TWO NEW SPECIES OF ERIOPHYOID MITES (ACARI: ERIOPHYIDAE) INFESTING *CUPRESSUS SEMPERVIRENS* FROM EGYPT

ASHRAF S. ELHALAWANY[1], QIONG WANG[2] and XIAO-FENG XUE[2]

[1]*Plant protection Research Institute, ARC, Dokki, Giza, Egypt. E–mail:dr_ashraf_said@yahoo.com*

[2]Department of Entomology, Nanjing Agricultural University, Nanjing, Jiangsu, P. R. China (*formtheblue@126.com*; *xfxue@njau.edu.cn*)

Corresponding author. E–mail: dr_ashraf_said@yahoo.com

Abstract

Two new species of eriophyoid mites found in Egypt are described and illustrated. They are *Epitrimerus abousettai* **sp. nov.** and *Stenacis aegyptius* **sp. nov.** and were collected on *Cupressus sempervirens* L. (Cupressaceae). Both species are vagrants on the host plants.

Key words: Eriophyoidea, Taxonomy, new species, *Epitrimerus abousettai*, *Stenacis aegyptius*

INTRODUCTION

The majority, of the Eriophyoid mites are highly specific parasites of plants, potentially infesting all plant parts other than the roots (Westphal & Manson 1996). Up to 2013, 66 species in 28 genera have been reported in Egypt (El-Halawany 2012, 2013). Only three species of phytoptids and two species of diptilomiopids were reported. *Aceria* is the biggest genus in Egypt, accounting for nearly 40% (25/66) of the total number of species.

Almost 47 eriophyoid species have been reported from Cupressaceae worldwide (de Lillo and Amrine 2011, unpublished data), but there are no records of eriophyoid mites infesting Cupressaceae from Egypt. Nine species of the genus *Epitrimerus* were recorded on Cupressaceae. The species *Epitrimerus abousettai* sp. nov is the 10th species assigned to the genus *Epitrimerus* recorded from Cupressaceae. The other nine species are: *E. convergens* Keifer 1966 infesting *Juniperus occidentalis*; *E.*

cupressi (Keifer, 1939) infesting *Cupressus sempervirens*; *E. cupressifoliae* Keifer 1952 infesting *Cupressus sargentii*; *E. insons* Boczek 1961 infesting *Thuja occidentalis*; *E. libocedri* (Keifer, 1939) infesting *Calocedrus decurrens*; *E. macnabianae* Keifer 1969 infesting *Cupressus macnabiana*; *E. perplexus* Mitrofanov & Sharonov 1982 infesting *Cupressus sempervirens*; *E. phoeniceae* Keifer 1962 infesting *Juniperus phoenicia* and *E. sabinae* Xue & Hong 2005 infesting *Juniperus chinensis*.

Nine species of the genus *Stenacis* Keifer were reported, but there are no records of *Stenacis* species infesting Cupressaceae. Only *Stenacis thunbergii* She, Wang & Hong, 2009 was reported infesting conifersous plants (Pinaceae).

Field surveys of eriophyoid fauna on *Cupressus* from Egypt resulted in two new species. More field work should be done in the future to better understand the fauna of eriophyoid mites in Egypt.

MATERIALS AND METHODS

Specimens were collected from November 2012 to March 2014. Specimens of the eriophyoid mites were collected from plants by direct examination under a stereomicroscope. Slides were mounted with Keifer's F-medium (Amrine & Manson 1996). Specimens were examined under a phase contrast Zeiss A2 (Germany) research microscope equipped with phase contrast (A-plan phase objectives: ×10/0.25, ×20/0.45; EC plan-NEOFLUAR phase objectives: ×40/0.75; ×100/1.3 oil immersion) and schematic drawings were made. Images were taken with the same microscope (under 100× oil immersion with 10× eyepieces) using an Axio Cam MRc (Carl Zeiss) system, connected to a computer and using Axiovision image analysis software.. The morphological terminology used herein follows that of Lindquist (1996) and the generic classification is based on Amrine *et al.* (2003). Specimens were measured following de Lillo *et al.* (2010). For each species, the holotype female measurement precedes the corresponding range for paratypes (given in parentheses). For males, only the range of measurements is given. All measurements are given in micrometers (μm). Holotype and paratypes were deposited as slides mounted specimens in Arthropod/Mite Collection of the Department of Entomology, Nanjing Agricultural University, Jiangsu Province, China. Some paratypes were deposited in the Department of Fruit Acarology, Plant protection Research Institute, Agriculture Research Center, Egypt.

RESULTS AND DISCUSSION

Eriophyidae Nalepa, 1898

Phyllocoptinae Nalepa, 1892

Phyllocoptini Nalepa, 1892

***Epitrimerus abousettai* sp. nov. (Figs. 1–3)**

Description

Female: (n = 10). Body fusiform, 180 (175–195), 72 (62–74) wide, 50 (48–52) thick; amber color. Gnathosoma 30 (28–30), projecting obliquely down, oral stylets 21 (21–22); pedipalp coxal seta (*ep*) 3 (3–4), dorsal pedipalp genual seta (*d*) 6 (5–6). Prodorsal shield 51 (49–51) included frontal lobe, 70 (64–72) wide; sub triangular; frontal shield lobe broad 15 (14–15); with lateral lobes; median line absent, complete admedian lines present and concaved at basal 1/4 and 2/3; faint submedian lines ahead of scapular tubercles, scapular tubercles ahead of rear shield margin, 22 (21–22) apart, scapular setae (*sc*) 3 (3–4) projecting centrad. Coxigenital region with 17 (16–18) semiannuli between coxae and genitalia. Coxal plates with short lines and granules, anterolateral setae on coxisternum I (*1b*) 11 (11–13), 13 (13–14) apart; proximal setae on coxisternum I (*1a*) 20 (19–23), 10 (9–10) apart; proximal setae on coxisternum II (*2a*) 24 (22–24), 27 (25–30) apart; sternal line short. Leg I 30 (30–32), femur 12 (10–12), basiventral femoral seta (*bv*) 10 (10–11); genu 5 (5–6), antaxial genual seta (*l''*) 24 (22–24); tibia 7 (7–8), paraxial tibial seta (*l'*) 3 (3–4), located 2/3 from dorsal base; tarsus 7 (6–7), seta *ft'* 21 (19–21), seta *ft''* 25 (23–25), seta *u'* 3 (3–4); tarsal empodium (*em*) 8 (8–9), simple, 6-rayed, tarsal solenidion (*ω*) 8 (8–9), tapering. Leg II 28 (26–28), femur 10 (9–10), basiventral femoral seta (*bv*) 11 (10–11); genu 5 (4–5), antaxial genual seta (*l''*) 5 (5–6); tibia 6 (5–6); tarsus 6 (6–7), seta *ft'* 7 (7–8), seta *ft''* 23 (21–23), seta *u'* 3 (3–4); tarsal empodium (*em*) 8.5 (8–9), simple, 6-rayed, tarsal solenidion (*ω*) 8 (8–9), tapering. Opisthosoma with 64 (64–67) smooth dorsal annuli, 87 (86–88) microtuberculated ventral annuli, middorsal ridge and lateral ridges stretching over 47–50 dorsal annuli. Seta *c2* 20 (19–20), 54 (53–60) apart, on ventral annulus 17 (17–18); seta *d* 25 (22–28), 37 (33–38) apart, on ventral annulus 37 (37–38); seta *e* 16 (16–19), 18 (17–19) apart,

on ventral annulus 62 (62–63); seta *f* 16 (16–18), 17 (17–18) apart, on 5th ventral annulus from rear; seta *h1* 3 (2–3), seta *h2* 25 (25–32). Female genitalia coverflap 35 (32–36) wide, 18 (18–20), with 14 longitudinal ridges and granules at base, proximal setae on coxisternum III (*3a*) 14 (13–15), 16 (15–17) apart.

Male: (n = 6). Body fusiform, 140–170, 57–61 wide, 45–48 thick. Prodorsal shield 39–41 included frontal lobe, 50–53 wide; sub triangular; frontal lobe broad 13–14; scapular tubercles ahead of rear margin, 17–19 apart, scapular setae (*sc*) 2–3 projecting centrad. Opisthosoma with 52–56 smooth dorsal annuli and 72–75 microtuberculated ventral annuli, middorsal ridge and lateral ridges stretching over 40–43 dorsal annuli. Male genitalia 19–22 wide, 12–15, proximal setae on coxisternum III (*3a*) 13–16, 14–16 apart.

Type material.

Holotype, female (slide number NJAUAcariEriEgypt25.1; marked Holotype), from *C sempervirens*, Qalyubia Governorate, Egypt, 3 November 2012, 30°15'N, 31°13'E, coll. Ashraf Elhalawany, deposited as slide mounted specimens in the Arthropod/Mite Collection of the Department of Entomology, Nanjing Agricultural University, Jiangsu Province, China. Paratypes, 6 females and 2 males on 4 slides (slide numbers NJAUAcariEriEgypt25.2–25.5), from *C. sempervirens* , Qalyubia Governorate, Egypt, 3 November 2012, 30°15'N, 31°13'E, coll. Ashraf El-Halawany, deposited as slide mounted specimens in the Arthropod/Mite Collection of the Department of Entomology, Nanjing Agricultural University, Jiangsu Province, China; 10 females and 5 males (slide numbers EGPErio30.1–30.10) from *C. sempervirens* , Qalyubia Governorate, Egypt, 3 November 2012, 30°15'N, 31°13'E, coll. Ashraf El–Halawany, deposited at Department of Fruit Acarology, Plant Protection Research Institute, Dokki, Egypt; 10 females and 5 males (slide numbers EGPErio30.11–30.20) from *C. sempervirens*, Qalyubia Governorate, Egypt, 15 March 2014, 30°15'N, 31°13'E, coll. Ashraf El–Halawany, deposited at Department of Fruit Acarology, Plant Protection Research Institute, Dokki, Egypt; and two slides deposited at Department of Soil, Plant and Food Sciences (Di.S.S.P.A.), section of Entomology and Zoology, University of Bari Aldo Moro (Italy).

Type host plant

Cupressus sempervirens L. (Cupressaceae).

Relation to host

Vagrant on the tips of the twigs and squeezed into the crevices between the leaf scales; no apparent damage was observed.

Etymology

This species was named after the Emeritus Prof. Dr. Mahmed M. Abou-setta, Plant Protection Research Institute, A.R.C., Egypt.

Differential diagnosis

The new species *Epitrimerus abousettai* sp. nov. is similar to *Epitrimerus cupressi* (Keifer, 1939) in empodium 6-rayed, but can be differentiated from the latter by dorsal annuli smooth; prodorsal shield with complete admedian lines present and faint submedian ahead of scapular tubercles (dorsal annuli with microtubercles; admedian lines present from central to anterior and absent submedian line in *E. cupressi*), Also the new species resemble to *E. macnabianae* Keifer, 1969 in prodorsal shield design and empodium 6-rayed but differs by dorsal annuli smooth and genital coverflap with 14 longitudinal ribs while, in *E. macnabianae* dorsal annuli with microtubercles and genital coverflap with curved transverse lines. Moreover the new species similar to *E. phoeniceae* Keifer, 1962 in dorsal annuli smooth but differs in deign of prodorsal shield complete admedian line, empodium 6-rayed, genital female coverflap with 14 longitudinal ribs, anterior coxae contiguous, raised of ventral annuli more than 87, coxae genital region with 17 semiannuli, setae *c2* and *d* shorter about 20 and 25 µ, respectively in *E. abousettai*, in versus prodorsal shield design obsolete, anterior coxae not definitely contiguous, empodium 5-rayed, genital female coverflap with 12 diagonal furrows, ventral annuli less about 65, coxae genital region with 9 semiannuli, setae *c2* and *d* longer about 32 and 42 µ in *E. phoeniceae*.

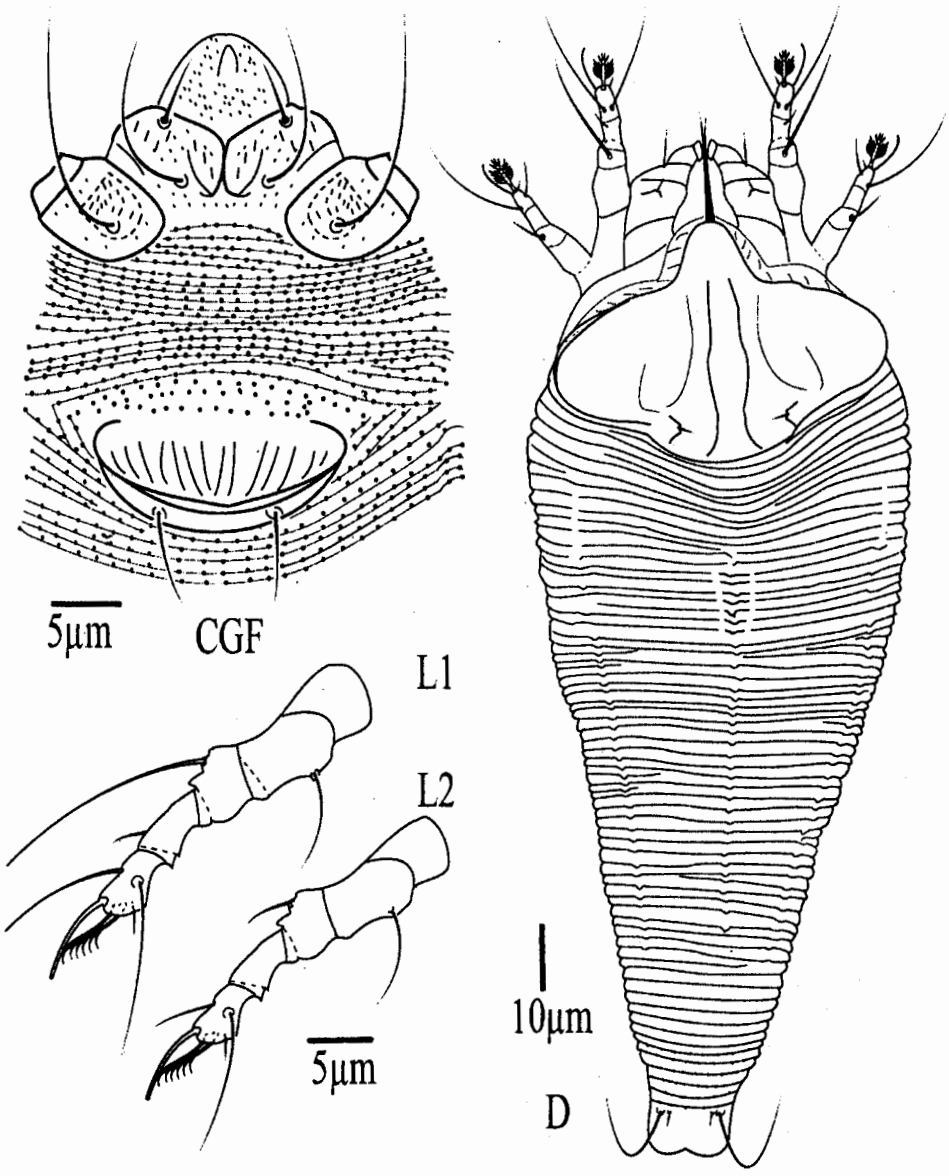

FIGURE 1. *Epitrimerus abousettai* n. sp.: D, dorsal view of mite; CGF, coxigenital region of female; L1, leg I; L2, leg II.

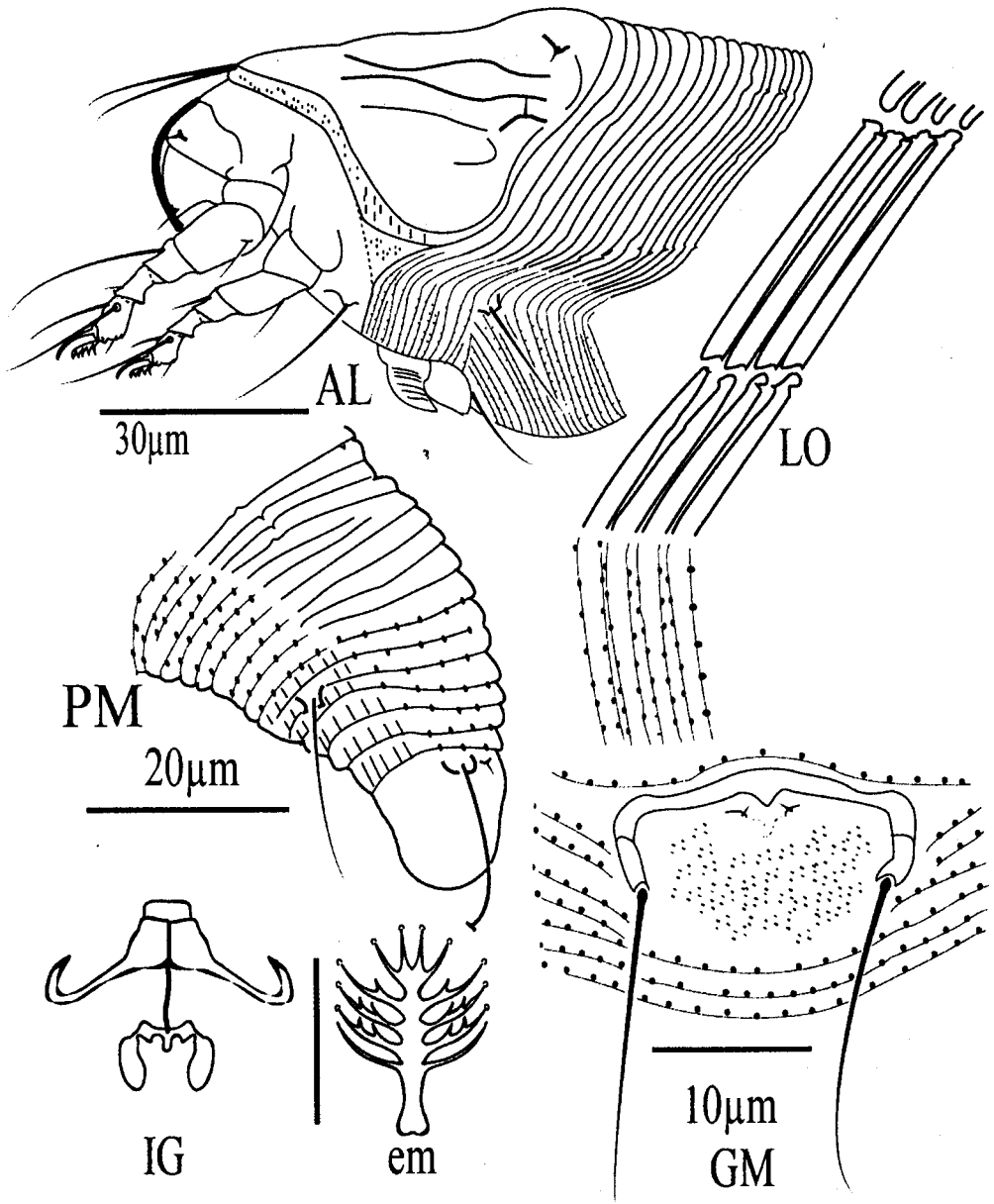

FIGURE 2. *Epitrimerus abousettai* n. sp.: AL, antero–lateral view of female; LO, lateral view of annuli; PM, posterior-lateral of opisthosoma; IG, internal female genitalia; em, empodium; GM, male genitalia.

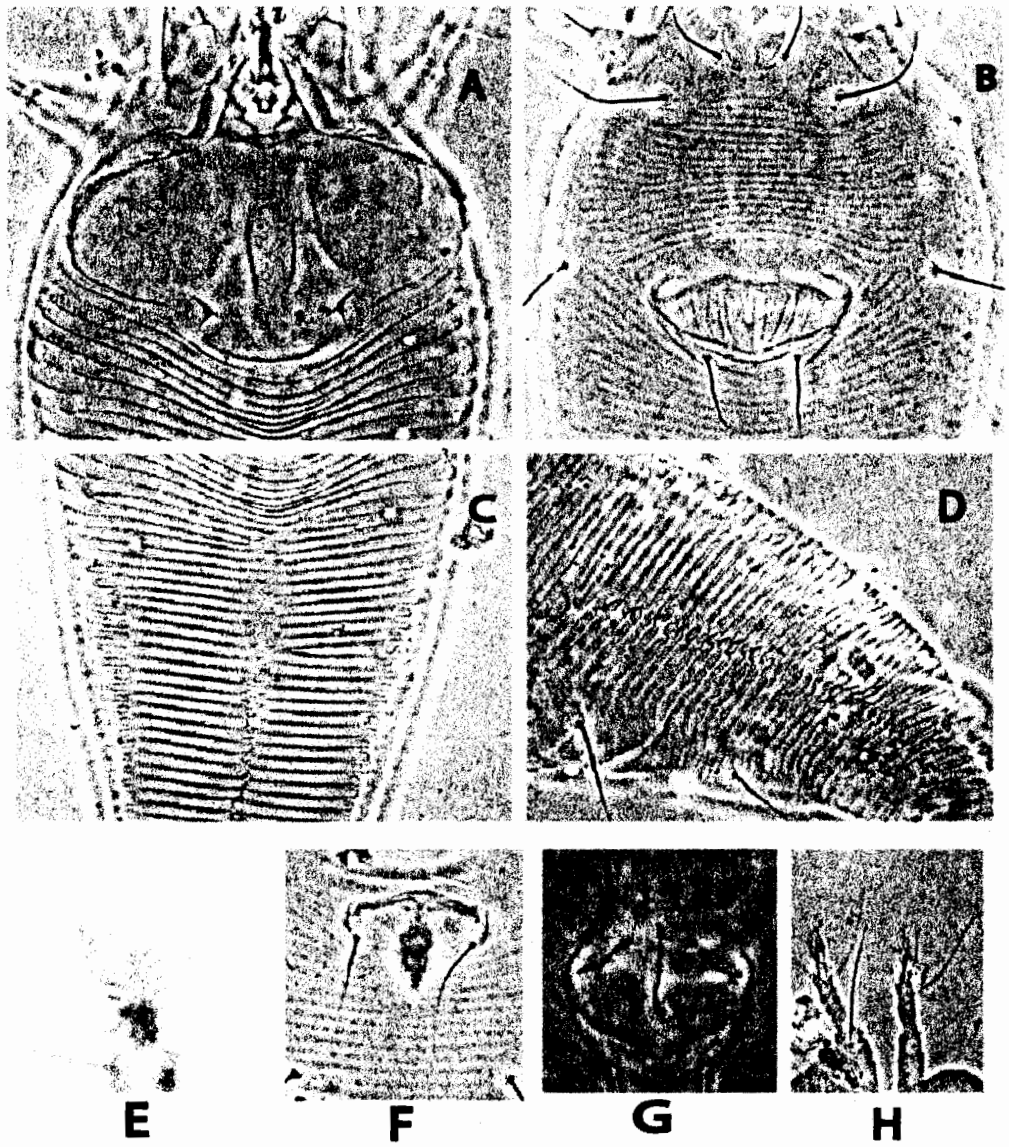

FIGURE 3. Digital micrographs of *Epitrimerus abousettai* n. sp.: A, prodorsal shield; B, coxigenital region of female; C, dorsal annuli; D, lateral view of annuli; E, empodium; F, male genitalia; G, internal female genitalia; H, legs.

Subfamily Eriophyinae Nalepa, 1898

Tribe Eriophyini Nalepa, 1898

***Stenacis aegyptius* sp. nov. (Figs. 4–6)**

Description

Female: (n = 10). Body vermiform, 170 (165–183), 42 (41–45) wide, 35 (35–37) thick; white color. Gnathosoma 25 (24–25), projecting obliquely down, oral stylets 17 (17–18), pedipalp coxal seta (*ep*) 3 (3–4), dorsal pedipalp genual seta (*d*) 5 (4–5), chelicerae 25 (23–25). Prodorsal shield 25(23–29) included frotal lobe, 27 (26–27) wide, subtriangular; frontal shield lobe sub-triangular 4 (4–6), divided; prodorsal shield with many granules. Scapular tubercles ahead of rear margin, 12 (12–13) apart, scapular seta (*sc*) 4 (4–5), projecting centrad. Coxigenital region with 6 (5–6) semiannuli. Coxal plates with granules, anterolateral setae on coxisternum I (*1b*) 7 (7–9), 11 (10–11) apart; proximal setae on coxisternum I (*1a*) 17 (17–20), 7 (6–7) apart; proximal setae on coxisternum II (*2a*) 25 (22–27), 17 (17–18) apart. Prosternal apodeme 7 (6–7). Leg I 22 (20–22), femur 7 (6–7), basiventral femoral seta (*bv*) 7 (7–8); genu 3 (3–4), antaxial genual seta (*l''*) 22 (20–22); tibia 6 (5–6), paraxial tibial seta (*l'*) 3 (3–4), located 1/3 from dorsal base; tarsus 4 (4–5), seta *ft'* 8 (8–9), seta *ft''* 18 (17–19), seta *u'* 2 (2–3); tarsal empodium (*em*) 5 (5–6), simple, 6–rayed, tarsal solenidion (*ω*) 7 (7–8), knobbed. Leg II 20 (18–20), femur 6 (6–7), basiventral femoral seta (*bv*) 8 (7–8); genu 3 (3–4), antaxial genual seta (*l''*) 7 (6–7); tibia 5 (4–5); tarsus 4 (4–5), seta *ft'* 7 (7–8), seta *ft''* 17 (16–18), seta *u'* 2 (2–3); tarsal empodium (*em*) 5 (5–6), simple, 6-rayed, tarsal solenidion (*ω*) 7 (6–7), knobbed. Opisthosoma with 78 (76–83) dorsoventral annuli, with elongate microtubercles on rear annular margin, with 80 (78–83) microtuberculated ventral annuli. Seta *c2* 22 (20–23), 37 (36–38) apart, on ventral annulus 10 (9–11); seta *d* 23 (22–24), 14 (13–14) apart, on ventral annulus 22 (21–23); seta *e* 14 (13–14), 13 (12–14) apart, on ventral annulus 40 (39–41); seta *f* 18 (16–18), 16 (15–17) apart, on 5th ventral annulus from rear; seta *h1* 3 (2–3), seta *h2* 30 (27–35). Female genital coverflap 19 (19–20) wide, 13 (13–15), with 14 (13–14) longitudinal ridges, proximal setae on coxisternum III (*3a*) 11 (10–12), 12 (11–12) apart.

Male: (n = 4). Body fusiform, 155–167, 40–43 wide, 31–33 thick; white color. Prodorsal shield 19–21, 26–27 wide. Scapular tubercles ahead of rear margin, 11–13

apart, scapular seta (*sc*) 3–4 projecting medially. Opisthosoma with microtuberculated annuli, the dorsal and ventral annuli number is subequal, 69 (65–73). Male genitalia 15 (14–15) wide, 11 (11–12), proximal setae on coxisternum III (*3a*) 10 (9–11), 11 (10–12) apart.

Type material

Holotype, female (slide number NJAUAcariEriEgypt24.1; marked Holotype), from *C. sempervirens*, Qalyubia Governorate, Egypt, 3 November 2012, 30°15'N, 31°13'E, coll. Ashraf El-Halawany, deposited as slide mounted specimens in the Arthropod/Mite Collection of the Department of Entomology, Nanjing Agricultural University, Jiangsu Province, China. Paratypes, 3 females and one male (slide numbers NJAUAcariEriEgypt24.2–24.5), with the same data as holotype; 10 females and 5 males (slide number EGPErio31.1–31.10) from *C. sempervirens*, Qalyubia Governorate, Egypt, 3 November 2012, 30°15'N, 31°13'E, coll. Ashraf El-Halawany, deposited at Department of Fruit Acarology, Plant Protection Research Institute, Dokki, Egypt ; and two slides deposited at Department of Soil, Plant and Food Sciences (Di.S.S.P.A.), section of Entomology and Zoology, University of Bari Aldo Moro (Italy).

Type host plant

Cupressus sempervirens L. (Cupressaceae).

Relation to host

The mites are found vagrants on the tips of the twigs and squeezed into the crevices between the leaf scales.

Etymology

The species name *aegyptius*, refers to the Latin name of collected location Egypt, Aegyptus; used here as a noun in apposition.

Differential diagnosis

The new species is similar to *Stenacis thunbergii* She, Wang & Hong, 2009 by many coarse granules on the prodorsal shield and frontal shield lobe large but can be differentiated from the latter by reducing in size, female genital coverflap with 14 longitudinal ridges (female genital coverflap smooth in *S. thunbergii*); coxae genital region with 6 semiannuli plus 3 transverse lines of granules at genital coverflap base (coxae genital region with 4 semiannuli, coverflap with many granules at base *S. thunbergii*), and empodium 6-rayed (empodium 5-rayed)

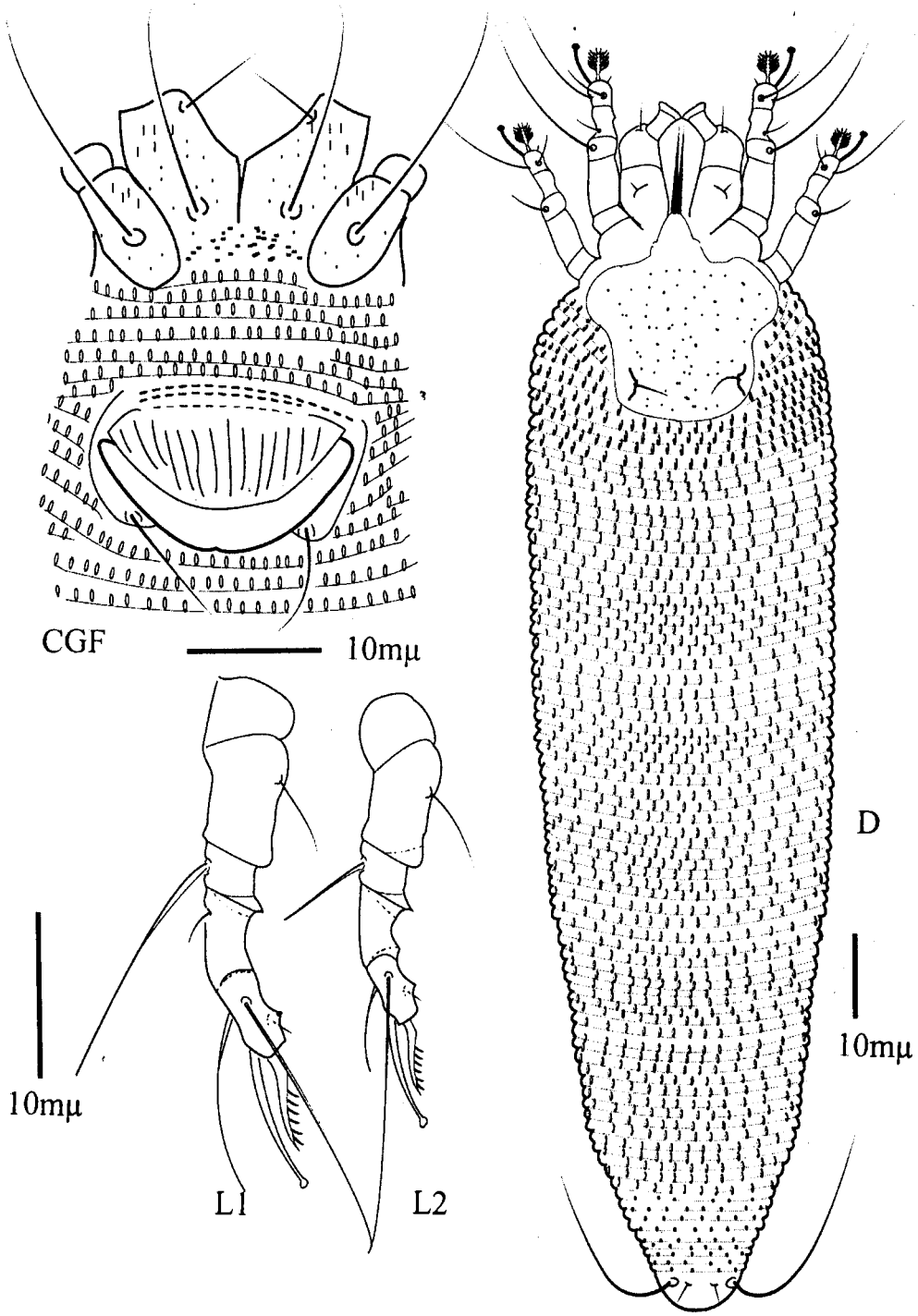

FIGURE 4. *Stenacis aegyptius* n. sp.: D, dorsal view of mite; CGF, coxigenital region of female; L1, leg I; L2, leg II.

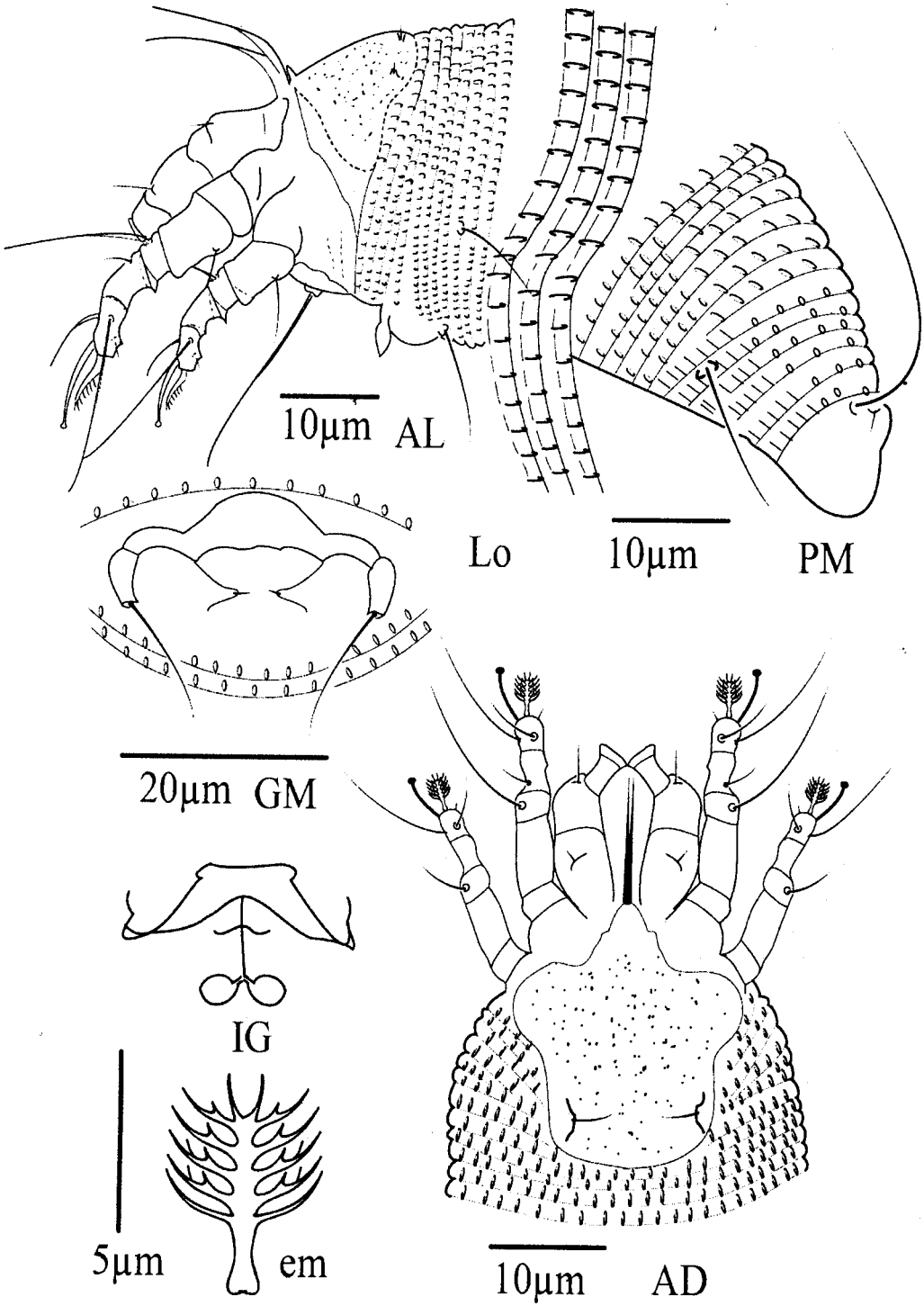

FIGURE 5. *Stenacis aegyptius* n. sp.: AL, antero–lateral view of female; LO, lateral view of annuli; PM, posterior-lateral of opisthosoma; GM, male genitalia; IG, internal female genitalia; AD, antero–dorsal view; em, empodium.

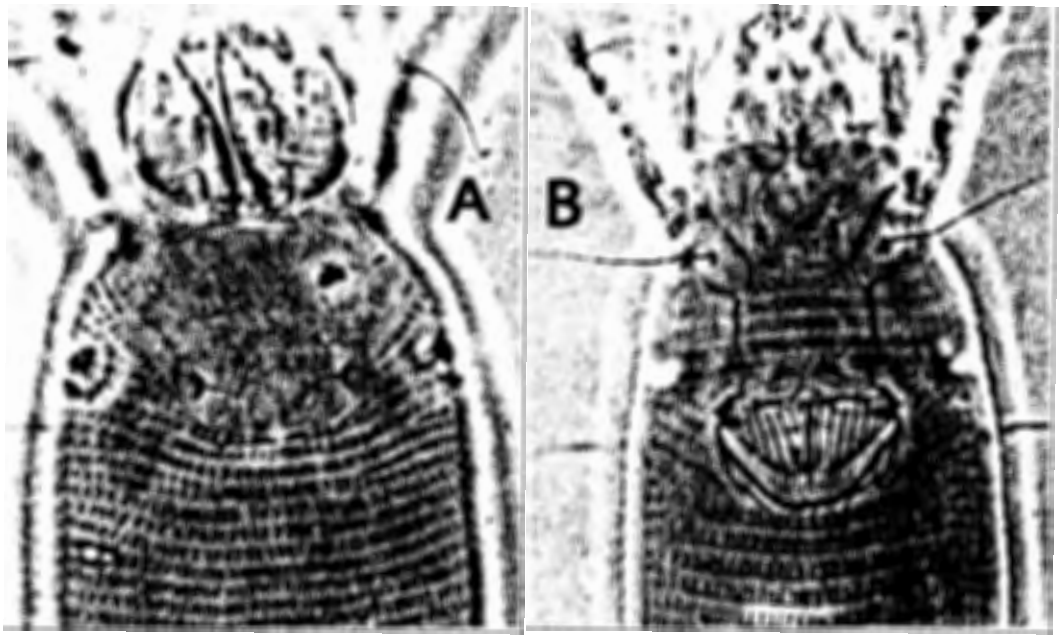

FIGURE 6. Digital micrographs of *Stenacis aegyptius* n. sp.: A, prodorsal shield; B, coxae and female genitalia.

ACKNOWLEDGEMENTS

Deep thanks to Prof Dr. Enrico de Lillo University of Bari Aldo Moro, Italy for reviewing the earlier draft and suggestions on the manuscript. We thank Xiao Han and Jing-Feng Guo (Nanjing Agriculutral University) for the review of an early version of the manuscript and referees for their valuable suggestions on the manuscript.

REFERENCES

1. Amrine, J.W. Jr. & Manson, D.C.M. (1996) Preparation, mounting and descriptive study of eriophyoid mites. *In*: Lindquist, E.E., Sabelis M.W. & Bruin, J. (Eds.), *Eriophyoid Mites: Their Biology, Natural Enemies and Control*. Elsevier, World Crop Pests, 6, pp. 383–396.
2. Amrine, J.W. Jr. & Stasny, T.A. (1994) *Catalog of the Eriophyoidea (Acarina: Prostigmata) of the World*. Indira Publishing House, Michigan, U.S.A., 798 pp.
3. Amrine, J.W.Jr., Stasny, T.A. & Flechtmann, C.H.W. (2003) *Revised keys to world genera of Eriophyoidea (Acari: Prostigmata)*. Indira Publishing House, Michigan, U.S.A., 244 pp.
4. Boczek, J. (1961) Badania nad roztoczami z rodziny Eriophyidae (Szpecielowate) w Polsce. I. [Studies on Eriophyid mites of Poland I]. Prace Naukowe Instytutu Ochrony Ros´lin 3(2):5–85.

5. de Lillo, E., Craemer, C., Amrine, J.W. Jr. & Nuzzaci, G. (2010) Recommended procedures and techniques for morphological studies of Eriophyoidea (Acari: Prostigmata). *Experimental and Applied Acarology*, 51, 283–307. http://dx.doi.org/10.1007/s10493–009–9311–x
6. Elhalawany, A.S.H. (2012) Survey of eriophyid mites on some fruit trees, with re–descriptions of two newly recorded species and a checklist of eriophyid mites in Egypt (Acari: Eriophyoidea). *Egyptian Academy Journal of Biological Sciences*, 5(2), 205–216.
7. Elhalawany, A.S.H. (2013) First record of the genus *Echinacrus* Keifer, 1966 (Acari: Eriophyidae) on *Acacia* from Egypt, with description of a new species. *Acarines*, 7(2), 7–12.
8. Keifer, H.H. (1939) Eriophyid studies VII. *Bulletin of the California Department of Agriculture*, 28, 484–505.
9. Keifer, H.H. (1952) Eriophyid Studies XVIII. *Bulletin of the California Department of Agriculture*, 41: 31-42.
10. Keifer, H.H. (1962) Eriophyid studies B-6. *Bureau of the California Department of Agriculture*, 20 pp.
11. Keifer H.H. (1966) Eriophyid Studies B-20. *Bureau of the California Department of Agriculture*, 20 pp.
12. Keifer, H.H. (1969) Eriophyid Studies C-3. *Department of Agriculture, Agricultural Research Service,* 24 pp.
13. Lindquist, E.E. (1996) External anatomy and notation of structures. *In*: Lindquist, E.E., Sabelis, M.W. & Bruin, J. (eds.), *Eriophyoid Mites. Their Biology, Natural Enemies and Control*. Elsevier, World Crop Pests, 6, pp. 3–31.
14. Vasilieva, E.A., Mitrofanov, V.I., Sekerskaya, N.P. & Sharonov, A.A. (1982) Chetyrekhnogie kleshchi khovoinykh porod Kryma. [Four-legged mites of the Crimean conifers (Acari: Eriophyoidea)]. *Trudy Gosudarskovo Nikitskiy Botanicheskaya Sada,* 87: 7-21.
15. She, D.S., Wang, Z. & Hong, X.Y. (2009) Two new species and a new record of eriophyoid mites (Acari: Eriophyidae) on coniferous plants in China. *Entomological News*, 120(3), 299–304. http://dx.doi.org/10.3157/021.120.0308
16. Westphal, E., & Manson, D.C.M. (1996) Feeding effects on host plants, Gall formation and other distortions, *In*: Lindquist E.E., Sabelis M.W.& Bruin J. (eds.), *Eriophyoid mites – Their biology, natural enemies and control*. Elsevier Science Publ., Amsterdam, pp. 231–241.

نوعان جديدان من الحلم الدودي (أكاريدى: اريوفيدى) الذي يصيب أشجار السرو في مصر

أشرف سعيد الحلوانى[١]، تشيونغ وانغ[٢]، شياو فنغ شوي[٢]

١- *معهد بحوث وقاية النباتات- مركز البحوث ألزراعية الدقي، جيزة ، القاهرة*

٢- *قسم ألحشرات جامعة نانجينغ الزراعية - نانجينغ - جيانغسو، جمهورية الصين الشعبية*

تم وصف ورسم نوعان جديدان من الحلم الدودي في مصر. تم جمع النوعان *Epitrimerus* *abousettai* sp. nov.، *Stenacis aegyptius* sp. nov.، على أشجار السرو. سجل كلا النوعان متجولان على أوراق العائل.