Three new species of eriophyoid mites (Acari, Eriophyoidea) associated with Lauraceae in China

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Abstract
In this paper, three new species of eriophyoid mites in the family Eriophyidae associated with Phoebe hu-
nanensis Hand.–Mazz. (Lauraceae), namely Gammaphytoptus striatilobus sp. n., Phyllocoptes setalsolenidion sp. n., and Dechela phoebe sp. n. are described and illustrated. All are vagrants causing no apparent damage to the same host plants.

Keywords
Acari, plant feeding, Prostigmata, taxonomy

Introduction
Eriophyoidea is the lineage most highly adapted for plant feeding among the Acari. Among the vast array of eriophyoid taxa, patterns varying from narrow to extreme host specificity are far more prevalent, and repeatedly independent, than in other groups of phytophagous mites (Lindquist 1996a).
During July 2013, field surveys were conducted in Zhangjiajie National Forest Park of Hunan Province. We found three species from the same host Phoebe hunanensis Hand.–Mazz. (Lauraceae), this plant is native to South China naturally in the sheltered and moist places in valleys, under forests or by streams (Lee and Wei 1982). The host plant in this study is a shrub with the leaf blade lanceolate, and leaves close to leathery texture (Fig. 1).

So far, no eriophyoid mite species have been described or reported from P. hunanensis. Two species are, however, known from other Phoebe species, which are Bucculacus phoebus Huang, 2001a and Phyllocoptruta hungmaensis Xue, Cheng & Hong, 2012. Furthermore, seven of the nine recognized Gammaphytoptus species and three Phyllocoptes species are found associated with Lauraceae. A key to known Gammaphytoptus and Phyllocoptes species is given.

Materials and methods

Eriophyoid mites were collected from plants with the aid of hand-lens (30x). Eriophyoids, together with their host plants, were placed in vials and stored in 75% ethanol. Each vial was marked with the following collection data: specimen number, date, host plant species name, colour of living mites, sample location, collector name and relationship of mite to the host plant. Collection data were also recorded in a notebook and examples of host plant parts were kept in a plant specimen folder in a dry environment for further identification and reference.

The morphological terminology follows Lindquist (1996b) and Amrine et al. (2003) and the generic classification was made according to Amrine et al. (2003). The liquid contents were pooled into a petri dish from the vials, then mite specimens were picked up using a fine pin and slide mounted using Keifer’s Booster and modified Berlese medium (Amrine and Manson 1996). Specimens were examined with the aid of a 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;
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×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. Specimens were measured according to de Lillo et al. (2010). For each species, the holotype female measurement precedes the corresponding range for paratypes (given in parentheses). All measurements are in micrometres (μm) and are lengths when not otherwise specified. All type specimens are deposited as slide mounted specimens in the Arthropod/Mite Collection of the Department of Entomology, Nanjing Agricultural University (NJAU), Jiangsu Province, China.

Results

Family Eriophyidae Nalepa, 1898
Subfamily Cecidophyinae Keifer, 1966
Tribe Colomerini Newkirk & Keifer, 1975
Genus Gammaphytoptus Keifer, 1939

Gammaphytoptus striatilobus sp. n.
http://zoobank.org/F691F812-36E8-4CB7-BB9C-844634DE98CD
http://species-id.net/wiki/Gammaphytoptus_striatilobus
Figs 2–4

Description. FEMALE: (n=11). Body fusiform, 187 (187–200), 61 (55–61) wide, 56 (56–60) thick; light yellow. Gnathosoma 24 (20–24), projecting obliquely downwards, pedipalp coxal setae (ep) 2 (2–3), dorsal pedipalp genual setae (d) 7 (6–7), cheliceral stylets 24 (23–24). Prodorsal shield 40 (39–42), 50 (48–50) wide, median, admedian and submedian lines complete and parallel, connected with transverse lines, shield design with anterior part covered with striaes; anterior shield lobe present 8 (8–9). Scapular tubercles on rear shield margin, 32 (32–33) apart, scapular setae (sc) 16 (15–16), projecting posteriorly. Coxigenital region with 4 (3–4) semiannuli between coxae and genitalia. Coxal plates with irregular lines, anterolateral setae on coxisternum I (1b) 7 (6–7), 12 (12–13) apart, proximal setae on coxisternum I (1a) 14 (14–17), 11 (11–12) apart, proximal setae on coxisternum II (2a) 26 (26–27), 26 (24–26) apart. Prosternal apodeme absent. Leg I 27 (26–27), femur 9 (9–10), basiventral femoral setae (bv) 8 (8–9); genu 5 (4–5), antaxial genital setae (l’) 23 (21–23); tibia 6 (5–6), paraxial tibial setae (l) 6 (6–7), located at centre; tarsus 5 (5–6), paraxial, fastigial, tarsal setae (f”) 11 (11–12), antaxial, fastigial, tarsal setae (f”) 17 (17–18), paraxial, unguinal, tarsal setae (u’) 4 (4–5); tarsal empodium (em) 4 (4–5), simple, 7-rayed, tarsal solenidion (ω) 6 (6–7), rod-like. Leg II 24 (24–26), femur 9 (9–10), basiventral femoral setae (bv) 9 (8–9); genu 4 (4–5), antaxial genital setae (l”) 7 (6–7); tibia 5 (5–6); tarsus 5 (5–6), paraxial, fastigial, tarsal setae (f”) 5 (5–6), antaxial, fastigial, tarsal setae (f”) 17 (16–17), paraxial, unguinal, tarsal setae (u”) 3 (3–4); tarsal empodium (em) 5...
(5–6), simple, 7-rayed, tarsal solenidion (ω) 8 (7–8), rod-like. **Opisthosoma** dorsally with 34 (34–35) semiannuli, with elliptical microtubercles, ventrally with 49 (49–51) semiannuli, with elliptical microtubercles. Setae c2 12 (12–13) on ventral semiannulus
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Figure 3. *Gammaphytoptus striatilobus* sp. n.: AL lateral view of anterior body region LO lateral view of annuli PM lateral view of posterior opisthosoma CGF female coxae and genitalia L1 leg I L2 leg II.

8 (8–9), 48 (48–50) apart; setae d 41 (40–43) on ventral semiannulus 19 (18–19), 40 (37–40) apart; setae e 11 (11–14) on ventral semiannulus 30 (30–31), 22 (20–22) apart, setae f 25 (24–25) on 6th ventral semiannulus from rear, 18 (18–20) apart. Setae
h1 absent, h2 38 (37–38). Female genitalia 12 (12–15), 20 (20–22) wide, cover flap with two rows of ridges, the upper one with 14 (12–14) longitudinal ridges, the other with 12 (12–14) longitudinal ridges, setae 3a 8 (7–8), 15 (14–15) apart.

MALE: (n=7, dorsal view). Body fusiform, 169–190, 56–63 wide; light yellow. Gnathosoma 19–22, projecting obliquely downwards, pedipalp coxal setae (ep) 2–3, dorsal pedipalp genual setae (d) 5–6, cheliceral stylets 23–24. Prodorsal shield 37–40, 47–50 wide, median, admedian and submedian lines complete and parallel, connected with transverse lines, shield design with anterior part covered with striaes; anterior shield lobe present 8–9. Scapular tubercles on rear shield margin, 27–30 apart, scapular setae (sc) 15–16, projecting posteriorly. Coxigenital region with 4–5 semiannuli between coxae and genitalia. Coxal plates with irregular lines, anterolateral setae on coxisternum I (1b) 5–6, 11–12 apart, proximal setae on coxisternum I (1a) 12–15, 8–11 apart, proximal setae on coxisternum II (2a) 25–26, 23–25 apart. Prosternal apodeme absent. Leg I 25–26, femur 9–10, basiventral femoral setae (bv) 8–9; genu 4–5, antaxial genual setae (l') 18–22; tibia 5–6, paraxial tibial setae (l) 5–6, located at centre; tarsus 5–6, paraxia, fastigial, tarsal setae (ft') 11–12, antaxial, fastigial, tarsal setae (ft') 15–17, paraxial, unguinal, tarsal setae (u') 4–5; tarsal empodium (em) 4–5, simple, 7-rayed, tarsal solenidion (ω) 5–6, rod-like. Leg II 24–26, femur 9–10, basiventral femoral setae (bv) 8–10; genu 3–4, antaxial genual setae (l') 6–7; tibia 5–6; tarsus 5–6, paraxia, fastigial, tarsal setae (ft') 5–6, antaxial, fastigial, tarsal setae (ft') 16–17, paraxial, unguinal, tarsal setae (u') 3–4; tarsal empodium (em) 4–5, simple, 7-rayed, tarsal solenidion (ω) 6–7, rod-like. Opisthosoma dorsally with 33–37 semiannuli, with elliptical microtubercles, ventrally with 47–50 semiannuli, with elliptical microtubercles. Setae c2 15–16 on ventral semiannulus 8–9, 51–57 apart; setae d 40–41 on ventral semiannulus 17–19, 30–35 apart; setae e 13–15 on ventral semiannulus 29–33, 18–19 apart, setae f 24–25 on 6th ventral semiannulus from rear, 20–23 apart. Setae h1 absent, h2 57–58. Male genitalia 16–18 wide, setae 3a 7–8, 15–16 apart.

Type material. Holotype female (slide number NJAUAcariEriHN128C.1; marked Holotype), from Phoebe hunanensis Hand.–Mazz. (Lauraceae), Zhangjiajie National Forest Park, Zhangjiajie City, Hunan Province, P.R. China, 29°20'41"N, 110°27'33"E, elevation 420m, 10 July 2013, coll. Qiong Wang, Xiao Han and Jinfeng Guo, deposited as a slide mounted specimen in the Arthropod/Mite Collection of the Department of Entomology, NJAU, Jiangsu Province, China. Paratypes 10 females and 7 males on 17 microscope slides (slide number NJAUAcariEriHN128C.2–128C.18), with the same data as holotype.

Relation to host. This species is vagrant on lower part of the leaf surface. No damage to the host plant was observed.

Etymology. The specific designation “striatilobus” is from the character of prodorsal shield lobe (“lobus”) marked with parellel fine impressed lines (“striatus”), masculine in gender.

Differential diagnosis. This new species is similar to Gammaphytophus machilus Li, Wei & Wang, 2009, but can be differentiated from the latter by having: the design of prodorsal shield with anterior part covered with striaes (a prodorsal shield design
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Figure 4. *Gammaphytoptus striatilobus* sp. n.: A coxae and female genitalia B prodorsal shield C female internal genitalia D leg I and leg II E male genitalia F empodium.

with two rows of cells in *G. machilus*; dorsal semiannuli with elliptical microtubercles (dorsal semiannuli smooth in *G. machilus*) and ventral semiannuli with elliptical microtubercles (ventral semiannuli with rounded microtubercles in *G. machilus*).
Family Eriophyidae Nalepa, 1898
Subfamily Phyllocoptinae Nalepa, 1892
Tribe Phyllocoptini Nalepa, 1892
Genus Phyllocoptes Nalepa, 1887

Phyllocoptes setalsolenidion sp. n.
http://zoobank.org/3A5DC24D-760D-4E86-A6F2-FA640D8F52E3
http://species-id.net/wiki/Phyllocoptes_setalsolenidion
Figs 5–7

Description. FEMALE: (n=5, dorsal view). Body fusiform, 198 (186–198), 62 (59–65) wide; light yellow. Gnathosoma 29 (28–31), projecting obliquely downwards, pedipalp coxal setae (ep) 4 (4–5), dorsal pedipalp genual setae (d) 18 (18–21), cheliceral stylets 23 (20–24). Prodorsal shield 41 (41–42), 59 (59–60) wide, median, admedian and submedian lines absent, prodorsal shield with some short lines; anterior shield lobe 10 (10–14), acuminate, ending in a sharp point. Scapular tubercles 5 (5–6), ahead of rear shield margin, 19 (19–24) apart, scapular setae (sc) 10 (8–10), projecting centrad. Coxigenital region with 11 (10–11) semiannuli between coxae and genitalia. Coxal plates with fine granules, anterolateral setae on coxisternum I (1b) 15 (15–16), 12 (12–15) apart, proximal setae on coxisternum I (1a) 16 (15–16), 10 (10–11) apart, proximal setae on coxisternum II (2a) 33 (30–33), 25 (25–26) apart. Prosternal apodeme 4 (4–5). Leg I 37 (36–38), femur 12 (11–13), with fine granules, basiventral femoral setae (bv) 18 (18–20); genu 7 (6–7), antaxial genual setae (l”) 22 (20–22); tibia 11 (10–11), paraxial tibial setae (l’) 10 (9–10), located at 1/3 from dorsal base; tarsus 7 (7–8), paraxia, fastigial, tarsal setae (ft’) 30 (29–30), antaxial, fastigial, tarsal setae (ft”) 35 (32–35), paraxial, unguinal, tarsal setae (u’) 15 (15–17); tarsal empodium (em) 9 (8–9), simple, 8-rayed, tarsal solenidion (ω) 16 (16–17), seta-like. Leg II 31 (31–32), femur 10 (10–12), with fine granules, basiventral femoral setae (bv) 15 (15–16); genu 5 (4–5), antaxial genual setae (l”) 14 (14–16); tibia 5 (5–6); tarsus 7 (5–7), paraxia, fastigial, tarsal setae (ft’) 18 (18–20), antaxial, fastigial, tarsal setae (ft”) 28 (25–28), paraxial, unguinal, tarsal setae (u’) 14 (14–16); tarsal empodium (em) 10 (9–10), simple, 8-rayed, tarsal solenidion (ω) 15 (15–17), seta-like. Opisthosoma dorsally with 45 (45–48) semiannuli, between coxae and genitalia. Coxal plates with fine granules, anterolateral setae on coxisternum I (1b) 15 (15–16), 12 (12–15) apart, proximal setae on coxisternum I (1a) 16 (15–16), 10 (10–11) apart, proximal setae on coxisternum II (2a) 33 (30–33), 25 (25–26) apart. Prosternal apodeme 4 (4–5). Leg I 37 (36–38), femur 12 (11–13), with fine granules, basiventral femoral setae (bv) 18 (18–20); genu 7 (6–7), antaxial genual setae (l”) 22 (20–22); tibia 11 (10–11), paraxial tibial setae (l’) 10 (9–10), located at 1/3 from dorsal base; tarsus 7 (7–8), paraxia, fastigial, tarsal setae (ft’) 30 (29–30), antaxial, fastigial, tarsal setae (ft”) 35 (32–35), paraxial, unguinal, tarsal setae (u’) 15 (15–17); tarsal empodium (em) 9 (8–9), simple, 8-rayed, tarsal solenidion (ω) 16 (16–17), seta-like. Leg II 31 (31–32), femur 10 (10–12), with fine granules, basiventral femoral setae (bv) 15 (15–16); genu 5 (4–5), antaxial genual setae (l”) 14 (14–16); tibia 5 (5–6); tarsus 7 (5–7), paraxia, fastigial, tarsal setae (ft’) 18 (18–20), antaxial, fastigial, tarsal setae (ft”) 28 (25–28), paraxial, unguinal, tarsal setae (u’) 14 (14–16); tarsal empodium (em) 10 (9–10), simple, 8-rayed, tarsal solenidion (ω) 15 (15–17), seta-like. Opisthosoma dorsally with 45 (45–48) semiannuli, smooth, ventrally with 70 (70–76) semiannuli, with small and rounded microtubercles set on rear annular margins, last 5th–6th semiannuli with elongated and linear tubercules. Setae e2 53 (53–55) on ventral semiannulus 14 (13–15), 49 (49–52) apart; setae d 59 (55–60) on ventral semiannulus 28 (26–28), 33 (32–33) apart; setae c 40 (39–42) on ventral semiannulus 42 (42–45), 15 (15–18) apart, setae f 21 (20–22) on 9th ventral semiannulus from rear, 17 (16–18) apart. Setae h1 4 (4–5), h2 25 (24–25). Female genitalia 14 (14–15), 26 (26–28) wide, coverflap with 14 (12–14) longitudinal ridges, setae 3a 20 (17–20), 17 (17–19) apart.

MALE: (n=1, dorsal view). Body fusiform, 169, 54 wide; light yellow. Gnathosoma 27, projecting obliquely downwards, pedipalp coxal setae (ep) 4, dorsal pedipalp genual setae (d) 18, cheliceral stylets 22. Prodorsal shield 42, 57 wide, median, admedian and submedian lines absent, prodorsal shield with some short lines; anterior shield lobe 12,
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acuminate, ending in a sharp point. Scapular tubercles 5 ahead of rear shield margin, 24 apart, scapular setae (sc) 8, projecting centrad. **Coxigenital region** with 9 semiannuli between coxae and genitalia. Coxal plates with fine granules, anterolateral setae on coxisternum I (1b) 12, 14 apart, proximal setae on coxisternum I (1a) 17, 10 apart, proximal setae on coxisternum II (2a) 24, 25 apart. Prosternal apodeme 4. **Leg I** 30, femur 11, with fine granules, basiventral femoral setae (bv) 15; genu 4, antaxial genual setae (l‘) 20; tibia 7, paraxial tibial setae (l) 10, located at 1/3 from dorsal base; tarsus 6, paraxia, fastigial,
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tarsal setae ($f^t$) 27, antaxial, fastigial, tarsal setae ($f''$) 28, paraxial, unguinal, tarsal setae ($u'$) 14; tarsal empodium ($em$) 8, simple, 8-rayed, tarsal solenidion ($\omega$) 15, seta-like. **Leg II** 26, femur 10, with fine granules, basiventral femoral setae ($bv$) 13; genu 4, antaxial genual...

**Figure 7.** *Phyllocotes setalolenidion* sp. n.: A prodorsal shield B male genitalia C coxae and female genitalia D female internal genitalia E empodium F leg I and leg II.
setae (ł') 14; tibia 5; tarsus 6, paraxia, fastigial, tarsal setae (ft') 13, antaxial, fastigial, tarsal setae (ft") 23, paraxial, unguinal, tarsal setae (u') 11; tarsal empodium (em) 7, simple, 8-rayed, tarsal solenidion (ω) 14, seta-like. **Opisthosoma** dorsally with 42 semiannuli, smooth, ventrally with 71 semiannuli, with small and rounded microtubercles set on rear annular margins, last 5th–6th semiannuli with elongated and linear tubercles. Setae c2 50 on ventral semiannuli 14, 40 apart; setae d 52 on ventral semiannulus 25, 30 apart; setae e 40 on ventral semiannulus 43, 15 apart, setae f 24 on 9th ventral semiannulus from rear, 17 apart. Setae h1 5, h2 22. **Male genitalia** 21 wide, setae 3a 11, 17 apart.

**Type material.** Holotype female (slide number NJAUAcarEriHN128A.1; marked Holotype), from *Phoebe hunanensis* Hand.–Mazz. (Lauraceae), Zhangjiajie National Forest Park, Zhangjiajie City, Hunan Province, P.R. China, 29°20'41"N, 110°27'33"E, elevation 420m, 10 July 2013, coll. Qiong Wang, Xiao Han and Jingfeng Guo, deposited as a slide mounted specimen in the Arthropod/Mite Collection of the Department of Entomology, NJAU, Jiangsu Province, China. Paratypes 4 females and 1 male on 5 microscope slides (slide number NJAUAcarEriHN128A.2-128A.6), with the same data as holotype.

**Relation to host.** Vagrant on lower part of the leaf surface. No damage to the host plant was observed.

**Etymology.** The specific designation *setalsolenidion* is derived from the shape (setal) of the tarsal solenidion. It is regarded as a noun phrase regardless of the gender and part of speech.

**Differential diagnosis.** This new species is similar to *Phyllocoptes machilus* Wei, Xie & Chen, 2006, but can be differentiated from the latter mainly by possessing: prodorsal shield lacking median, admedian and submedian lines (with median line incomplete, present on the anterior and rear 1/5 respectively, admedian lines complete, forming a network in *P. machilus*); anterior shield lobe acuminate, ending in a sharp point (with small frontal lobe in *P. machilus*); femur having fine granules (femur smooth in *P. machilus*) and tarsal empodium 8-rayed, tarsal solenidion seta-like (tarsal empodium 4-rayed, tarsal solenidion knobbed).

### Family Eriophyidae Nalepa, 1898

**Subfamily Cecidophyinae Keifer, 1966**

**Tribe Cecidophyini Keifer, 1966**

**Genus Dechela Keifer, 1965**

*Dechela phoebe* sp. n.

http://zoobank.org/E018B236-5BB5-485C-A921-66AC407D15A8

http://species-id.net/wiki/Dechela_phoebe

Figs 8–10

**Description.** FEMALE: (n=13). Body vermiform, 187 (183–192), 60 (55–60) wide, 62 (57–62) thick; light yellow. **Gnathosoma** 15 (15–18), projecting obliquely down-
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wards, pedipalp coxal setae (ep) 3 (2–3), dorsal pedipalp genual setae (d) 4 (4–5), cheliceral stylets 12 (12–14). Prodorsal shield 27 (26–30), 51 (45–51) wide, covered with short lines; anterior shield lobe absent. Scapular tubercles and scapular setae absent. Coxigenital region with 2 (2–3) indistinct semiannuli between coxae and genitalia. Coxal plates with minute lines, anterolateral setae on coxisternum I (1b) absent, proximal setae on coxisternum I (1a) 12 (12–15), 13 (11–13) apart, proximal setae on coxisternum II (2a) 19 (18–21), 28 (27–29) apart. Prosternal apodeme absent. Leg I 21 (20–22), femur 6 (6–7), with some dash lines on ventral part, basiventral femoral setae (bv) 9 (9–11); genu 4 (3–4), antaxial genual setae (l′) 24 (22–24); tibia 3 (2–3), paraxial tibial setae (l′) absent; tarsus 5 (5–6), paraxia, fastigial, tarsal setae (ft′) 13 (13–15), antaxial, fastigial, tarsal setae (ft‴) 17 (16–18), paraxial, unguinal, tarsal setae (u′) 5 (5–7); tarsal empodium (em) 7 (7–8), simple, 7-rayed outside, 5-rayed inside, tarsal solenidion (ω) 5 (5–6), rod-like, located below empodia. Leg II 18 (18–19), femur 6 (5–6), with some dash lines on ventral part, basiventral femoral setae (bv) 10 (10–11); genu 4 (3–4), antaxial genual setae (l′) absent; tibia 6 (5–6), paraxia, fastigial, tarsal setae (ft′) 7 (7–8), antaxial, fastigial, tarsal setae (ft‴) 18 (18–23), paraxial, unguinal, tarsal setae (u′) 5 (4–5); tarsal empodium (em) 6 (6–7), simple, 7-rayed outside, 5-rayed inside, tarsal solenidion (ω) 15 (15–16), rod-like. Opisthosa dorsally with 55 (55–57) annuli, with elliptical microtubercles, ventrally with 56 (56–58) annuli, with elliptical microtubercles. Setae c2 10 (10–11) on ventral annulus 8 (7–9), 48 (48–50) apart; setae d 53 (50–55) on ventral annulus 16 (16–18), 38 (38–40) apart; setae e 50 (50–52) on ventral annulus 32 (31–32), 26 (26–27) apart, setae f 15 (15–16) on 6th ventral annulus from rear, 12 (11–12) apart. Setae h1 absent, h2 21 (20–23). Female genitalia 12 (12–14), 19 (18–19) wide, coverflap with transverse dashes, setae 3a 30 (27–30), 16 (15–16) apart.

MALE: (n=2, dorsal view). Body vermiform, 175–192, 48–54 wide; light yellow. Gnathosoma 20–21, projecting obliquely downwards, pedipalp coxal setae (ep) 2–3, dorsal pedipalp genual setae (d) 4–5, cheliceral stylets 10–13. Prodorsal shield 25–27, 40–50 wide, covered with short lines; anterior shield lobe absent. Scapular tubercles and scapular setae absent. Coxigenital region with 2–3 indistinct semiannuli between coxae and genitalia. Coxal plates with minute lines, anterolateral setae on coxisternum I (1b) absent, proximal setae on coxisternum I (1a) 12–13, 9–10 apart, proximal setae on coxisternum II (2a) 17–20, 24–25 apart. Prosternal apodeme absent. Leg I 17–20, femur 6–7, with some dash lines on ventral part, basiventral femoral setae (bv) 8–9; genu 3–4, antaxial genual setae (l′) 20–21; tibia 3–4, paraxial tibial setae (l′) absent; tarsus 4–5, paraxia, fastigial, tarsal setae (ft′) 10–11, antaxial, fastigial, tarsal setae (ft‴) 14–16, paraxial, unguinal, tarsal setae (u′) 5–6; tarsal empodium (em) 6–7, simple, 7-rayed outside, 5-rayed inside, tarsal solenidion (ω) 5–6, rod-like, located below empodia. Leg II 17–20, femur 5–6, with some dash lines on ventral part, basiventral femoral setae (bv) 8–9; genu 2–3, antaxial genual setae (l′) absent; tibia 2–3; tarsus 5–6, paraxia, fastigial, tarsal setae (ft′) 6–7, antaxial, fastigial, tarsal setae (ft‴) 18–19, paraxial, unguinal, tarsal setae (u′) 4–5; tarsal empodium (em) 5–6, simple, 7-rayed outside, 5-rayed inside, tarsal solenidion (ω) 13–15, rod-like.
Opisthosoma dorsally with 54–56 annuli, with elliptical microtubercles, ventrally with 56–57 annuli, with elliptical microtubercles. Setae $c_2$ 15–16 on ventral annulus 8–9, 40–41 apart; setae $d$ 43–45 on ventral annulus 16–17, 30–34 apart; setae $e$
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43–44 on ventral annulus 30–32, 23–24 apart, setae f 15–16 on 6th ventral annulus from rear, 10–11 apart. Setae h1 absent, h2 26–27. **Male genitalia** 18–19 wide, setae 3a 26–30, 15–16 apart.

**Figure 9.** *Dechela phoebe* sp. n.: **AL** lateral view of anterior body **LO** lateral view of annuli **PM** lateral view of posterior opisthosoma **CGF** female coxae and genitalia **GM** male genital region.
Figure 10. Dechela phoebe sp. n.: A prodorsal shield B coxae and female genitalia C leg I and leg II D female internal genitalia E male genitalia F tarsal solenidion of leg I G empodium.
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**Material examined.** 13 females and 2 males on 15 microscope slides (slide number NJAUAcariEriHN128B.1-128B.15), from *Phoebe hunanensis* Hand.–Mazz. (Lauraceae), Zhangjiajie National Forest Park, Zhangjiajie City, Hunan Province, P.R. China, 29°20’41"N, 110°27’33"E, elevation 420m, 10 July 2013, coll. Qiong Wang, Xiao Han and Jingfeng Guo, deposited as a slide mounted specimen in the Arthropod/Mite Collection of the Department of Entomology, NJAU, Jiangsu Province, China.

**Relation to host.** Vagrant on lower part of the leaf surface. No damage to the host plant was observed.

**Etymology.** The specific designation *Phoebe* is derived from the generic name of the host plant; feminine in gender.

**Differential diagnosis.** This new species is very similar to *Dechela epelis* Keifer, 1965, but some quantitative characters can be used to separate them (Table 1).

**Table 1.** The differential diagnosis between *Dechela epelis*, Keifer and *Dechela phoebe* sp. n.

| Characters          | *Dechela epelis* Keifer          | *Dechela phoebe* sp. n.            |
|---------------------|----------------------------------|------------------------------------|
| body length         | 175–190                          | 187 (183–192)                      |
| body width          | 42–45                            | 60 (55–60)                         |
| gnathosoma length   | 19                               | 15 (15–18)                         |
| d                   | 3.5                              | 4 (4–5)                            |
| shield length       | 26                               | 27 (26–30)                         |
| shield width        | 32                               | 51 (45–51)                         |
| anterior shield lobe| present                          | absent                             |
| coxisternal area    | coxae with curved lines of granules or short dashes | coxal plates with minute lines |
| leg I               | 20–21                            | 21 (20–22)                         |
| tibia I//’           | 3/absent                         | 3 (2–3)/absent                     |
| tarsus I//*          | 5, tarsal solenidion 4 straight or slightly curved laterally | 5 (5–6), tarsal solenidion 5 (5–6), slightly curved laterally |
| em I                | 7-rayed on outside, 5-rayed inside | 7 (7–8), 7-rayed on outside, 5-rayed inside |
| leg II              | 20                               | 18 (18–19)                         |
| tibia II            | 2                                | 2 (2–3)                            |
| tarsus II//*         | 5, tarsal solenidion 10 straight | 6 (5–6), tarsal solenidion 15 (15–16) straight |
| em II               | 7-rayed on outside, 5-rayed inside | 6 (6–7), 7-rayed on outside, 5-rayed inside |
| dorsal annuli       | 62                               | 55 (55–57)                         |
| ventral annuli      | 62                               | 56 (56–58)                         |
| c2                  | 15, on 6–8 annuli behind shield, projecting up and forward | 10 (10–11), on 8 (7–9) annuli from coxae |
| d                   | 36, on 19 annuli                 | 53 (50–55), on 16 (16–18) annuli   |
| e                   | 42, on 37 annuli                 | 50 (50–52), on 32 (31–32) annuli   |
| f                   | 14, on 4–5 from rear             | 15 (15–16), on 6 from rear         |
| b1                  | absent                           | absent                             |
| female genitalia/3a | 16 wide, 11 long; cover flap with transverse and gently curved lines of granules and dashes; 13 long | 19 (18–19) wide, 12 (12–14) long; cover flap with transverse dashes; 30 (27–30) long |
| host plant          | *Bixa* sp. (Bixaceae)            | *Phoebe hunanensis* Hand.–Mazz. (Lauraceae) |
A key to *Gammaphytoptus, Phyllocoptes* species known from Lauraceae

1. Female genitalia appressed to coxae, ridges on female coverflap in two uneven ranks. ...........................................................................................................2
   - Female genitalia not appressed to coxae, ridges on female coverflap in one rank. ........................................................................................................9

2. The anterior part of prodorsal shield design covered with striae. ................
   - Prodorsal shield design without short lines .................................................3

3. Dorsal annuli smooth ... *Gammaphytoptus machilus* Li, Wei & Wang, 2009
   - Dorsal annuli with microtubercles ..........................................................4

4. Empodia 6-rayed or 7-rayed .................................................................5
   - Empodia 5-rayed ......................................................................................6

5. Empodia 6-rayed, prodorsal shield pattern of part longitudinal and part network lines ........................................ *Gammaphytoptus camphorae* Keifer, 1939
   - Empodia 7-rayed, prodorsal shield without median line and submedian, admedian lines complete ..... *Gammaphytoptus commune* Huang & Wang, 2009

6. Prodorsal shield design with median line complete ..................................7
   - Prodorsal shield design with median line incomplete ............................8

7. Prodorsal shield design complex and anteriorly with a number of cells .......
   - Prodorsal shield design simple and with a number of longitudinal parallel lines .......................... *Gammaphytoptus bengalensis* Das & Chakrabarti, 1985
   - Setae $h_1$ present ...... *Gammaphytoptus zuihoensus* Huang & Wang, 2004
   - Setae $h_1$ absent ................. *Gammaphytoptus litseasis* Ghosh & Chakrabarti, 1982

8. Dorsal annuli smooth. ........................................... *Phyllocoptes setalsolenidion* sp. n.
   - Dorsal annuli with microtubercles ..........................................................10

9. Empodia 4-rayed ............ *Phyllocoptes machilus* Wei, Xie & Chen, 2006
   - Empodia 5-rayed ......................................................................................11

10. Coxae with short curved lines and dashes ............................................. *Phyllocoptes linderafolius* Styer, 1975
   - Coxae with granular lines............ *Phyllocoptes sassafrasella* Keifer, 1959

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References

Amrine JW Jr, Manson DCM (1996) Preparation, mounting and descriptive study of eriophyoid mites. In: Lindquist EE, Sabelis MW, Bruin J (Eds) Eriophyoid Mites: Their Biology, Natural Enemies and Control. Elsevier, World Crop Pests 6: 383–396. doi: 10.1016/S1572-4379(96)80023-6

Amrine JW Jr, Stasny TA (1994) Catalog of the Eriophyoidea (Acarina: Prostigmata) of the world. Indira Publishing House, West Bloomfield, Michigan, U.S.A., 804 pp.

Amrine JW Jr, Stasny TA (1996) Corrections to the catalog of the Eriophyoidea (Acarina: Prostigmata) of the world. International Journal of Acarology 22(4): 295–304. doi: 10.1080/01647959608684108

Amrine JW Jr, Stasny TA, Flechtmann CHW (2003) Revised keys to world genera of Eriophyoidea (Acari: Prostigmata). Indira Publishing House, West Bloomfield, MI, U.S.A., 244 pp.

Das AK, Chakrabarti S (1985) Studies on eriophyid mites (Acari: Eriophyoidea) of India. XVI. One new genus and ten new species from India. Oriental Insects 19: 133–153. doi: 10.1080/00305316.1985.10433708

de Lillo E, Craemer C, Amrine JW Jr, Nuzzaci EG (2010) Recommended procedures and techniques for morphological studies of Eriophyoidea (Acari: Prostigmata). Experimental and Applied Acarology 51: 283–307. doi: 10.1007/S10493-009-9311-x

Huang KW (2001a) The eriophyoid mites of Taiwan: description of twenty-five species from Walapi. Bulletin of the National Museum of Natural Science 13: 65–93.

Huang KW (2001b) The eriophyid mites of Taiwan: description of eighty-six species from the Tengchih Area. Bulletin of the National Museum of Natural Science 14: 1–84.

Huang KW, Wang CF (2004) Eriophyoid mites of Taiwan: description of nine species of Cecidophyinae and Eriophyinae from Hueysuen (Acari: Eriophyoidea). Plant Protection Bulletin 46: 55–68.

Huang KW, Wang CF (2009) Eriophyoid mites (Acari: Eriophyoidea) of Taiwan: thirty-seven species from Yangmingshan, including one new genus and twenty-two new species. Zootaxa 1986: 1–50.

Keifer HH (1939) Eriophyid Studies III. Bulletin of the California Department of Agriculture 28: 144–162.

Keifer HH (1959) New Eriophyid mites. Annals of the Entomological Society of America 52(6): 649–657.

Keifer HH (1965) Eriophyid Studies B–13. Bulletin of the California Department of Agriculture, 20 pp.

Keifer HH (1969) Eriophyid Studies C–2. U.S. Department of Agriculture, Agricultural Research Service, 24 pp.

Lee SK, Wei FN (1982) Phoebe Nees. In: Li HW (Ed) Flora Reipublicae Popularis Sinicae. Science Press, Beijing 100: 89–120.

Lindquist EE (1966a) Evolution of Eriophyoid mites in relation to their host plants. In: Lindquist EE, Sabelis MW, Bruin J (Eds) Eriophyoid mites: their biology, natural enemies and control. Elsevier, World Crop Pests 6: 277–300.
Lindquist EE (1996b) External anatomy and notation of structures In: Lindquist EE, Sabelis MW, Bruin J (Eds) Eriophyoid mites: their biology, natural enemies and control. Elsevier, World Crop Pests 6: 3–31.

Mondal S, Ghosh B, Chakrabarti S (1982) Three new species of eriophyid mites (Acari: Eriophyoidea) from West Bengal, India. Indian Journal of Acarology 6: 17–23.

Styer WE (1975) New species of Eriophyid mites (Acari: Eriophyoidea) from Ohio. Annals of the Entomological Society of America 68(5): 833–841.

Wei SG, Wang GQ, Li DW, Ou SS (2009) Eriophyoid mites of Guangxi, China (Acari: Eriophyoidea). Guangxi Science and Technology Press, 329 pp.

Wei SG, Xie MC, Chen JW (2006) A new genus and five new species of Eriophyidae from Mt. Shiwanda of Guangxi, China (Acari: Eriophyidae). Acta Zootaxonomica Sinica 31(1): 130–136.

Xue XF, Cheng LS, Hong XY (2012) Eriophyoid mites from Hainan Province, China VI: descriptions of one new genus and four new species of Phyllocoptini (Acari: Eriophyidae). International Journal of Acarology 38(2): 146–159. doi: 10.1080/01647954.2011.624122