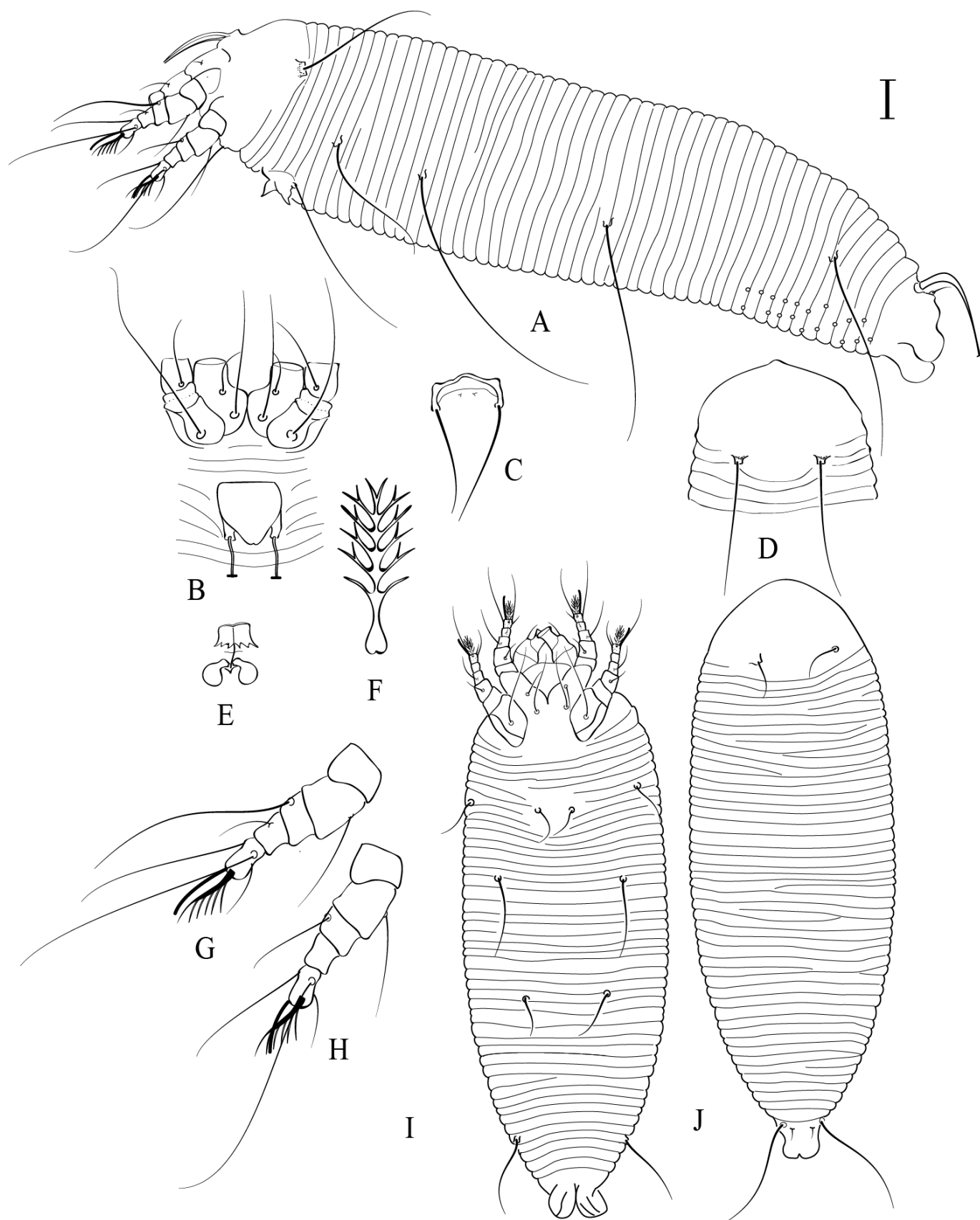


Figure 4 Drawings of *Aceria amrini* Joshi, 2013: A – lateral view of mite; B – coxigenital region of female; C – male external genitalia; D – dorsal view of female; E – internal female genitalia; F – empodium; G – leg1; H – leg2; I – ventral view of a nymph; J – dorsal view of a nymph. Scale bar: 10 μ m for A, B, C, D, E, I, J; G, H – 5 μ m; F – 2.5 μ m. Drawings – A.S. Elhalawany.

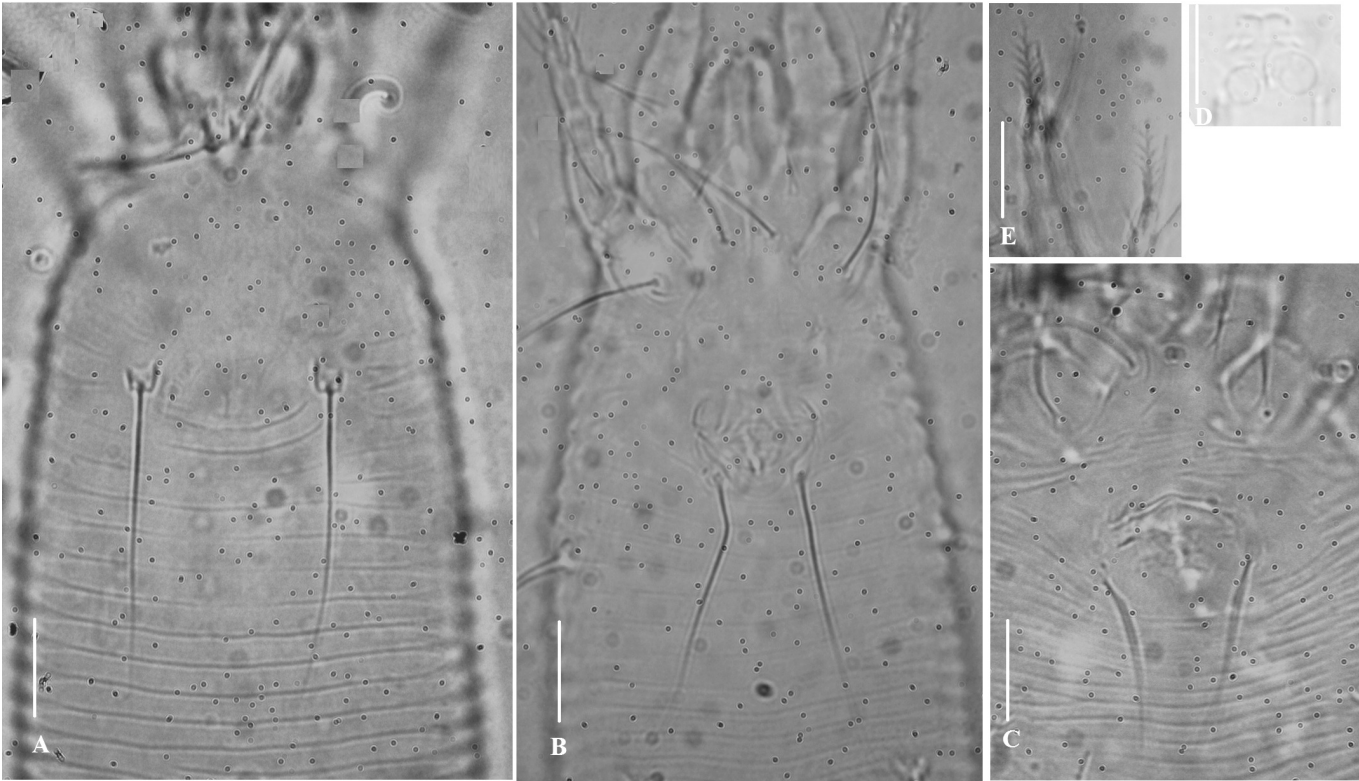


Figure 5 PC LM microphotographs of *Aceria amrini* Joshi, 2013: A – prodorsal shield of female; B – coxigenital region of female; C – coxi-genital region of male; D – female internal genitalia; E – empodium; Scale bar: 12 µm. Photos – A.S. Elhalawany.

Supplementary description

Female — (n=10). Body vermiform, 225 (150–235) including gnathosoma, 51 (42–52) wide, 49 (41–50) thick; yellowish.

Table 2 Morphological differences between three *Aceria* species from *Tamarix* spp.

Character	<i>Aceria dioicae</i> (Keifer, 1979)	<i>A. tamaricis</i> (Trotter, 1901) protogyne	<i>A. aegyptytamaricis</i> sp. n.
Prodorsal shield ornamentation	Median line short, present only in posterior ¼ of prodorsal shield. Admedian lines distinct in posterior ½, weak in medial ½ and absent in anterior ½ of prodorsal shield. Submedian I very short, situated near basis of <i>sc</i> tubercle. Posterior ends of median, admedian and submedian I lines connected with sinuous transverse line forming medio-posterior margin of prodorsal shield between tubercles of <i>sc</i> . One or two short curved lines (putative submedian II and III) present in lateral fields of prodorsal shield.	Smooth, with a small median pit present near rear shield margin.	Median line short, present only near posterior shield margin in a form of short dark ridge, admedian lines very indistinct, complete; sub-median lines absent
Shape of microtubercles on opisthosomal annuli	Dorsal and ventral semiannuli with subcircular microtubercles ahead of rear annular margin, except the last 10–11 dorsal annuli bearing pointed microtubercles and the last 5–6 th ventral annuli bearing linear elongate microtubercles.	Dorsal and ventral semiannuli with elliptical microtubercles ahead of rear annular margin, except the last 4 dorsal annuli with pointed microtubercles and last 8 th ventral annuli with linear elongate.	Dorsal semiannuli with linear elongate microtubercles on rear annular margins, 4–5 caudal annuli dorsally without microtubercles. Ventral semiannuli with elongate microtubercles on rear annular margins, microtubercles on the last 7-8 ventral semiannuli oval.
Length of C2	36	30–40	25 (25–30)
Number of empodial rays	7	7	8
length of 3a	40	25–35	40 (35–48)
Reference	Keifer, 1979	de Lillo & Sobhian, 1994	this study

Gnathosoma 26 (24–28), projecting obliquely downwards, *ep* 2 (2–3), *d* 7 (6–8), *v* absent, cheliceral stylets 20 (18–21). **Prodorsal shield** 31 (29–33), 43 (39–44) wide; subtriangular, smooth. Scapular tubercles on rear shield margin, 22 (20–23) apart, *sc* 37 (34–38), directed backward. **Coxigenital area** smooth, with three semiannuli between coxae and genitalia, prosternal apodeme 4 (4–5); *lb* 10 (10–12), 12 (12–14) apart; *la* 25 (21–31), 8 (7–8) apart; *2a* 43 (29–45), 23 (23–25) apart.

Leg I 25 (23–28), femur 7 (6–8), *bv* 13 (11–14); genu 4 (4–5), *l''* 25 (25–27); tibia 4 (4–5), *l'* 7 (7–8), located in the middle from dorsal base; tarsus 5 (5–6); tarsal empodium simple 9 (8–10), 6-rayed, tarsal solenidion ω tapered, 9 (8–9), *pa.ft'* 17 (15–20), *ft''* 28 (27–33), *u'* 7 (6–7). **Leg II** 24 (23–26), femur 6 (6–7), *bv* 13 (12–15); genu 4 (3–4), *l''* 11 (11–13); tibia 4; tarsus 6 (5–7); tarsal empodium simple 9 (8–10), 6-rayed, ω tapered 8 (8–9), *ft'* 15 (15–17), *ft''* 30 (30–34), *u'* 7 (6–7).

Opisthosoma dorsally evenly arched, with 53 (52–55) dorsal semiannuli and 58 (56–60) ventral semiannuli. Dorsal and ventral semiannuli smooth except the last 10–11th ventral annuli bearing distinct pointed microtubercles. Setae *c2* 37 (35–45), 40 (39–50) apart, on annulus 8 (8–9) from coxae II; *d* 70 (45–70), 30 (29–36) apart, on semiannulus 15 (15–16); *e* 57 (35–58), 15 (14–18) apart, on annulus 31 (30–32); *f* 55 (38–55), 33 (33–35) apart, on 6–7th annulus from rear, *h1* 6 (5–6), *h2* 100 (85–107). **External genitalia**. Genital coverflap subtriangular, smooth, 15 (15–16), 17 (16–17) wide, *3a*, 45 (30–44), 11 (11–12) apart. **Internal genitalia**. Anterior genital apodeme trapezoidal, longitudinal bridge distinct; oblique apodeme non-apparent; spermathecal tubes short, directed laterad; spermathecae ovoid.

Male — (n=5). Similar to female, body vermiform, 185–215 including gnathosoma, 50–58 wide and 40–57 thick; whitish in life.

Gnathosoma 23–25, cheliceral stylets 16–20, *ep* 2–3, *d* 6–8, *v* absent. **Prodorsal shield** smooth, 25–28, 34–38 wide; scapular tubercles on rear shield margin, 21–25 apart, *sc* 23–32, directed backward. **Coxigenital area** smooth, prosternal apodeme 3–5; *lb* 7–8, 10–11 apart; *la* 14–16, 6–8 apart; *2a* 19–27, 18–20 apart.

Leg I 24–26, femur 6–8, *bv* 13–14; genu 4–5, *l''* 22–25; tibia 3–4, *l'* 5–6; tarsus 5–6; empodium simple 6–7, 6-rayed, ω 6–7 tapered, *ft'* 13–15, seta *ft''* 20–27, *u'* 5–6. **Leg II** 21–24, femur 6–8, *bv* 11–14; genu 3–4, *l''* 10–12; tibia 3–4; tarsus 5–6; empodium 6–6, 6-rayed, ω 6–7 tapered, *ft'* 12–15, *ft''* 25–28, *u'* 5–6.

Opisthosoma with 50–54 dorsal semiannuli and 53–57 ventral semiannuli, microtubercles shaped similar to those of female. Setae *c2* 27–35, 47–50 apart, on annulus 7–8 from coxae II; *d* 36–45, 31–40 apart, on annulus 15–16; *e* 25–45, 16–18 apart, on annulus 29–30; *f* 27–35, 32–35 apart, on 6th annulus from rear, *h1* 4–6, *h2* 72–95. **External genitalia** 10–14, 17–19 wide, cuticle behind eugenital setae smooth, *3a* 27–31, 15–16 apart.

Nymph — (n=3). Body vermiform, 148–160 including gnathosoma, 45–52 wide, 42–46 thick.

Gnathosoma 17–19, cheliceral stylets 14–16, *ep* 1–2, *d* 4–6. **Prodorsal shield** subtriangular, smooth, 24–25, 35–38 wide. Scapular tubercles on rear shield margin, 19–21 apart, *sc* 10–14, directed backward. **Coxigenital area** smooth; *lb* 5–8, 9–11 apart; *la* 14–16, 6–8 apart; *2a* 17–21, 19–20 apart; *3a* 7–10, 8–9 apart.

Leg I 15–16, femur 3–4, *bv* 4–6; genu 2, *l''* 10–12; tibia 2, *l'* 2–3; tarsus 2; empodium simple 4–5, 5-rayed, ω 5–6 tapered, *ft'* 11–14, *ft''* 12–15, *u'* 3–4. **Leg II** 15–16, femur 3–4, *bv* 4–6; genu 2, *l''* 7–8; tibia 2; tarsus 2; *em* 4–5, 5-rayed, ω 5–6 tapered, *ft'* 6–8, *ft''* 10–13, *u'* 3–4.

Opisthosoma with 44–47 smooth annuli. Setae *c2* 10–13, 40–42 apart, on annulus 7 from coxae II; *d* 20–22, 30–31 apart, on annulus 15–16; *e* 11–20, 20–22 apart, on annulus 27–28; *f* 20–22, 20–21 apart, on 4–5th annulus from rear, *h1* 3–4, *h2* 29–33.

Host plant

Tamarix aphylla (L.) Karst. (Tamaricaceae).

Relation to the host plant — In Egypt, *A. amrini* causes large rounded brown galls about 30–52 mm diameter on twigs of *Tamarix aphylla* (Figure 1 E, F). In India, these mites were

collected as vagrants from the stems, leaves, and buds on the same host with no apparent damage to plant observed (Joshi *et al.* 2013).

Distribution

India (New Delhi) and Egypt (first record for Africa).

Material examined

Fifteen females, five males and four nymphs on five slides (slide no. EGYErio40.1–40.5), from *T. aphylla*, deposited in the Plant Protection Research Institute collection, Giza, Egypt, 9 March, 2021, Qalyubia governorate (30°16'14.03"N, 31°14'07.28"E), coll. Ashraf Elhalawany. Four slides (slides no. EgTA01-04) with the same data, deposited at UNIBA, Italy. Four slides with the same data as holotype, deposited at Zoological Institute of the Russian Academy of Sciences (ZIN RAS), Russia. Two slides deposited at the College of Agriculture and Forestry, West Virginia University (WVU), USA. Five females on two slides (EGYErio40.6 and EGYErio40.7, collected on 28 January 2023), deposited at ESAM, Egypt.

Remarks

In comparison to specimens of *A. amrini* described by Joshi *et al.* (2013) from India, the specimens from Egypt have shorter opisthosomal setae *c2* (35–45 vs 45–60) and *h2* (85–107 vs 100–135).

Aceria benhaiensis Elhalawany, Ngubane-Ndhlovu et Situngu n. sp.

Zoobank: [EAA146D6-487C-44F0-BB59-2A1088122FBC](https://zoobank.org/EAA146D6-487C-44F0-BB59-2A1088122FBC)

(Figures 6–8)

Description

Female — (n=15). Body vermiform, 185 (170–195) including gnathosoma, 45 (40–46) wide, 42 (40–45) thick; light yellow.

Gnathosoma 23 (21–23), projecting obliquely downwards, *ep* 3 (3–4), *d* 6 (6–7), *v* 1–2, chelicerae 17 (14–17). **Prodorsal shield** 21 (21–22) with short anteriorly rounded subtriangular frontal lobe, 32 (30–33) wide; prodorsal shield ornamentation faint. Median line absent or very indistinct only in posterior ¼ of prodorsal shield, admedian lines very faint, complete, curved at base L-shaped; some dashes and short lines present in epicoxal areas. Scapular tubercles on rear shield margin, 22 (19–23) apart, *sc* 23 (22–25), projecting posteriorly. **Coxigenital area** smooth, with 2–3 annuli between coxae and genitalia, prosternal apodeme 4 (3–4); *I lb* 5 (4–6), 8 (8–10) apart; *I la* 21 (19–24), 6 (6–7) apart; *2a* 32 (30–35), 19 (19–20) apart.

Leg I 23 (21–23), femur 7 (7–8), *bv* 9 (5–9); genu 4 (3–4), *l''* 22 (17–23); tibia 4 (4–6), *l'* 4 (3–5), located in the middle from dorsal base; tarsus 5 (4–6); tarsal empodium simple 5 (5–6), 6-rayed, *ω* tapered, 6 (6–7), *ft'* 17 (14–17), *ft''* 20 (18–22), *u'* 3 (3–4). **Leg II** 21 (18–21), femur 6 (5–6), *bv* 9 (7–10); genu 4 (3–4), *l''* 10 (9–10); tibia 4 (3–4); tarsus 4 (4–5); tarsal empodium simple 5 (5–6), 6-rayed, *ω* tapered 6 (6–7), *ft'* 10 (8–10), *ft''* 20 (19–22), *u'* 3 (3–4).

Opisthosoma dorsally with 41 (39–46) annuli, with linear elongate microtubercles on rear annular margins, last 6 annuli without microtubercles; ventrally with 42 (42–45) annuli, with more rounded microtubercles than on dorsal annuli. Setae *c2* 21 (20–22), 44 (44–45) apart, on annulus 7 from coxae II; *d* 32 (31–40), 30 (29–30) apart, on annulus 14 (14–15); *e* 30 (28–30), 16 (15–18) apart, on annulus 25 (24–25); *f* 30 (25–35), 31 (31–35) apart, on 6–7th annulus from rear, *h1* 5 (5–6), *h2* 55 (49–70). **External genitalia** 10 (9–10), 17 (16–17) wide, coverflap smooth, subtriangular, *3a* 25 (25–32), 10 (8–10) apart.

Male — (n=5). Similar to female, body vermiform, 149–175 including gnathosoma, 37–42 wide and 38–40 thick; whitish.

Gnathosoma 18–20, cheliceral stylets 16–18, *ep* 2–3, *d* 5–6, *v* 1–2. **Prodorsal shield** pattern similar to that of female, 18–20, 27–34 wide; Scapular tubercles on rear shield margin,

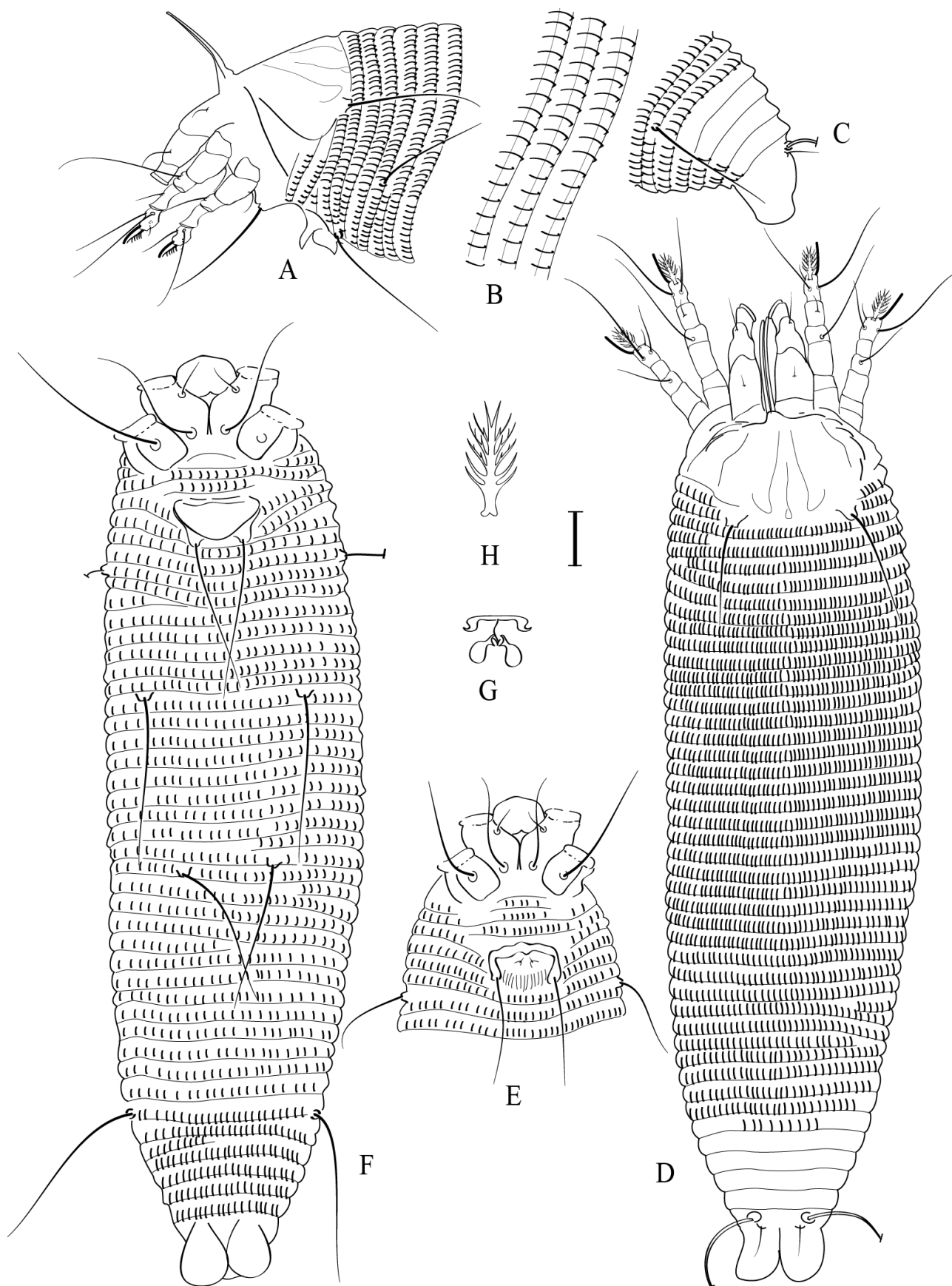


Figure 6 Drawings of *Aceria benhaiensis* n. sp.: A – antero-lateral view of mite; B – lateral view of opisthosomal annuli; C – postero-lateral view of mite; D – dorsal view of female; E – coxi-genital region of male; F – ventral view of female; G – female internal genitalia; H – empodium. Scale bar: A, C, D, E, F, G – 10 µm; B – 5 µm; H – 2.5 µm. Drawings – A.S. Elhalawany.

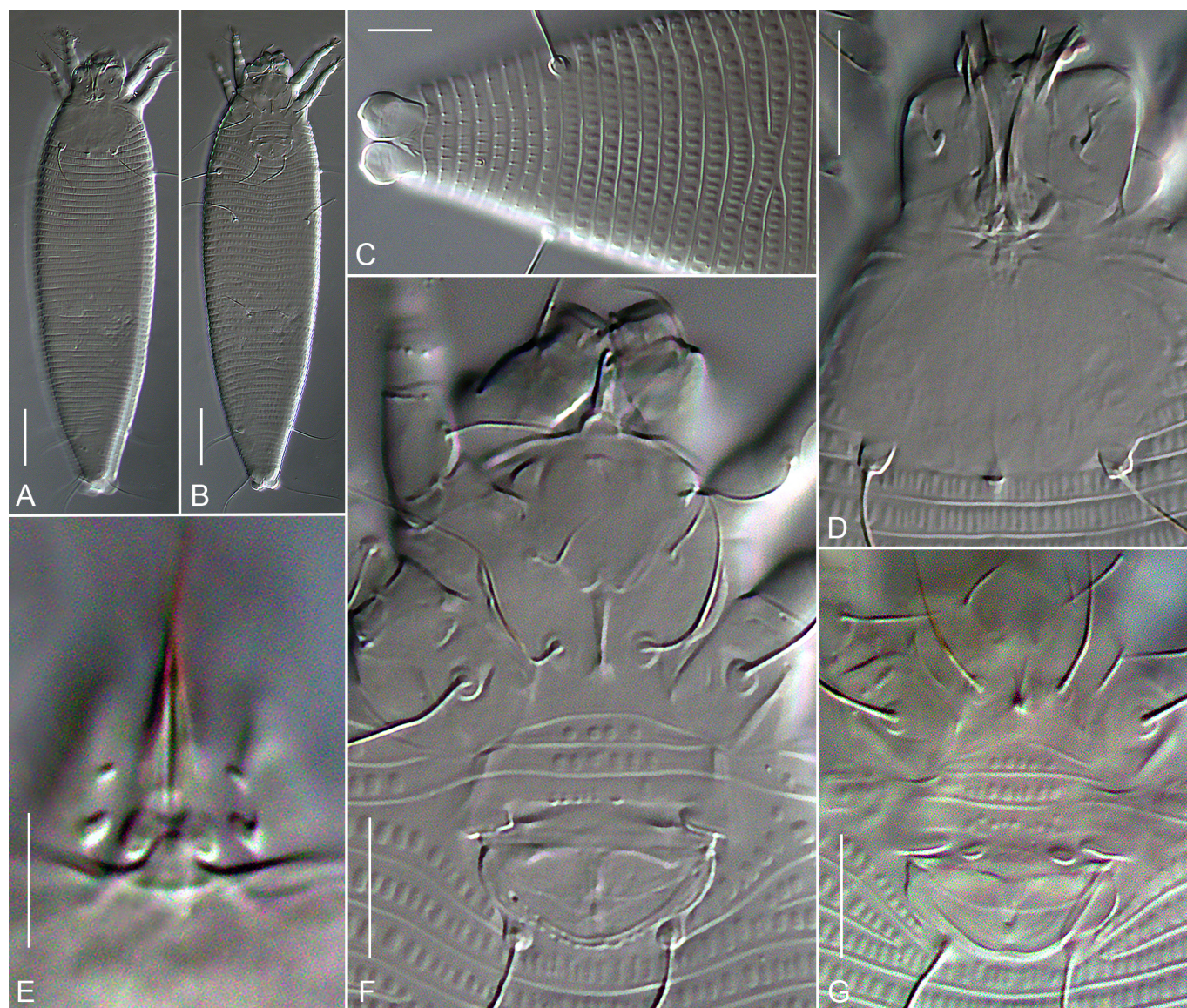


Figure 7 DIC LM photographs of *Aceria benhaiensis* n. sp. (females) from South African population. A and B – dorsal (A) and ventral (B) entire mite, C – ventral view of posterior part of opisthosoma, D – prodorsal shield, E – dorsal aspect of basal gnathosoma, F and G – coxigenital area. Scale bar: A,B – 20 µm; C,D,E,F,G – 10 µm; E – 5 µm. Photos – P.E. Chetverikov.

21–22 apart, *sc* 18–22, directed backward. **Coxigenital area** smooth, prosternal apodeme 3–4; *lb* 4–5, 8–9 apart; *la* 16–18, 5–6 apart; *2a* 25–28, 17–19 apart.

Leg I 17–19, femur 5–7, *bv* 6–9; genu 2–3, *l'* 12–15; tibia 3–4, *l'* 3–4; tarsus 4–5; empodium simple 4–5, 6-rayed, *ω* 5–6 tapered, *ft'* 12–15, *ft''* 17–21, *u'* 2–4. **Leg II** 16–174, femur 5–6, *bv* 7–11; genu 3, *l''* 8–10; tibia 3; tarsus 3–4; empodium 4–5, 6-rayed, *ω* 6–7 tapered, *ft'* 7–9, *ft''* 15–18, *u'* 2–3. **Opisthosoma** with 38–40 dorsal semiannuli and 40–42 ventral semiannuli, microtubercles shaped similar to those of female. Setae *c2* 16–21, 41–43 apart, on annulus 7 from coxae II; *d* 24–27, 29–30 apart, on annulus 12–13; *e* 15–23, 16–17 apart, on annulus 21–22; *f* 26–30, 25–29 apart, on 5th annulus from rear, *h1* 5–6; *h2* 49–70. Male genital area 10–12 long 13–15 wide, *3a* 18–21, 11–12 apart, *eu* minute, surface below eugenital setae with short lines.

Larva — (n=3). Body vermiform, 130–139 including gnathosoma, 32–34 wide.

Gnathosoma 12–15, cheliceral stylets 10–11, *ep* 1–2, *d* 2–3. **Prodorsal shield** subtrian-

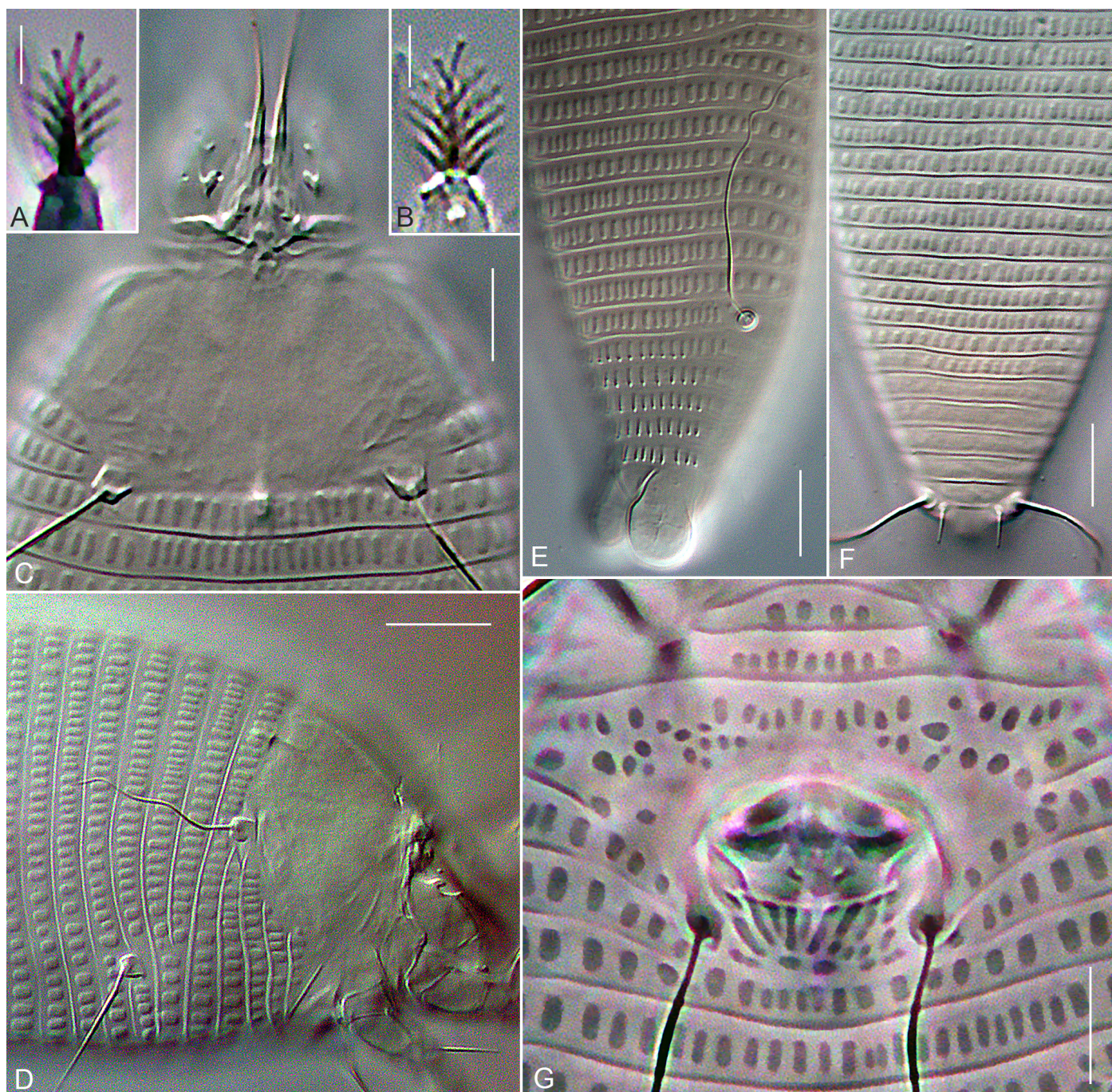


Figure 8 PC LM (A,G) and DIC LM (B-F) photographs of *Aceria benhaiensis* n. sp. (males) from the South African population. A and B – empodium I, C – prodorsal shield, D – lateral aspect of anterior part of body, E and F – ventral (E) and dorsal (F) view of posterior part of opisthosoma, G – coxigenital area. Scale bar: A,B – 2 μ m; C,G – 5 μ m; D – 15 μ m; E,F – 5 μ m. Photos – P.E.Chetverikov.

gular, smooth, 12–14, 22–24 wide. Scapular tubercles on rear shield margin, 18–20 apart, *sc* 9–11, directed backward. **Coxigenital area** smooth; *lb* 2–3, 5–6 apart; *la* 7–9, 3–4 apart; *2a* 10–11, 13–14 apart; *3a* 4–5, 4 apart.

Leg I 13–14, femur 2–3, *bv* 3–4; genu 2, *l''* 9–10; tibia 2, *l'* 1–2; tarsus 2–3; empodium simple 2–3, 3-rayed, *ω* 2–3 tapered, *ft'* 5–7, *ft''* 10–11, *u'* 1–2. **Leg II** 10–12, femur 2–3, *bv* 3–5; genu 2, *l''* 5–6; tibia 2; tarsus 2–3; empodium 2–3, 3-rayed, *ω* 2–3 tapered, *ft'* 5–7, seta *ft''*

11–13, *u'* 1–2.

Opisthosoma with 30–35 smooth annuli. Setae *c*2 7–8, 30–31 apart, on annulus 5 from coxae II; *d* 9–10, 28 apart, on annulus 10; *e* 9–10, 16 apart, on annulus 17–18; *f* 11–13, 20–21 apart, on 4th annulus from rear, *h*1 1–2; *h*2 15–22.

Host plant

Tamarix senegalensis DC. (= *T. nilotica*) in Egypt and *T. usneoides* E. May. ex Bunge. (Tamaricaceae) in South Africa.

Relation to the host plant — Mites were collected from leaf axils and twigs; they cause rusting symptoms and deformations on the plants.

Etymology

The name “*benhaiensis*” refers to the type location; Benha city, Qalyubia governorate, Egypt, where the type specimens were collected + suffix –iensis, meaning coming from.

Type locality

Benha city (30°26'04.62"N, 31°11'24.22"E), Qalyubia governorate, Egypt, 9 March, 2021, coll. Ashraf Elhalawany.

Type material

Holotype: female (slide no. EGYErio110.1), deposited at ARC-PPRI, Egypt. Paratypes: ten females, five males and five nymphs on five slides (slides no. EGYErio110.2–110.6), 10 January 2019, deposited at ARC-PPRI, Egypt. Five paratype females on two slides (slide no. EGYErio55.7–55.8), 14 November, 2017, with the same data as holotype, deposited at ESAM, Egypt. Two slides with the same data as holotype, 9 March 2021, deposited at Zoological Institute of the Russian Academy of Sciences (ZIN RAS), Russia. Two slides, 10 January 2019, deposited at the College of Agriculture and Forestry, West Virginia University (WVU), USA.

Additional material — Mites morphologically very similar to *A. benhaiensis* **n. sp.** from Egypt were also found under scaly leaves on *T. usneoides* in South Africa. In order to test the conspecificity of the mites from Egypt and South Africa we extracted mite DNA and performed PCR of three marker genes (Cox1, D1D2 28S and ITS1–5.8S–ITS2). Only samples from South Africa provided positive PCR results. This is most likely because of inappropriate storage of the Egyptian material prior to DNA extraction (the samples spent almost four months in the post office until they were delivered to Russia). Although genetic data on the mites from Egypt were unavailable for comparison, in this paper we consider specimens from Egypt and South Africa conspecific because morphologically they were indistinguishable and assign them to the same species, *A. benhaiensis* **n. sp.**, until it is disproved by PCR. In South Africa these mites were found in two localities situated about 200 kilometers from each other: (1) near Noorspoort farm, Steytlerville, Eastern Cape, 33.412778°S, 24.565556°E, 22 November 2022, coll. N. Ngubane-Ndhlovu, and (2) near Dwayka River, Western Cape (33.130000°S, 21.778056°E), same date and collector. Additional materials are deposited at The Department of Agriculture, Land Reform and Rural Development at Plant Quarantine Station in Stellenbosch, South Africa and at Zoological Institute of the Russian Academy of Sciences (ZIN RAS), Russia.

Remarks on population of *A. benhaiensis* from South Africa (Figures 7, 8)

When compared to the Egyptian population, measurements of South African specimens of *A. benhaiensis* **n. sp.** were within the ranges of most characters except for the setae that were relatively longer in mites from South Africa. Females from Noorspoort (n=12): *la* 20–38, *2a* 28–46; *d* 34–62, *e* 33–49, *f* 30–43, and *h*2 60–85. Male from Noorspoort (n=5): *la* 21–27, *2a* 33–39, *bv* I 13–20, opisthosoma with 47–50 dorsal annuli, *d* 42–42, and *e* 36–38, *3a* 35–42. Both males and females from Noorspoort had 6–7 empodium rays, the rays were sometimes asymmetrical.

GenBank data and Blast search results

Six sequences of three marker genes for three DNA isolates of *A. benhaiensis* **n. sp.** from Noorspoort and Dwayka were obtained (Table 3). Two D1D2 28S and two Cox1 sequences from Noorspoort were pairwise identical as well as the ITS sequences from different localities. Blastx search for Cox1 sequences of *A. benhaiensis* **n. sp.** against *Aceria* from GenBank returns the best hit sequence as AIT38252.1 of *Aceria* sp. from *Tamarix* sp. from India (this sequence originated from an unpublished study by Menon, Chandrabose and Ramamurthy) with about 90% identity and 56% coverage when sorted by identity. Additionally, blast alignments show that contrary to all other *Aceria* from GenBank both Cox1 sequences of *A. benhaiensis* **n. sp.** have one codon deletion about 500 bp in the 3' direction from the *Cox1* start codon.

Differential diagnosis

Aceria benhaiensis **n. sp.** is morphologically close to *A. aegyptytamaricis* **n. sp.** (described above) in prodorsal shield design, shape of microtubercles, and smooth coxae and genital coverflap. The new species can be differentiated by size of the body, number of dorsal and ventral semiannuli, and lengths of prodorsal shield and setae *sc*, *c2*, *d*, *e*, *f* and *3a* (Table 4). It is also close to deutogynes of *A. tamaricis* (Trotter) (described below). The main differences are in the ornamentation of prodorsal shield (median and admedian lines present in the new species but absent in *A. tamaricis*), shape of microtubercles (linear elongate microtubercles in new species and more rounded microtubercles in *A. tamaricis*), number of empodial rays and opisthosomal annuli and lengths of prodorsal shield and setae *sc*, *c2*, *d*, *e* and *3a* (Table 4).

Aceria dloicae (Keifer 1979)

(Figures 9–10)

Supplementary description

Female — (n=15). Body vermiform, 200 (155–217) including gnathosoma, 50 (46–51) wide, 49 (49–54) thick; yellowish.

Table 3 DNA isolates and GB accession numbers for sequences of three marker genes of *A. benhaiensis* **n. sp.** and *A. noorspoortiensis* **n. sp.** from South Africa.

Mite species	Isolate	Locality	ITS1-5.8S-ITS2	D1D2 28S	Cox1
<i>Aceria benhaiensis</i> n. sp.	c8a	Noorspoort	OR139568 1272 bp	OR139574 994 bp	OR133633, 1182 bp
	d373	Noorspoort	—	OR139573 989 bp	OR133634, 1181 bp
	d10	Dwayka	OR139567 1273 bp	—	—
<i>Aceria noorspoortiensis</i> n. sp.	d2	Noorspoort	OR139564 1313 bp	OR139570 962 bp	OR133635, 1197 bp
	d5	Noorspoort	OR139566 754 bp	OR139571 959 bp	—
	c2	Noorspoort	—	—	OR133636, 1194 bp
	c4a	Noorspoort	OR139565 1313 bp	OR139569 958 bp	—
	d6	Dwayka	OR139562 1314 bp	—	—
	d7	Dwayka	OR139563 1314 bp	—	—
	d8	Dwayka	—	OR139572 962 bp	—

Gnathosoma 26 (23–28), projecting obliquely downwards, *ep* 3 (2–3), *d* 7 (6–8), *v* 1–2, cheliceral stylets 18 (17–20) long.

Prodorsal shield 29 (27–30) long, 33 (33–37) wide. Median line short, present only in posterior ¼ of prodorsal shield. Admedian lines distinct in posterior ½, weak in medial ½ and absent in anterior 1/3 of prodorsal shield. Submedian I very short, situated near basis of *sc* tubercle. Posterior ends of median, admedian and submedian I lines connected with sinuous transverse line forming medio-posterior margin of prodorsal shield between tubercles of *sc*. One or two short curved lines (putative submedian II and III) present in lateral fields of prodorsal shield. Scapular tubercles 22 (21–23) apart, *sc* 23 (23–35), directed backward. **Coxigenital area** smooth, with four semiannuli between coxae and genitalia, prosternal apodeme 6 (6–7), forked posteriorly; *Ib* 10 (9–11), 9 (9–10) apart; *Ia* 20 (18–20), 7 (6–7) apart; *2a* 29 (28–37), 20 (19–21) apart.

Leg I 26 (25–27), femur 8 (8–9), *bv* 10 (8–11); genu 4 (4–5), *l''* 25 (22–25); tibia 4 (4–5), *l'* 5 (5–6), located in the middle from dorsal base; tarsus 5 (4–5); empodium simple 7 (7–8), 7-rayed, **n. sp.** *ω* tapered, 8 (7–8), *ft'* 16 (14–16), *ft''* 20 (17–25), *u'* 3 (2–3). **Leg II** 21 (20–21), femur 12 (11–13), *bv* 13 (12–15); genu 4 (3–4), *l''* 10 (8–10); tibia 4 (3–4); tarsus 4 (4–5); empodium simple 7 (7), 7-rayed, *ω* tapered 8 (7–8), *ft'* 15 (12–15), *ft''* 20 (16–23), *u'* 2 (2–3).

Opisthosoma dorsally evenly arched, with 56 (54–57) dorsal and 51 (50–55) ventral semiannuli. Dorsal and ventral semiannuli with subcircular microtubercles ahead of rear annuli margin, except the last 10–11th dorsal annuli bearing pointed microtubercles and the last 5–6th ventral annuli bearing linear elongate microtubercles. Setae *c2* 35 (30–48), 44 (44–46) apart, on annulus 7 (7–8) from coxae II; *d* 40 (38–45), 30 (30–32) apart, on annulus 15 (15–16); *e* 37 (37–42), 15 (15–16) apart, on annulus 30 (28–30); *f* 35 (34–40), 30 (30–31) apart, on 8th annulus from rear, *h1* 4 (4–5), *h2* 50 (45–63). **External genitalia.** Genital coverflap subtriangular, smooth, 13 (13–14), 17 (17–18) wide, *3a* 30 (27–44), 11 (11–12) apart.

Male — (n=5). Similar to female, body vermiform, 135–180 including gnathosoma, 45–48 wide and 44–52 thick, whitish.

Gnathosoma 20–25, cheliceral stylets 15–19, *ep* 2–3, *d* 6–8. **Prodorsal shield** pattern similar to that of female, 27–29, 32–37 wide; Scapular tubercles on rear shield margin, 21–25 apart, *sc* 24–34, directed backward. **Coxigenital area** smooth, prosternal apodeme 4–6, forked; *Ib* 6–9, 9–10 apart; *Ia* 17–19, 6–7 apart; *2a* 19–23, 18–19 apart.

Leg I 25–26, femur 7–8, *bv* 8–10; genu 3–4, *l''* 23–24; tibia 3–4, *l'* 3–4; tarsus 4–5; empodium simple 6–7, 7-rayed, *ω* 6–7 tapered, *ft'* 13–15, *ft''* 19–24, *u'* 2–3. **Leg II** 20–21,

Table 4 Some differences between females of *Aceria benhaiensis* **n. sp.**, *A. aegyptytamaricis* **n. sp.** and *A. tamaricis* (Trotter) deutogyne (only ranges are given).

Characters	<i>A. benhaiensis</i> sp. n.	<i>A. aegyptytamaricis</i> sp. n.	<i>A. tamaricis</i> (Trotter) deutogyne
Body length	170–195	150–190	137–190
Body width	40–46	50–67	44–56
Prodorsal shield length	21–22	23–30	23–25
Prodorsal shield width	30–33	42–55	28–32
Seta <i>sc</i> length	22–25	30–45	36–42
Distance between <i>sc</i>	19–23	23–27	20–22
Number of empodial rays	6	8	8
Dorsal semiannuli number	39–46	65–75	54–57
Ventral semiannuli number	42–45	60–65	54–57
Seta <i>c2</i> length	20–22	25–30	30–36
Seta <i>d</i> length	31–40	42–49	40–58
Seta <i>e</i> length	28–30	38–45	40–45
Seta <i>f</i> length	25–35	35–48	30–38
Seta <i>3a</i> length	25–32	35–48	40–54
Seta <i>h2</i> length	49–70	65–86	59–72

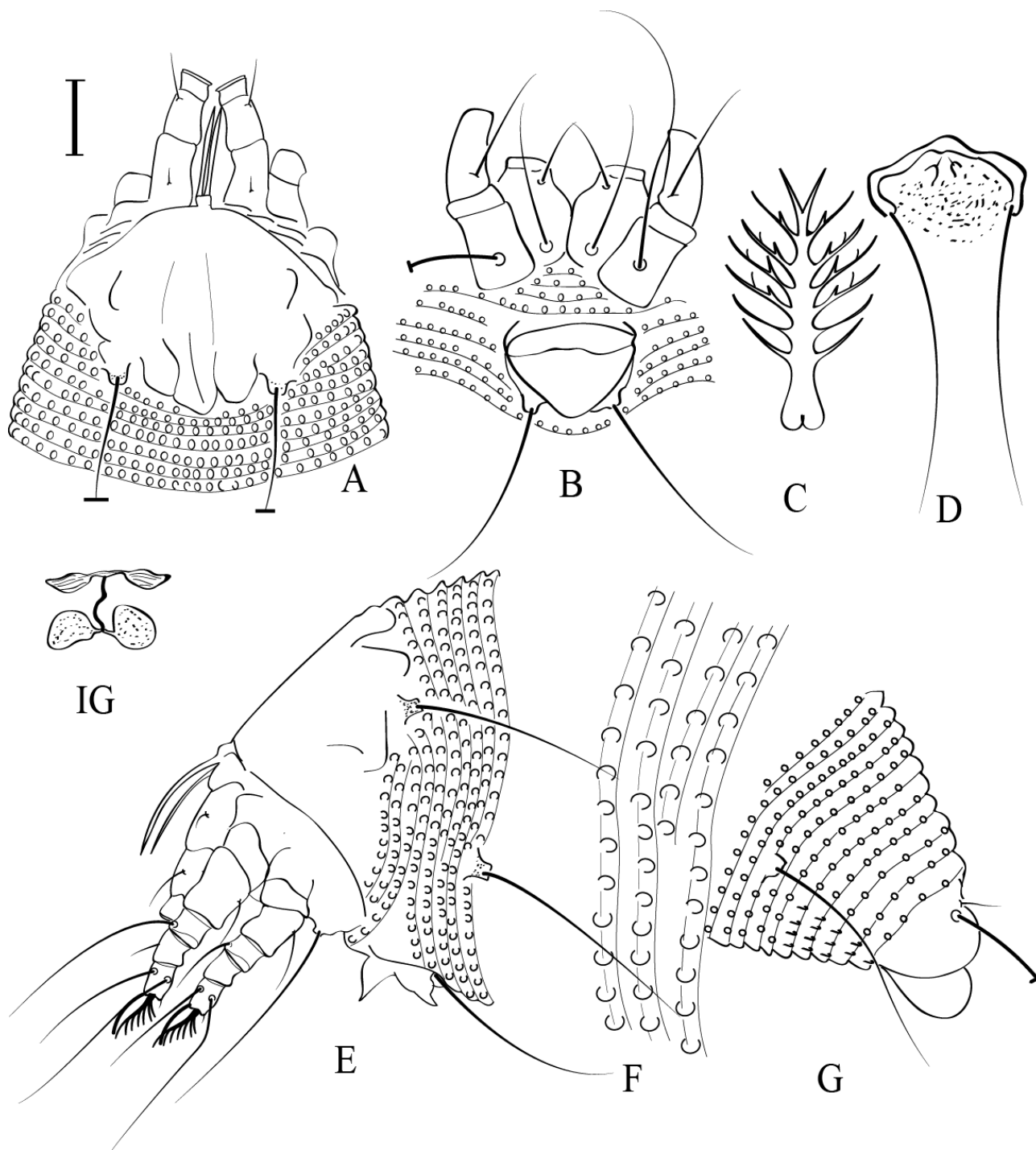


Figure 9 Drawings of *Aceria dioicae* (Keifer, 1979): A – prodorsal shield of female; B – coxigenital region of female; C – empodium; D – male genital area; E – anterolateral view of mite; F – lateral view of annuli; G – posterolateral view of mite. Scale bar: A, B, D, E, G – 10 μ m; F – 5 μ m; C – 2.5 μ m. Drawings – A.S. Elhalawany.

femur 7–8, *bv* 7–9; genu 3–4, *l''* 8–10; tibia 3–4; tarsus 4–5; empodium 6–7, 7-rayed, *o* 6–7 tapered, *ft'* 11–15, *ft''* 17–19, *u'* 2–3.

Opisthosoma with 52–55 dorso-ventrally semiannuli, microtubercles shape similar to that of female. Setae *c2* 25–28, 44–46 apart, on annulus 7–8 from coxae II; *d* 30–35, 27–28 apart, on annulus 15–16; *e* 25–30, 15–16 apart, on annulus 29–30; *f* 27–30, 24–27 apart, on 8th

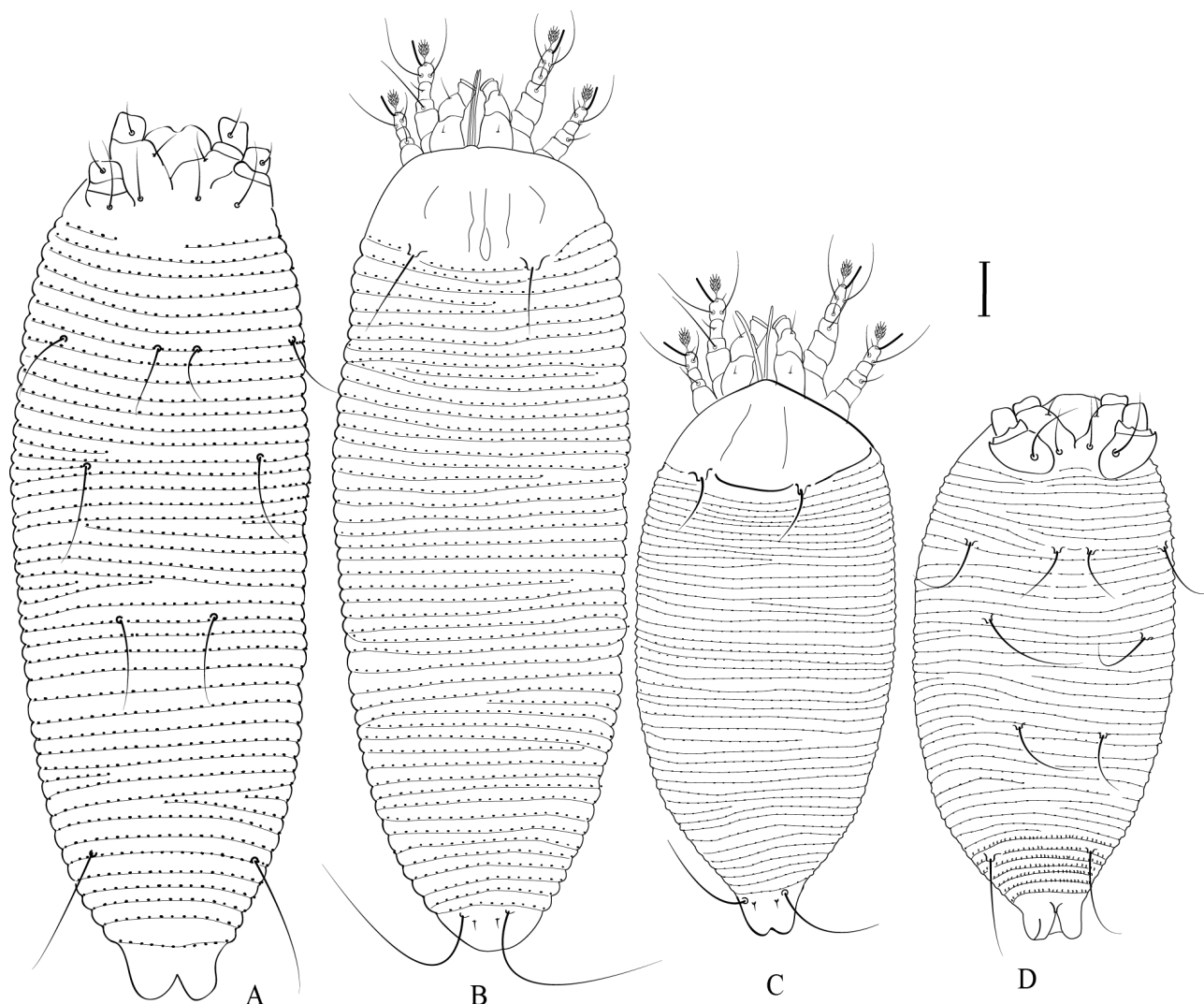


Figure 10 Drawings of immatures of *Aceria dioicae* (Keifer, 1979): A – ventral view of nymph; B – dorsal view of nymph; C – dorsal view of larva; D – ventral view of larva. Scale bar: 10. Drawings – A.S. Elhalawany.

annulus from rear, *h1* 4–6, *h2* 40–51. **Male genital area** 13–15 long, 19–22 wide, *eu* minute, genital cuticle behind tubercles of *eu* with granules, *3a* 26–40, 15–17 apart.

Nymph — (n=5). Body vermiform, 140–165 including gnathosoma, 48–52 wide, 48–52 thick.

Gnathosoma 15–17, cheliceral stylets 15–17, *ep* 1–2, *d* 4–5. **Prodorsal shield** 21–23, 35–40 wide; with median and admedian lines at $\frac{2}{3}$ posterior of prodorsal shield. Scapular tubercles on rear shield margin, 17–20 apart, *sc* 12–16, directed backward. **Coxigenital area** smooth; *lb* 5–7, 10–11 apart; *la* 9–13, 10–11 apart; *2a* 12–15, 21–24 apart; *3a* 13–15, 7–8 apart.

Leg I 17–19, femur 3–4, *bv* 5–6; genu 3, *l''* 11–13; tibia 3, *l'* 3; tarsus 4; empodium simple 4, 4-rayed, *ω* 4 tapered, *ft'* 10–13, *ft''* 15–18, *u'* 1–2. **Leg II** 13–15, femur 3–4, *bv* 5; genu 2–3, *l''* 4–6; tibia 2–3; tarsus 3–4; empodium 4, 4-rayed, *ω* 4–5 tapered, *ft'* 5–7, *ft''* 13–15, *u'* 1–2. **Opisthosoma** with 48–52 annuli with pointed microtubercles on rear annuli. Setae *c2* 13–17, 42–43 apart, on annulus 7 from coxae II; *d* 17–22, 30–32 apart, on annulus 14–15; *e* 16–19, 16–18 apart, on annulus 25–26; *f* 25–28, 30–31 apart, on 6th annulus from rear, *h1* 1–2, *h2* 30–35.

Larva — (n=3). Body vermiform, 105–120 including gnathosoma, 42–46 wide, 47–50 thick.

Gnathosoma 15–17, cheliceral stylets 12–13 long, *ep* 1–2, *d* 3–5. **Prodorsal shield** subtriangular, 20–22 long, 35–37 wide; median line absent, admedian lines at $\frac{2}{3}$ posterior of prodorsal shield. Scapular tubercles on rear shield margin, 18–19 apart, *sc* 11–13, directed backward. **Coxigenital area** smooth; *lb* 4–6, 8–9 apart; *la* 9–11, 6–7 apart; *2a* 13–15, 151–17 apart; *3a* 12–15, 2–3 apart.

Leg I 17–18, femur 3–4, *bv* 3–4; genu 2–3, *l''* 10–13; tibia 2–3, *l'* 2–3; tarsus 3–4; empodium simple 4, 4-rayed, *ω* 4–5 tapered, *ft'* 10–12, *ft''* 14–16, *u'* 1–2. **Leg II** 13–14, femur 3, *bv* 4; genu 2, *l''* 3–5; tibia 2–3; tarsus 3–4; empodium 4, 4-rayed, *ω* 4–5 tapered, *ft'* 5–7, *ft''* 8–11, *u'* 1–2.

Opisthosoma with 38–43 annuli, with pointed microtubercles on rear annuli. Setae *c2* 12–15, 35–37 apart, on annulus 7–8 from coxae II; *d* 19–21, 28–29 apart, on annulus 14–15; *e* 13–16, 16–17 apart, on annulus 22–23; *f* 18–20, 18–19 apart, on 6th annulus from rear, *hl* 1–2, *h2* 18–22.

Host plant in Egypt

Tamarisk (athel), *Tamarix senegalensis* DC. (= *Tamarix nilotica*) and *Tamarix* spp. (Tamaricaceae).

Relation to the host plant — Mites cause green galls on buds and twigs, about 8–11 mm long and 4–5 mm in diameter (Figure 1 A, B).

Distribution

Egypt; Iran; Pakistan and Turkey

Material examined

Fifteen females, five males, four nymphs and four larvae on five slides (slide no. EGYErio37.1–37.5), from *T. senegalensis*, deposited in the Plant Protection Research Institute collection, Giza, Egypt, 9 March, 2021, Qalyubia governorate (30°16'14.03» N, 31°14'7.28» E), coll. Ashraf Elhalawany. Four slides (slides no. EgTT01-04) with the same data, deposited at UNIBA, Italy. Four slides with the same data, deposited at Zoological Institute of the Russian Academy of Sciences (ZIN RAS), Russia. Two slides (Acy 13/371), 14 November 2017, deposited at Agriculture Research Council, Plant Health Protection, Biosystematics Division, Pretoria, South Africa ARC-PHP; two slides (NJAUAcarEriEgypt28) 14 November 2017, were deposited in the mite collection of Department of Entomology, College of Plant Protection, Nanjing Agricultural University (NJAU), China; two slides, 19 February 2019, deposited at the College of Agriculture and Forestry, West Virginia University (WVU), USA. Five females on two slides (slide no. EGYErio37.6–37.7), 28 January 2023, deposited at ESAM, Egypt.

Remarks

Aceria dioicae was described from a bud gall of *Tamarix dioica* Roxb. from the USA (Keifer 1979). The morphometrics of the females from Egypt and those from original description coincide.

Aceria noorspoortiensis Situngu, Ngubane-Ndhlovu et Chetverikov n. sp.

Aceria amrini in Chetverikov *et al.* 2019:1287

Zoobank: F09E50D8-1C3B-4E8B-8DE4-7B1451A66F16

(Figures 11–14)

Description

Female — (n=10). Body vermiform, 211 (157–211) including palps, 47 (38–54) wide; semitranslucent to white.

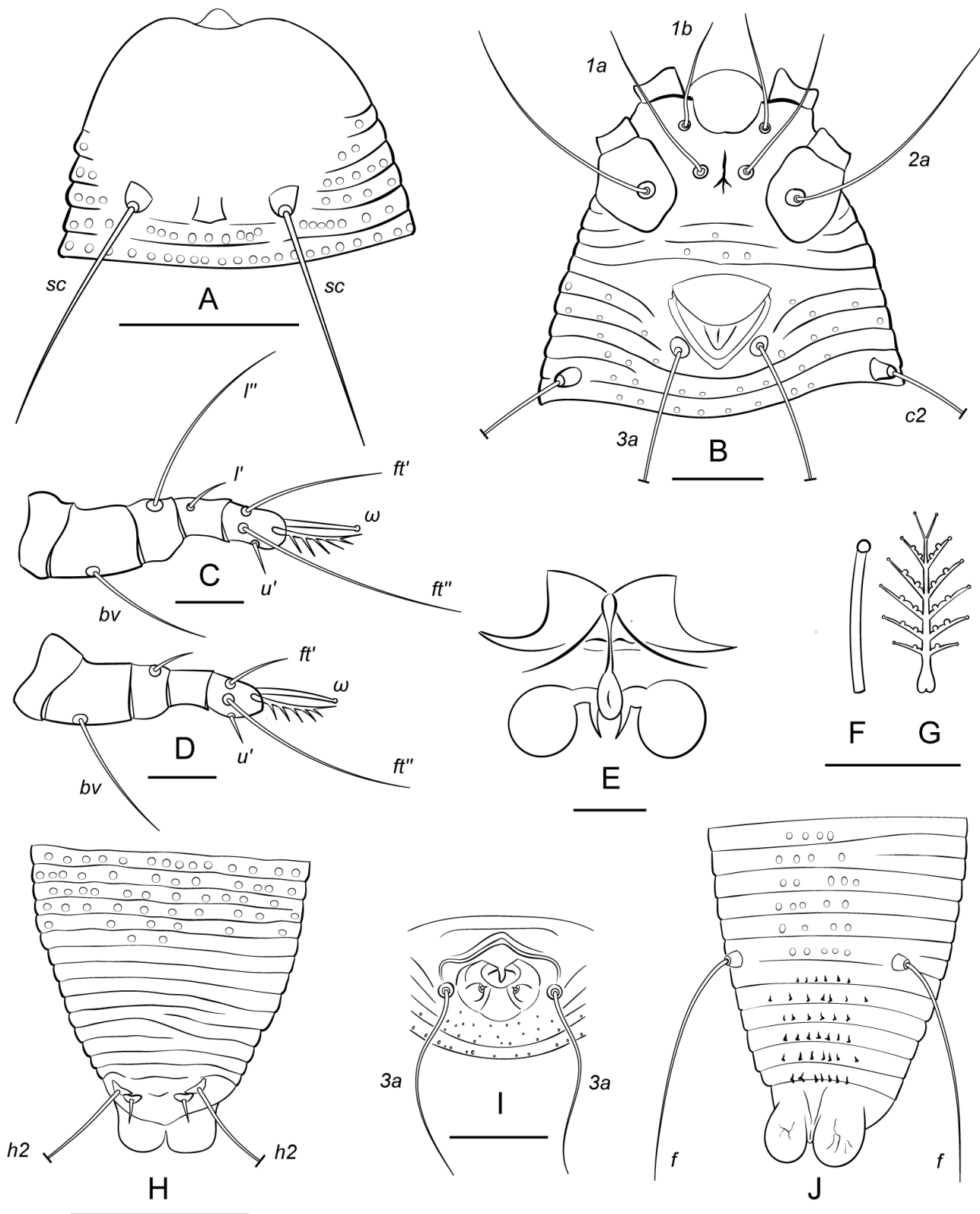


Figure 11 Drawings of *Aceria noorspoortiensis* n. sp. A – prodorsal shield, B – coxigenital area, C and D – legs I and II, E – female internal genitalia, F and G – tarsal solenidion and empodium, H – dorsal aspect of rear part of opisthosoma, I – male genital area, J – ventral aspect of rear part of opisthosoma. Scale bars: A – 20 μ m, B – 10 μ m; C,D,E,F,G – 5 μ m; H, J – 30 μ m; I – 15 μ m. Drawings – P.E. Chetverikov.

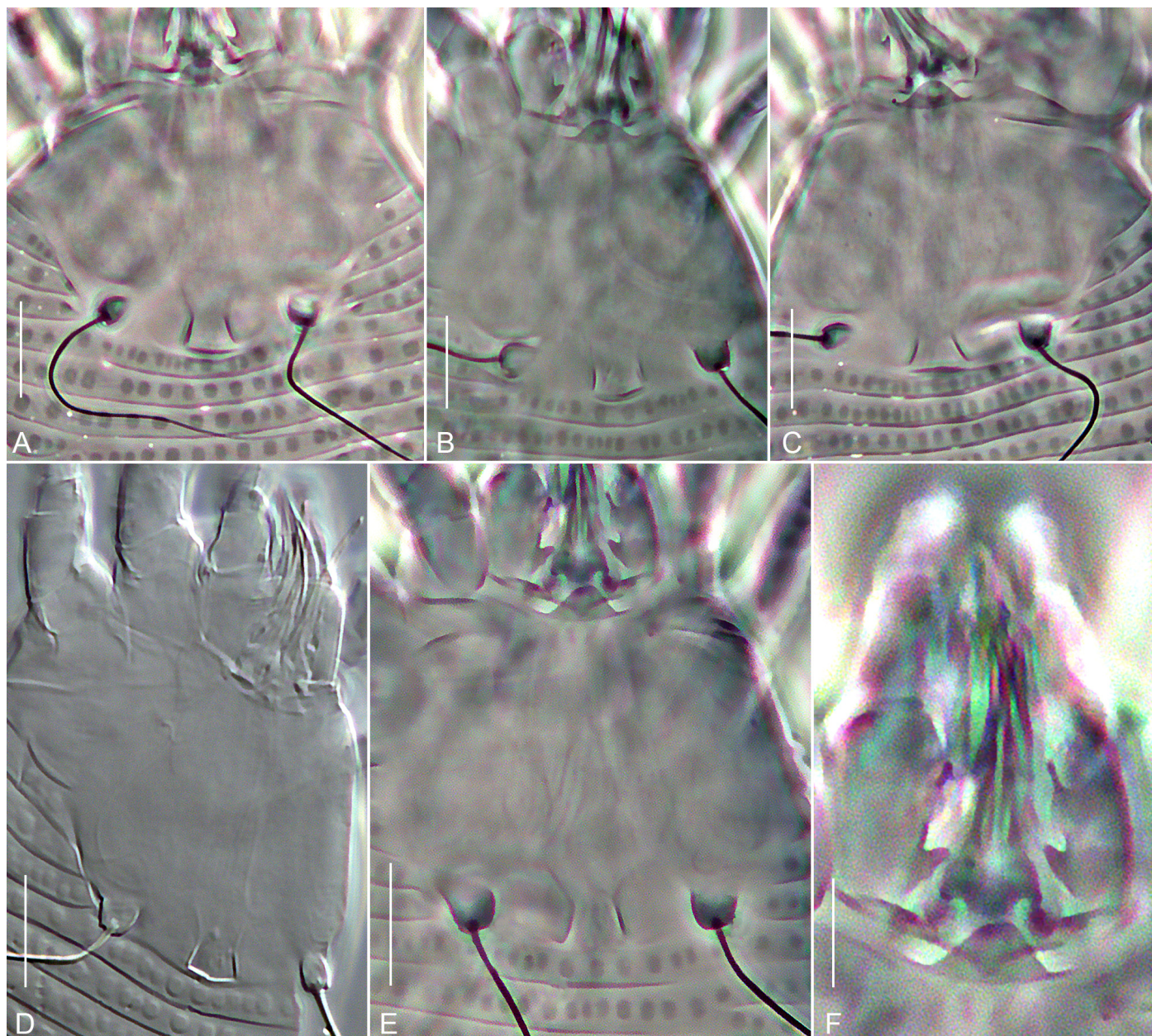


Figure 12 PC LM (A,B,C,E,F) and DIC LM (D) photographs of prodorsal shields (A-E) and dorsal gnathosoma (F) in females of *Aceria noorspoortiensis* n. sp. Scale bars: A, B, C, D, E – 10 μ m; F – 5 μ m. Photos – P.E.Chetverikov.

Gnathosoma 16 (14–19), projecting obliquely downwards, *d* 6 (4–6), cheliceral stylets 12 (12–16) long, *v* minute. **Prodorsal shield** 24 (22–27), 28 (26–34) wide; smooth, almost rounded with an incomplete quadrilateral to pentagonal shaped ditch posteriorly. Scapular tubercles on rear shield margin, 22 (17–22) apart, *sc* 37 (32–41), directed backward. **Coxigenital area** smooth, with 3 (2–3) coxigenital annuli before epigynum, prosternal apodeme inversely Ψ -shaped, *lb* 7 (4–8), 7 (6–10) apart; *la* 22 (16–28), 6 (5–6) apart; *2a* 22 (21–41), 20 (19–22) apart.

Leg I 22 (19–22), femur 7 (–7), *bv* 11 (9–13); genu 4 (4–5), *l''* 14 (14–23); tibia 4 (4–5), *l'* 4 (3–4), tarsus 4 (4–5); empodium simple 6 (5–7), 6-rayed, *o* tapered, 7 (5–7), *ft'* 12 (6–12), *ft''* 23 (20–33), *u'* 3 (3–4). **Leg II** 22 (18–22), femur 6 (4–7), *bv* 13 (10–15); genu 3 (3–4), *l''*

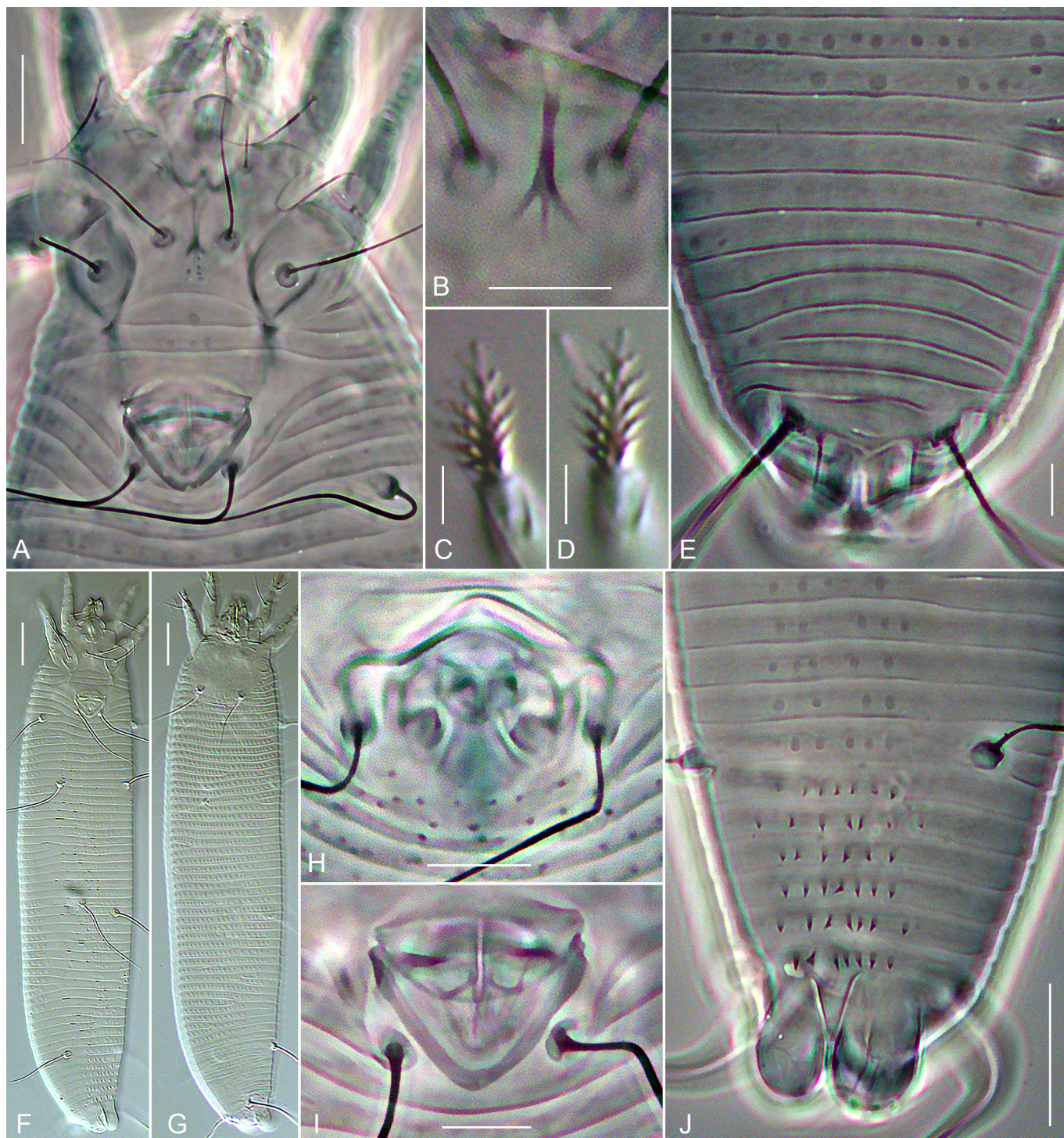


Figure 13 PC LM (A,B,E,H,I,J) and DIC LM (C,D,F,G) photographs of females (A,B,C,D,E,F,G,I,J) and male (I) of *Aceria noorspoortiensis* n. sp. A – coxigenital area, B – prosternal apodeme, C and D – empodia I (C) and II (D), E – dorsal view of posterior part of opisthosoma, F and G – ventral (F) and dorsal (G) view of entire mite, H and I – male (H) and female (I) external genitalia, J – ventral view of posterior part of opisthosoma. Scale bars: A – 10 μ m; B,E,H,I – 5 μ m; C, D – 2 μ m; F,G – 20 μ m; J – 15 μ m. Photos – P.E.Chetverikov.

4(4–8); tibia 4 (3–4); tarsus 4 (4–5); empodium simple 6 (5–7), 6-rayed, ω tapered 7 (6–7), ft' 7 (4–7), ft'' 20 (20–23), u' 4 (3–4).

Opisthosoma dorsally evenly arched, with 59 (54–60) dorsal and 49 (44–50) ventral annuli.

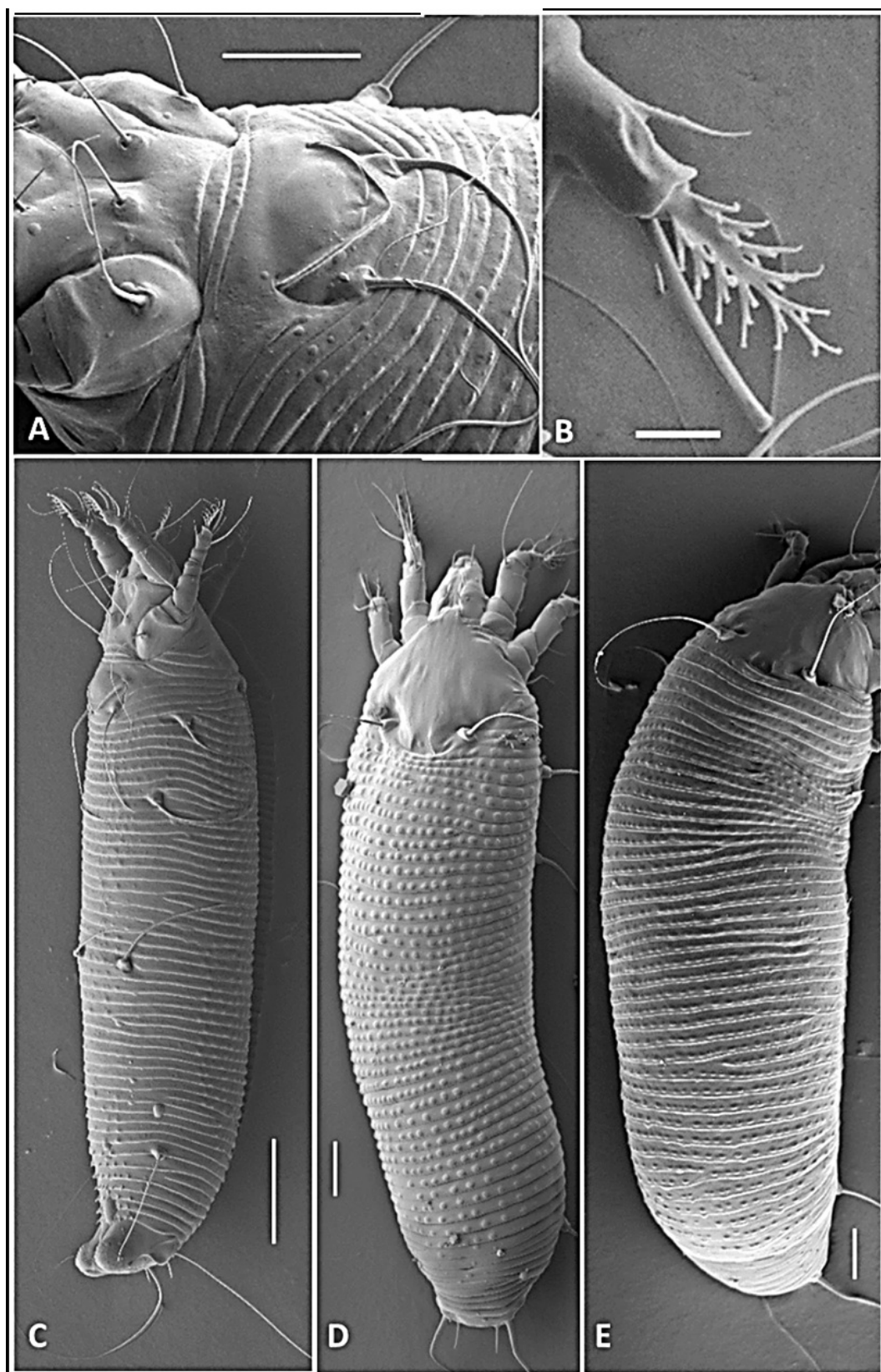


Figure 14 SEM images of *Aceria noorspoortiensis* n. sp. Female: A – external genitalia, B – empodium and solenidion, C – lateral view, D&E – dorsal view of opisthosoma showing variation in shape of microtubercles. Scale bars: A – 10 µm; B – 2 µm; C – 20 µm; D,E – 10 µm. Photos – S. Situngu.

All dorsal annuli microtuberculated except for the last 6-7 (telosomal) annuli with rounded microtubercles in most species, and rectangular-like microtubercles on the rear margin of annuli in some specimens. Ventral annuli with smaller round or faint rectangular microtubercles on rear margin of annuli. Telosomal ventral annuli (posterior to *f* setae) with spiky overlapping microtubercles. Setae *c2* 63 (36–67), 45 (36–47) apart, on annulus 8 (4–8) from shield; *d* 53 (35–72), 37 (28–37) apart, on annulus 15 (11–16); *e* 43 (38–45), 19 (12–19) apart, on annulus 28 (11–13); *f* 32 (32–38), 28 (27–31) apart, on 7 (6–7th) annulus from rear, *h1* 4 (4–5); *h2* 68 (68–86). **External genitalia** genital coverflap smooth, subtriangular, 14 (9–14), 18 (12–18) wide, *3a*, 48 (34–62), 17 (9–17) apart. **Internal genitalia** with trapezoidal anterior genital apodeme, relatively short longitudinal bridge; distinct oblique apodeme; short spermathecal tubes directed laterad; and round spermathecae each of them with distinct spermathecal process.

Nymph — (n=1). Body vermiform, translucent, 137 including palps, 37 wide.

Gnathosoma 16, cheliceral stylets 16 long. **Prodorsal shield** smooth. Scapular tubercles on rear shield margin, 16 apart, *sc* 16, directed backwards. **Coxigenital area** smooth; *1a* 5 apart; *2a*, 18 apart.

Leg I 16, **Leg II** 15.

Opisthosoma with 50 smooth dorsal and 42 smooth ventral annuli. Setae *c2* 27, 34 apart; *d* 27, 25 apart; *e* 24, 15 apart; *f* 17, 24 apart.

Larva — (n=1). Body vermiform, translucent, 110, 46 wide. **Prodorsal shield** smooth. Scapular tubercles on rear shield margin, 19 apart, *sc* 18, directed backwards. **Coxigenital area** smooth; *1a* 5 apart; *2a*, 16 apart. **Leg I** 15, **Leg II** 14, **Opisthosoma** with 56 smooth dorsal and 45 smooth ventral annuli. Lateral *c2* 15, 37 apart; setae *d* 16, 28 apart; *e* 17, 15 apart; *f* 17, 22 apart.

Host plant

Tamarix usneoides E. Mey. ex Bunge.

Relation to the host plant — Mites cause bright pink galls on young shoots (Figure 1G-J).

Etymology

The name “*noorspoortiensis*” refers to the location Noorspoort, Steytlerville, Eastern Cape, South Africa.

Type locality

The mites are found in Noorspoort farm, Steytlerville, Eastern Cape (33.412778°S, 24.565556°E) and near Dwayka River, Western Cape (33.130000°S, 21.778056°E).

Type material

Holotype: female (slide no. X2021-01(#2)), paratypes: Ten females (slides X2021-01 and X2021-04), nymph (slide X2021-10) and larva (slide X2021-12) are deposited at Department of Agriculture, Land Reform and Rural Development at Plant Quarantine Station in Stellenbosch, South Africa. Additionally some paratype material has been deposited at Zoological Institute of the Russian Academy of Sciences (ZIN RAS), Russia.

Additional material — Adult mites on slide #4287, SOUTH AFRICA: Noorspoort, right bank of Grootrivier, 33°18'12.1"S, 24°21'58.6"E; in red-purple callus-like abnormal growth on twigs of *Tamarix usneoides* Mey. ex Bunge (Tamaricaceae), 5 November 2016, coll. P.E. Chetverikov, C. Craemer, S. Naser

Remarks

This species was first found in Noorspoort (South Africa) in 2016 and identified as *Aceria amrini* Joshi *et al.* 2013 (Chetverikov *et al.* 2019b). In 2021 and 2022 the mites were recollected in Noorspoort by N. Ngubane-Ndhlovu and comprehensively reinvestigated in this study. Morphological comparison of the mites from Noorspoort with specimens of *A. amrini*

from Egypt showed that they belong to different species: *Aceria noorspoortiensis* n. sp. and *A. amrini* correspondingly.

GenBank data and Blast search results

Eleven sequences of three marker genes for seven isolates of *A. noorspoortiensis* n. sp. from Noorspoort and Dwayaka River were obtained. All ITS and D1D2 28S sequences from both localities were pairwise identical as well as all Cox1 sequences from Noorspoort. Similar to *Aceria benhaiensis* n. sp. (see above) Blastx search for Cox1 sequences OR133635 and OR133636 of *A. noorspoortiensis* n. sp. against *Aceria* from GenBank (a) returns the best hit was the sequence AIT38252.1 (*Aceria* sp. from *Tamarix* sp. from India, 87% identity, 55% coverage) when sorted by identity and (b) showed one homologous codon deletion in the same region, about 500 bp in the 3' direction from the *Cox1* start codon. Codon-deletion mutations in the middle part of Cox1 gene are rare in Eriophyoidea and currently known in only three eriophyoid species (all from Phytomyzidae s.l.): *Phytoptus avellanae* Nalepa, *Retracrus johnstoni* Keifer, and *Trisetacus indelis* Chetverikov *et al.* (Cvrković *et al.* 2016, Chetverikov *et al.* 2021, 2022). The two new species of the genus *Aceria* described in this study (*A. benhaiensis* n. sp. and *A. noorspoortiensis* n. sp.) are the first reported taxa from the large subfamily of gall mites, Eriophyinae, possessing codon deletion in the middle part of Cox1 gene..

Differential diagnosis

Aceria noorspoortiensis n. sp. causes very characteristic pink galls on young shoots of *T. usneoides* (Fig. 1 G-J) and very often coexists with *A. benhaiensis* n. sp. that is a common inquiline in the galls caused by *A. noorspoortiensis* n. sp. Incomplete quadrilateral or pentagonal ditch on the prodorsal shield and the absence of median line unambiguously differentiate *A. noorspoortiensis* n. sp. from all other *Aceria* spp. associated with *Tamarix*.

Aceria tamaricis (Trotter)

(Figure 15)

Supplementary description

Female protogyne — (n=8). Body vermiform, 240 (157–245) including gnathosoma, 57 (46–62) wide, 50 (42–57) thick; yellowish.

Gnathosoma 21 (20–21), projecting obliquely downwards, *ep* 3 (2–4), *d* 7 (7–9), cheliceral stylets 18 (16–18) long. **Prodorsal shield** 28 (25–28), 33 (30–38) wide; semicircular; a small median pit present near rear shield margin. Scapular tubercles on rear shield margin, 25 (25–27) apart, *sc* 37 (37–48), directed backward. **Coxigenital area** smooth, with three semiannuli between coxae and genitalia, prosternal apodeme 6 (6–7); *lb* 10 (9–10), 9 (9–10) apart; *la* 30 (27–33), 7 (6–7) apart; *2a* 35 (33–45), 20 (20–22) apart.

Leg I 26 (24–28), femur 8 (8–9), *bv* 15 (15–17); genu 4 (4–5), *l''* 25 (25–27); tibia 5 (5), *l'* 8 (8–10), located at $\frac{2}{3}$ from dorsal base; tarsus 5 (4–6); tarsal empodium simple 8 (8–10), 7–8-rayed, tarsal solenidion ω tapered, 9 (9–10), *ft'* 23 (23–26), *ft''* 25 (25–27), *u'* 4 (3–5). **Leg II** 25 (24–27), femur 8 (8–9), *bv* 15 (14–15); genu 4 (4–5), *l''* 15 (15–16); tibia 4 (3–4); tarsus 5 (5–6); tarsal empodium simple 8 (8–9), 7-rayed, ω tapered 8 (8–9), *ft'* 15 (13–15), *ft''* 20 (20–27), *u'* 4 (3–5).

Opisthosoma dorsally evenly arched, with 60 (58–63) annuli. Dorsal and ventral semiannuli with elliptical microtubercles ahead of rear annuli margin, except the last 4th dorsal annuli with pointed microtubercles and last 8th ventral annuli with linear elongate. Setae *c*2 30 (30–32), 45 (40–50) apart, on annulus 7 (6–7) from coxae II; *d* 60 (55–70), 41 (41–43) apart, on annulus 15 (15–16); *e* 41 (41–50), 20 (20–22) apart, on annulus 31 (31–32); *f* 35 (35–42), 39 (39–40) apart, on 8th annulus from rear, *h*1 6 (6–7), *h*2 75 (70–84). **External genitalia**. Genital coverflap subtriangular, smooth, 13 (13–14), 20 (20–22) wide, *3a*, 45 (45–54), 13 (13–14) apart.

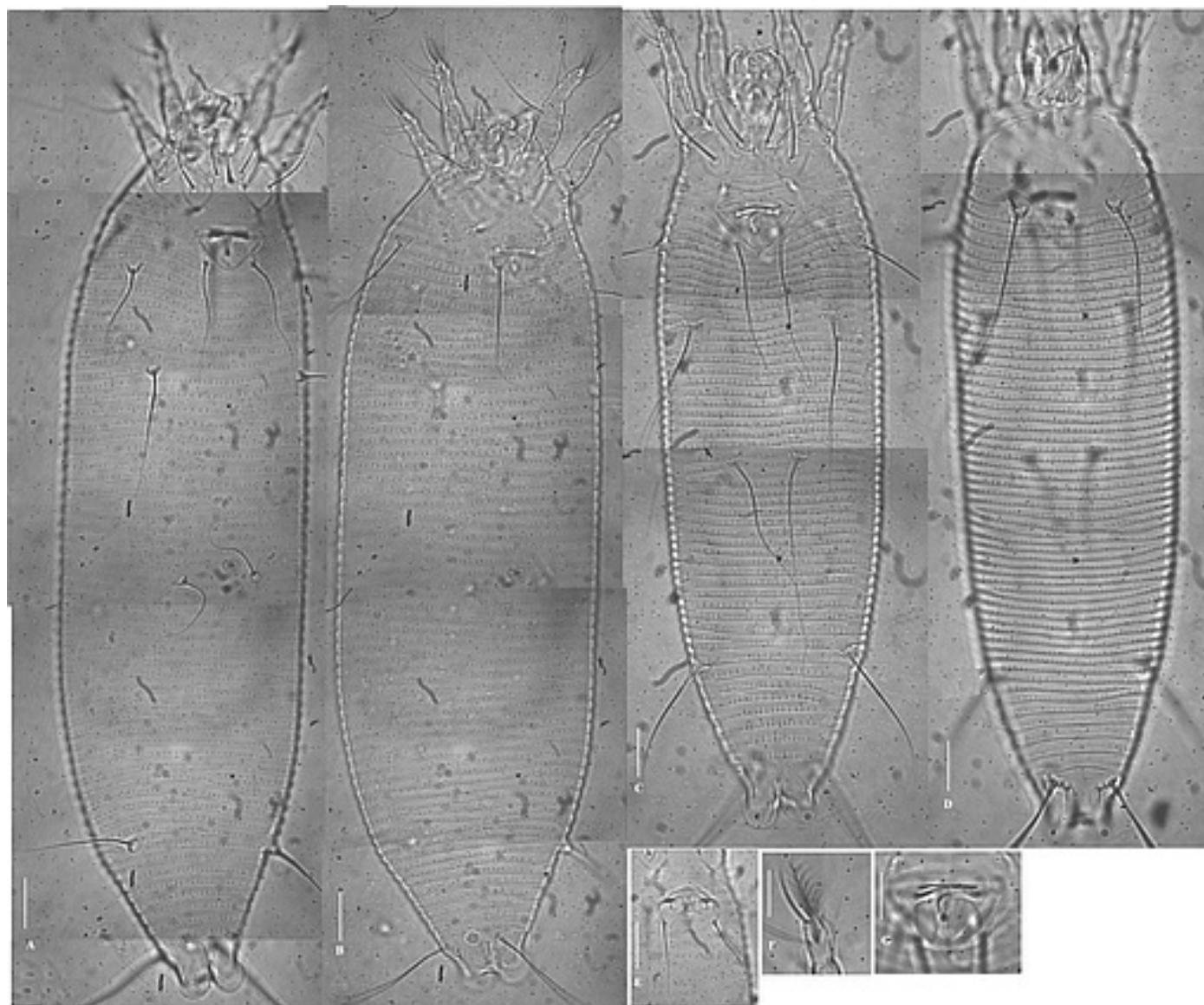


Figure 15 Phase microphotograph of *Aceria tamaricis* (Trotter, 1901): A – ventral view of female protogyne; B – dorsal view of female protogyne; C – ventral view of female deutogyne; D – dorsal view of female deutogyne; E – male genitalia; F – empodium; G – internal female genitalia; Scale bar: 12 μ m for A, B, C, D, E; 6 μ m for F, G. Photos – A.S. Elhalawany.

Female deutogyne — (n=7). Body vermiform, 190 (137–190) including gnathosoma, 50 (44–56) wide, 53 (53–55) thick; yellowish.

Gnathosoma 21 (20–22), projecting obliquely downwards, *ep* 3 (2–3), *d* 7 (7–8), cheliceral stylets 18 (16–20) long. **Prodorsal shield** 25 (23–25), 28 (28–32) wide; semicircular with a small medioposterior pit. Scapular tubercles on rear shield margin, 22 (20–22) apart, *sc* 36 (36–42), directed backward. **Coxigenital area** smooth, with three semiannuli between coxae and genitalia, prosternal apodeme 6 (6–7); *lb* 10 (9–11), 9 (8–10) apart; *la* 25 (22–27), 7 (6–7) apart; *2a* 30 (30–35), 20 (20–22) apart.

Leg I 26 (26–28), femur 9 (9–10), *bv* 15 (13–16); genu 4 (4–5), *l'* 24 (22–24); tibia 6 (6–7), *l'* 8 (7–10), located at $\frac{2}{3}$ from dorsal base; tarsus 5 (5–6); tarsal empodium simple 8 (7–8), 8-rayed, tarsal solenidion ω tapered, 8 (7–8), *ft'* 18 (18–22), *ft''* 25 (22–27), *u'* 4 (3–4). **Leg II** 25 (25–28), femur 8 (8–9), *bv* 15 (14–16); genu 4 (4–5), *l''* 15 (13–15); tibia 5 (4–6); tarsus

6 (6–7); tarsal empodium simple 8 (7–9), 8-rayed, ω tapered 8 (7–8), ft' 14 (11–14), ft'' 25 (21–30), u' 4 (3–5).

Opisthosoma dorsally evenly arched, with 55 (54–57) annuli. Dorsal and ventral semi-annuli with elongate microtubercles ahead of rear annuli margin, except the last 4th dorsal annuli with pointed microtubercles and last 8th ventral annuli with linear elongate. Setae $c2$ 30 (30–36), 32 (32–50) apart, on annulus 7 (6–7) from coxae II; d 40 (40–58), 40 (30–42) apart, on annulus 15 (15–16); e 40 (40–45), 20 (15–20) apart, on annulus 30 (29–31); f 30 (30–38), 35 (30–38) apart, on 8–9th annulus from rear, hl 6 (5–6), $h2$ 60 (59–72). **External genitalia** genital coverflap subtriangular, smooth, 13 (12–13), 20 (20–21) wide, $3a$, 40 (40–54), 11 (10–12) apart.

Male — (n=3). Similar to protogyne female. Body vermiform, 150–188 including gnathosoma, 48–57 wide and 48–51 thick; whitish.

Gnathosoma 20–23, cheliceral stylets 17–18, ep 2–3, d 5–7. **Prodorsal shield** pattern similar to that of female, 20–23, 25–30 wide; scapular tubercles on rear shield margin, 22–24 apart, sc 30–38, directed backward. **Coxigenital area** smooth, prosternal apodeme 4–5; lb 6–8, 8–10 apart; la 20–25, 6–7 apart; $2a$ 26–31, 20–23 apart.

Leg I 22–25, femur 7–8, bv 12–13; genu 4–5, l'' 12–14; tibia 4–5, l' 6–8; tarsus 5; empodium simple 6–7, 7-rayed, ω 6–7 tapered, ft' 15–21, ft'' 20–24, u' 3–4. **Leg II** 21–23, femur 6–7, bv 7–9; genu 4, l'' 8–10; tibia 3–4; tarsus 4–5; empodium 6–7, 7-rayed, ω 6–7 tapered, ft' 10–12, ft'' 18–23, u' 3–4.

Opisthosoma with 52–55 annuli, with microtubercles shaped similar to those of protogyne female. Setae $c2$ 20–25, 43–45 apart, on annulus 6–7 from coxae II; d 29–33, 32–34 apart, on annulus 14–15; e 28–30, 20–21 apart, on annulus 28–30; f 25–27, 23–25 apart, on 8th annulus from rear, hl 5–6, $h2$ 55–60. **External genitalia** 12–14, 16–17 wide, genital cuticle behind eugenital setae with granules, $3a$ 28–30, 12–13 apart.

Host plant in Egypt

Tamarisk (athel), *Tamarix senegalensis* DC. (= *Tamarix nilotica*) and *Tamarix* spp. (Tamaricaceae).

Relation to the host plant — Mites cause green galls on buds and twigs, about 5–6.5 mm long and 3–4 mm diameter, elongate (Figure 1 D).

Distribution

China; France; Egypt (first continental record); Greece; Turkey.

Material examined

Ten females and five males on five slides (slide no. EGYErio29.1–29.5), from *T. senegalensis*, deposited in the Plant Protection Research Institute collection, Giza, Egypt, 9 March, 2021, Qalyubia governorate (30°16'14.03"N, 31°14'7.28"E), coll. Ashraf Elhalawany. Four slides (slides no. EgTT05-08) with the same data, deposited at UNIBA, Italy. Three slides with the same data, deposited at Zoological Institute of the Russian Academy of Sciences (ZIN RAS), Russia. Two slides (Acy 13/370) deposited at Agriculture Research Council, Plant Health Protection, Biosystematics Division, Pretoria, South Africa (ARC-PHP); two slides, 10 January 2019 (NJAUAcariEriEgypt29) were deposited in the mite collection of Department of Entomology, College of Plant Protection, Nanjing Agricultural University (NJAU), China; two slides, 19 February 2019, deposited at the College of Agriculture and Forestry, West Virginia University (WVU), USA. Ten females on two slides (slide no. EGYErio29.6–29.7), Mariotya city (30°01'25.51"N, 31°81'22.94"E), Giza governorate, 28 January 2023, deposited at (ESAM), Egypt.

Remarks

Aceria tamaricis (Trotter) was redescribed by Castagnoli (1992) and later by de Lillo and Sobhian (1994) based on material from Italy from the bud gall on *Tamarix gallica*. The

morphometry of the female appears to match the description by Castagnoli in 1992. The morphometrics of the females from Egypt and those from Italy investigated by Castagnoli (1992) coincide.

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Declaration of Competing Interests

The authors have no conflict of interest.

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