

Sphaerolichus lekprayoona n. sp. (Acari: Sphaerolichida: Sphaerolichidae), a New Species of Leaf-litter Inhabiting Mite from Thailand

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ABSTRACT.— A new species of sphaerolichid mite, *Sphaerolichus lekprayoona* n. sp. (Acari: Sphaerolichida: Sphaerolichidae), is described and illustrated based on adult specimens collected from leaf-litter in tropical forests in Thailand. It is distinguished from other known species of *Sphaerolichus* by the unique presence of prodorsal apodemes, hypertrophied setae behind the dorsal concavity of tibia I, the absence of a prolonged solenidion at the apex of tibia I, and the solenidial counts of genera I-IV (1-1-1-0).

KEY WORDS: Acari, Trombidiformes, Sphaerolichida, Sphaerolichidae, new species, Thailand

INTRODUCTION

Mites of the family Sphaerolichidae are small to medium-sized (ca. 200–400 micrometres) and pinkish or yellowish in color. They have globular bodies with a soft integument and are readily recognized by their bizarre front legs, which have been observed to wave while walking (Walter et al., 2009). The known species have been found in moss, soil and leaf-litter habitats and are presumably ambush predators (Walter et al., 2009), feeding on other micro-arthropods. However, most aspects of their biology and ecology are unknown. To date, Sphaerolichidae contains only one genus, *Sphaerolichus* Berlese, 1904, with five described species (Zhang et al., 2011), namely *S. armipes* Berlese, 1904—the type species—from Italy, *S. barbarus* Grandjean, 1939 from France, *S. cuspidonasus* Theron & Ryke, 1975, *S. oculus* Theron & Ryke, 1975 and *S. narinusus* Theron & Ryke, 1975, from South Africa. Baker and Wharton (1952) mentioned an undescribed genus from California, but this taxon has

never been described. *Sphaerolichus barbarus* Grandjean, 1939 has also been recorded from Japan (Shiba, 1968; Nakamura et al., 2006), Malaysia (Shiba, 1976) and Spain (Moraza, 2008), whilst undescribed species have been reported from Iran (Beyzavi and Ostovan, 2011) and Australia (Walter et al., 2009). Together with the family Lordalycidae (about 10 described species), the Sphaerolichidae now constitute the suborder Sphaerolichida, a taxon that is closely related to the Prostigmata (O'Connor, 1984; Walter et al., 2009). Collectively, Sphaerolichida are cosmopolitan in distribution, but they are rarely encountered in large numbers and have received little study (Bonkowski et al., 2012). In this paper, I describe a new species of *Sphaerolichus*—*S. lekprayoona* n. sp.—based on adult specimens collected from the leaf-litter of tropical forests in the Surin Islands, Southern Thailand. This represents the first record of the genus from Thailand.

MATERIALS AND METHODS

Samples of leaf-litter (900 cm² of surface area) and top soil layer (0-2 cm depth) were collected into plastic bags and brought back to the laboratory within 48 hours (see *Material examined* for collection data). Mites were extracted into 70% (v/v) ethanol using Tullgren funnels with 25-Watt light bulbs for seven days, sorted under a stereomicroscope and then transferred to 60% (v/v) lactic acid for clearing. They were observed in this medium in a cavity slide under a compound microscope. Drawings were made with the aid of a camera lucida attached to the microscope. All size measurements given in the description are in micrometres. After examination, specimens were returned to 70% (v/v) ethanol for long-term preservation. The diagnostic characters of the family and genus can be found in Theron and Ryke (1975) and Moraza (2008). Body setal designations follow Kethley (1990).

RESULTS

Systematics

Family Sphaerolichidae Berlese, 1904

Genus *Sphaerolichus* Berlese, 1904

Sphaerolichus lekprayoonae n. sp.

(Figs. 1–5)

Diagnosis.— *Sphaerolichus* with the following combinations of character states: median eye under naso; one pair of lens-like lateral eyes (post-ocular body absent); strong prodorsal apodeme present; seta *exp* posteriad of level of trichobothrium *sci*; palpal tarsus relatively short; brush-like dorso-distal seta on palpal tarsus; coxal setation 2-3-1-9; two spear-like trichobothria on tibia I; three hypertrophied setae on tibia

I, two of which behind tibial dorsal concavity; three spear-like trichobothria on tarsus I; and solenidial counts of genua I-IV 1-1-1-0.

Description.— Adult Female: Body globular. Color in alcohol pale yellow or white; eye pigments dark red. Measurements of holotype (range of paratypes): body length (from apex of naso to posterior end of idiosoma) 260 (225–260); greatest width (at level of setal row *c*) 190 (175–200); height (at level of leg IV) 200 (175–206).

Gnathosoma (Fig. 1D).— Subcapitulum conical, but anteriorly blunt; integument striated basally, lateral lips smooth; three subcapitular setae (*a*, *m* and *n*) and two adoral setae (*or1* and *or2*), all barbed-filiform. Ventral lip (labium) short, triangular. Supracoxal seta small, peg-like. Palp (Fig. 1D) 70 (52–70) long, five-segmented: trochanter short, femur longest and nude, genu and tibia each with one seta, tarsus short (about combined length of tibia and genu), with one solenidion, one brush-like seta and three barbed setae. Chelicera (Fig. 1D) 100 (100–106) long; seta *cha* with minute barbs; seta *chb* thicker and about twice as long as *cha*; movable digit with two knob-like teeth; fixed digit with one lower, rayed knob-like tooth, ray-like processes also present at tip and on paraxial surface of fixed digit.

Idiosoma.— In dorsal view (Fig. 1A), relatively short: propodosoma (from naso to level of seta *in*) about half length of idiosoma; surface striated; naso well developed, its venter smooth, with lens-like median eye; one pair of lens-like lateral eyes (Fig. 1E), with red or dark brown pigment beneath; striated eyes (or post-ocular tubercle) absent—no evidence of different striation patterns in this area; with four pairs of rod-like, ciliate setae (*ve*, *sce*, *in* and *exp*;

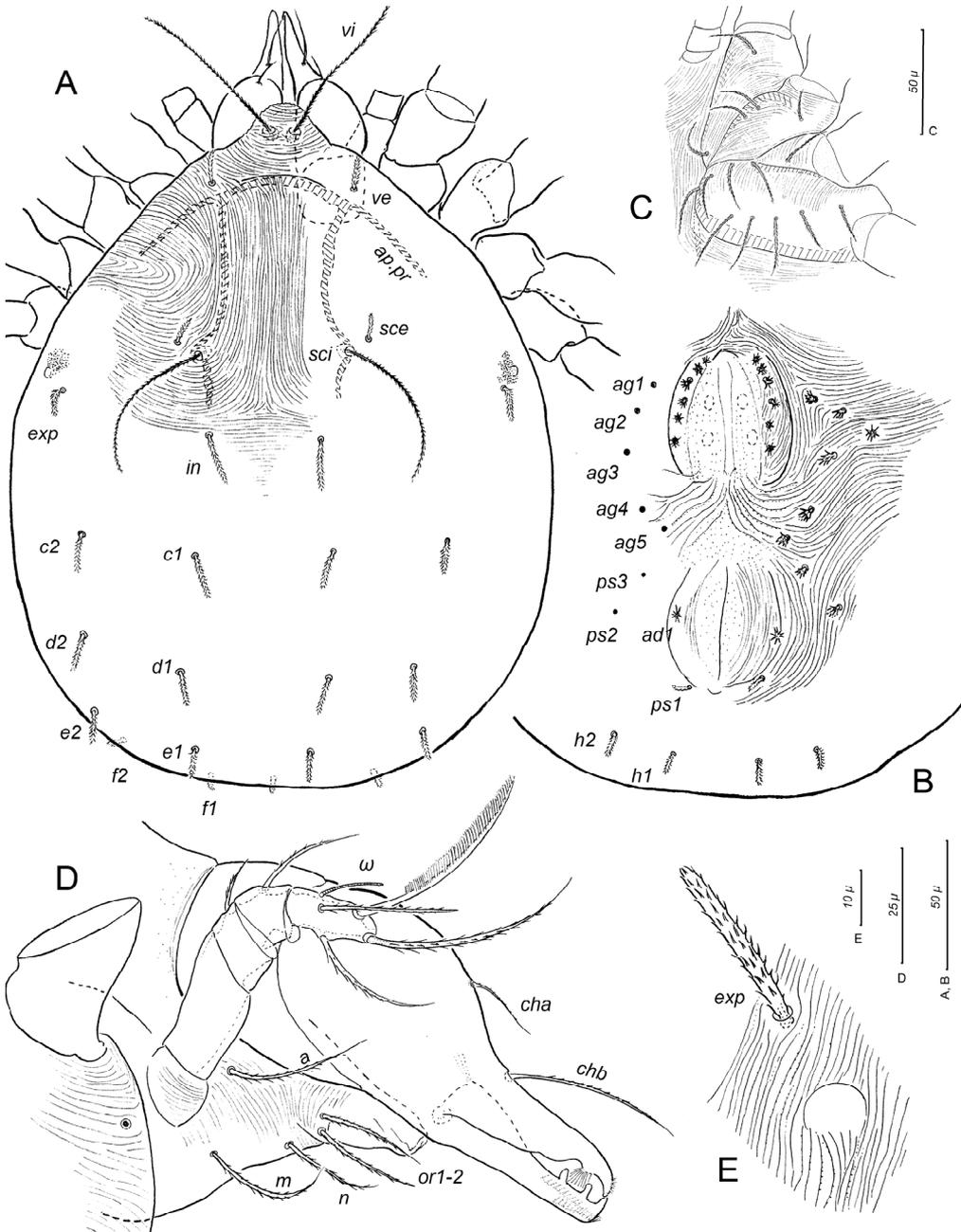


FIGURE 1. *Sphaerolichus lekprayoona* n. sp., female. A. Idiosoma, dorsal view, palps and legs partially drawn. B. Hysterosoma, ventral view, most setae on left represented by their alveoli. C. Left half of coxisternum. D. Gnathosoma, lateral view. E. Seta *exp* and lateral eye.

Fig. 1E) and two pairs of trichobothria (*vi* and *sci*); seta *sce* anterolateral to *sci*; seta *exp* posterolateral to lateral eyes, both of them behind level of *sci*; measurements of

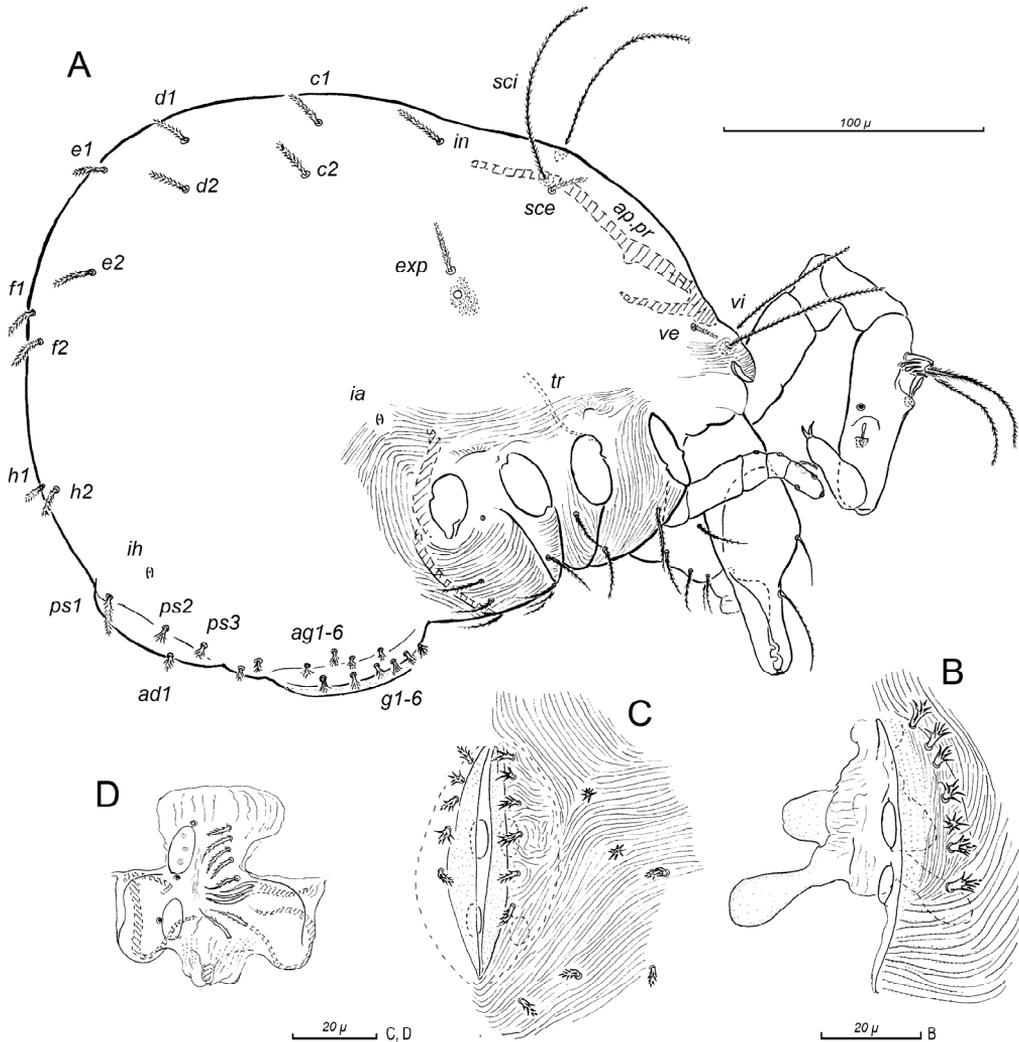


FIGURE 2. *Sphaerolichus lekprayoona* n. sp., adult. **A.** Female, lateral view, legs omitted except left leg I with some of its setae; right palp outlined. **B.** Female genital opening, right genital flap omitted to illustrate the ovipositor. **C.** Male genital area. **D.** Genitalia, with eugenital setae on left represented by their alveoli, genital papillae on right omitted.

prodorsal setae and trichobothria: *vi* 55 (55–57), *ve* 12 (11–12), *sci* 62 (57–76), *sce* 15 (15), *in* 20 (19–23), *exp* 20 (20–25); prodorsal apodemes (Fig. 1A, *ap.pr*) strongly developed, consisting of procurved transverse apodeme posteriad of *ve* and a pair of longitudinal apodemes, each extending posteriorly from anterior apodeme near insertion of *ve*, and past

bothridium of *sci*. Hysterosoma strongly bent, with 14 pairs of setae (*c1*, *c2*, *d1*, *d2*, *e1*, *e2*, *f1*, *f2*, *h1*, *h2*, *ps1*, *ps2*, *ps3*, and *ad1*), all rod-like (evenly thick) and ciliate; setae *c1* to *ps1* longer than *ps2*, *ps3* and *ad1*, which being grass-shaped with five to ten barbs. Two pairs of lyrifissures (*ia* and *ih*) at normal positions. Bump-like structure (*VI* of Grandjean (1939)) posteriad of coxa IV

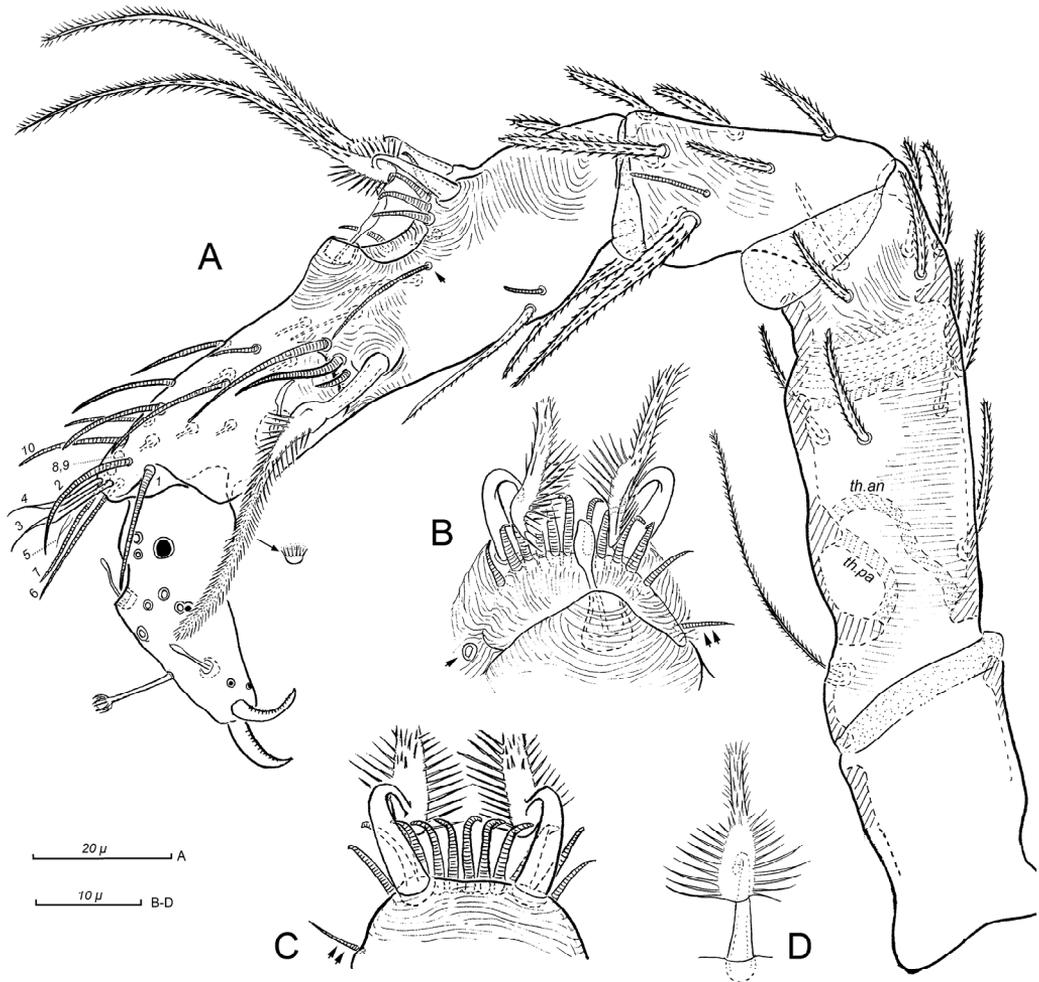


FIGURE 3. *Sphaerolichus lekprayoona* n. sp., female. **A.** Left leg I, paraxial view, most tarsal phaneres shown by their alveoli (solid, setae; empty, solenidia); distal solenidia of tibia are numbered to match those in Fig. 4C. **B-C.** Dorsal concavity on right tibia I, distal and proximal view, respectively, arrows (single and double) point to the same solenidia. **D.** Basal portion of the hypertrophied dorsal seta, laterodistal view.

absent. Measurements of hysterosomal setae: *c*₁ 15 (15–17), *c*₂ 17 (15–17), *d*₁ 10 (13–15), *d*₂ 15 (15), *e*₁ 15 (15), *e*₂ 15 (13–15), *f*₁ 15 (13–15), *f*₂ 13 (12–13), *h*₁ 10 (10–11), *h*₂ 10 (10), *ps*₁ 13 (11–13), *ps*₂ 6(6–7), *ps*₃ 6 (6), and *ad*₁ 7(7).

In ventral view, coxisternum (Fig. 1C) similar to that of congeners: surface striated; coxisternal plates I–IV contiguous on either side but separated medially by strip of soft membrane; coxisternal plate IV largest,

mesally displacing coxisternal plate III, touching coxisternal plate II; apodeme IV well developed and stronger than that of I–III. Coxal setae setiform, strongly barbed, coxal setation 2–3–1–9. Genital opening (Fig. 1B, 2B) 50 long; with well defined genital valves, antiaxial half longitudinally striated, paraxial half densely striated or punctate; with six (sometimes seven on one side) pairs of genital setae (*gl*–*g*₆), about 5–7 long, arranged in longitudinal row; and

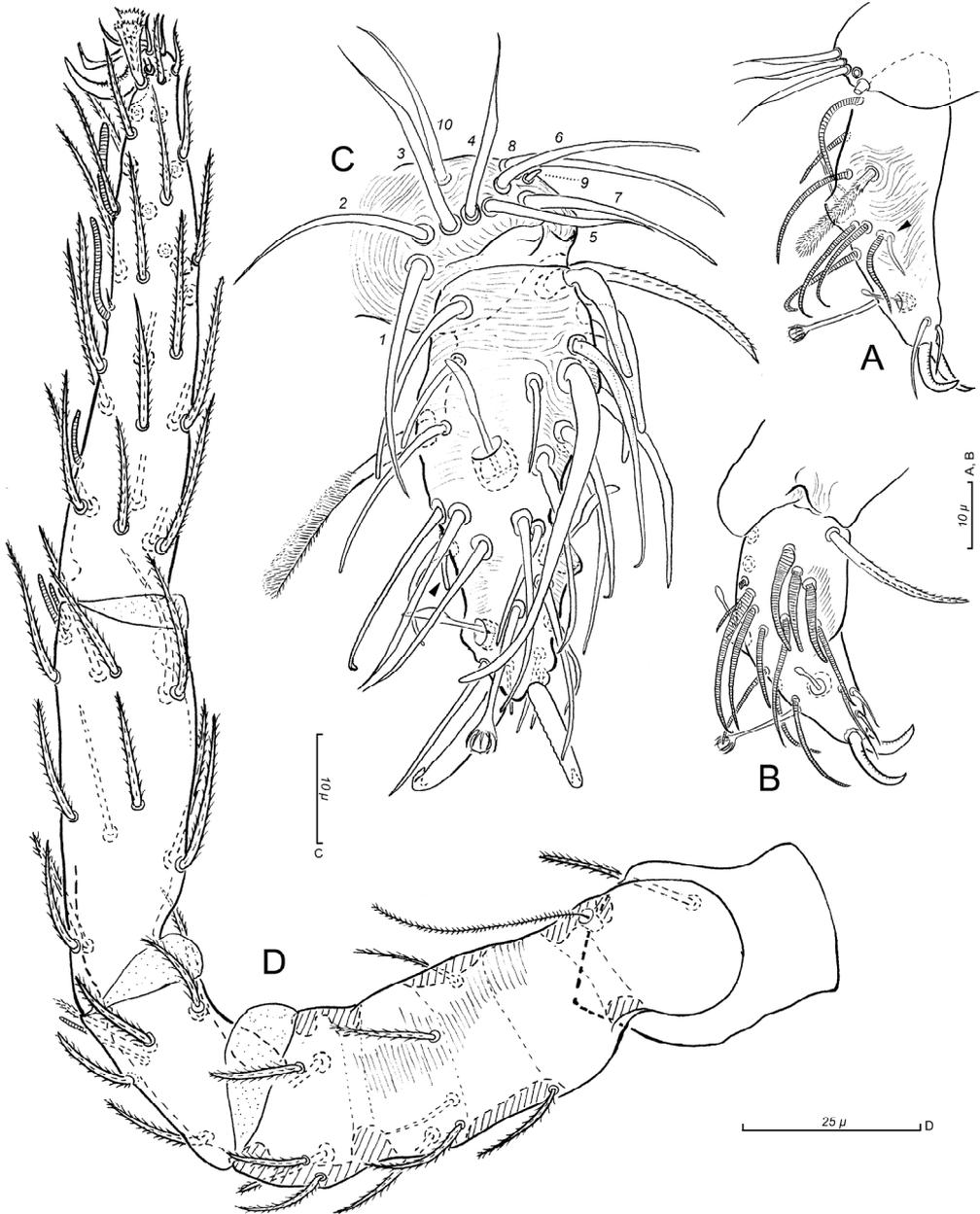


FIGURE 4. *Sphaerolichus lekprayoanae* n. sp., female. **A.** Tarsus of left leg I, paraxial view, arrow points to fused alveoli. **B.** Tarsus of left leg I, antiaxial view, slightly foreshortened. **C.** Dorsal view of tarsus and apex of tibia of right leg I; distal solenidia and peg-like seta of tibia numbered to match those in Fig. 3A, arrow points to a coupled seta. **D.** Right leg II, antiaxial view.

five or six pairs of subequal aggenital setae (*agl-ag6*), about 7–10 long. Genital and

aggenital setae short, grass-shaped with five to ten branches. Ovipositor (Fig. 2B) with

two pairs of unequal lobes; eugenital setae absent. Two pairs of genital papillae present, posterior pair smaller than anterior pair; associated seta *k* absent.

Legs (Figs. 3–5). Integument striated, but arthrodial membranes granulated. Leg length (from base of trochanter to distal end of tarsus, excluding pretarsus): I 290 (290–295), II 248 (246–250), III 215 (202–210) and IV 313 (300–315). Supracoxal seta *el* short, peg-like. Leg I generally similar to that of other species; trochanter robust, devoid of setae; femur incompletely divided (not fully articulated), integument at proximal end of telofemur and distal end of mesofemur internally thickened along circumference of segment. Portion between these two thickenings slightly constricted and surface striation broken, resembling arthrodial membrane but more rigid; mesofemur and basifemur jointed in a different way: broken striae absent and internal thickenings forming *S*-shape in paraxial view (Fig. 3A, *th.pa.*, paraxial thickenings; *th.an.*, antiaxial thickenings); basifemur with one long, flagellate trichobothrium, mesofemur and telofemur each with five setae. Genu relatively short, with one paraxial solenidion and eight setae, ventral setae much thicker and longer. Tibia longest, about twice as long as genu; with two concavities: one dorsal and a shallower one on paraxial side. Dorsal concavity bordered by one spear-like trichobothrium anteriorly and transverse row of 10–11 hook-like solenidia posteriorly, immediately behind which are two hypertrophied setae (Fig. 3). These enlarged setae consisting of two portions: smooth stalk and pilose flagellum; stalk basally cylindrical, but gradually narrowed and curved to attach to back of flagellar base; base of flagellum flattened, laterally provided with long barbs (Fig. 3D). Paraxial concavity anteriorly with

smaller spear-like trichobothrium, posteriorly with three unequal solenidia and one hypertrophied seta. This seta with stalk evenly thickened, straight; base of flagellum flattened, with long barbs laterally; rest of flagellum densely ciliate only on antiaxial side (Fig. 3A). In addition to above setae and solenidia, tibia with one small barbed ventro-proximal seta, 26 filiform solenidia of which distal most three obliquely truncated at tips, and one peg-like seta (Fig. 3A and 4C). Tarsi (Fig 2A, 4A–C) relatively short, directed paraxially; with three spear-like trichobothria: one each on dorsal, paraxial and antiaxial faces, one large brush-like seta on paraxial face (Fig. 4A), one thick barbed seta on proximo-antiaxial face (Fig. 4B), one elongate bracteate famulus, and 26 sensory setae (21 solenidia, and five smooth eupathidia of which one paraxial seta coupled with adjacent solenidion—their alveoli fused, Fig. 4A, arrowed). Two claws with short setules. Legs II–IV generally typical of genus; femora II–IV incompletely divided, exhibiting constrictions where integument thickened internally (femur II with three unequal circumferential thickenings, femur III–IV with two and one circumferential thickenings, respectively), surface uniformly striated. Setation of legs II–IV (solenidia in brackets): trochanter 1–1–1, femora 12–10–8, genua 6(1)–5(1)–5, tibiae 12(2)–10(2)–19(1) and tarsi 40(3)–32(1)–25; solenidia bacilliform, famulus II minute, spine-like, most setae filiform and ciliate, except truncated leaf-like setae and smooth eupathidial setae at tip of tarsus (Figs. 4D, 5). Legs II–IV tridactyl: two unequal claws and sickle-like empodium, similar to other species.

Male.— Similar to female. Body 239–260 long, 150–160 wide, and 170–175 high. Leg lengths: I 245–275, II 210–225, III 200 and

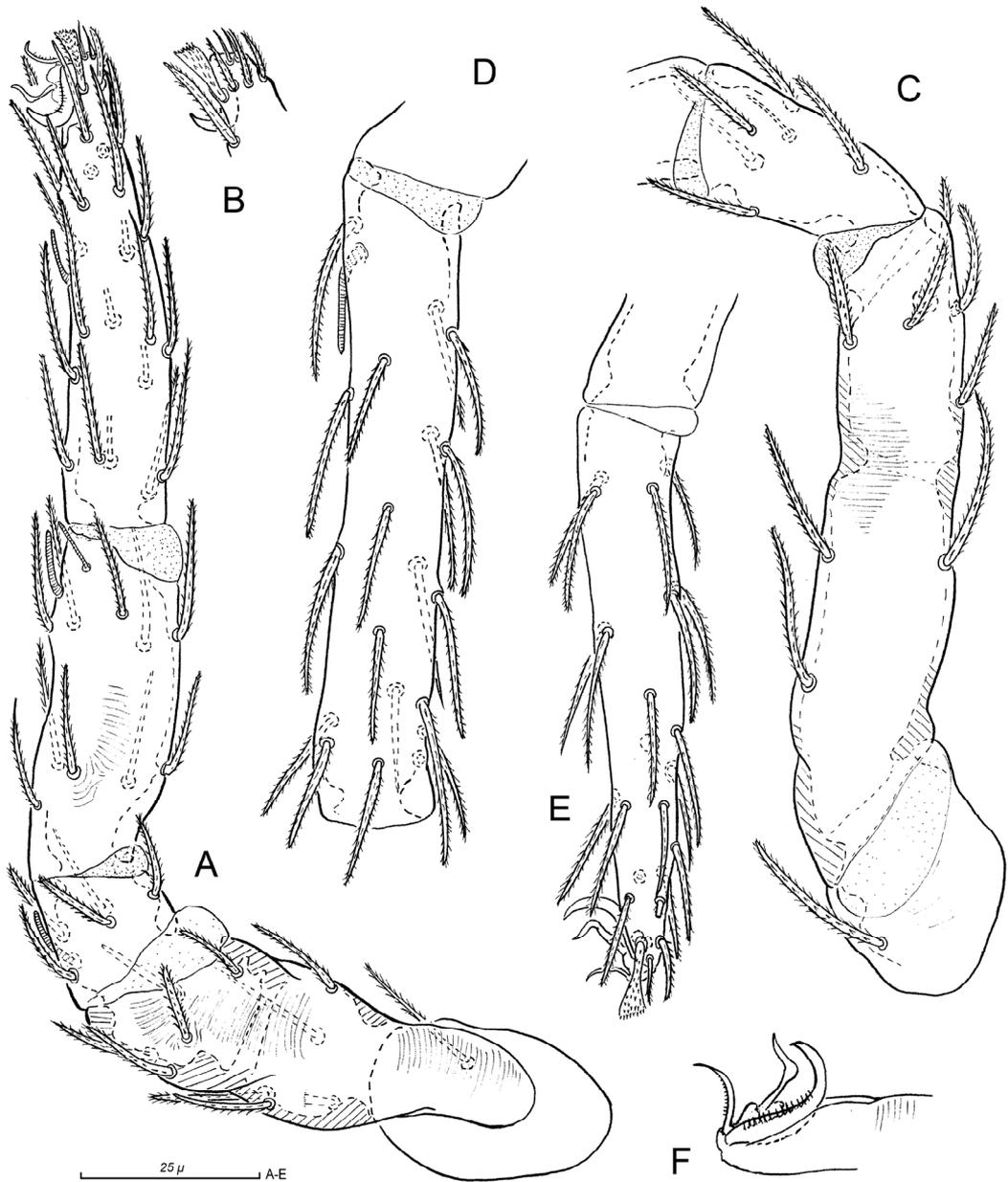


FIGURE 5. *Sphaerolichus lekprayoona* n. sp., female. **A.** Leg III, paraxial view. **B.** Tip of tarsus of leg III, anti-axial view. **C-E.** Leg IV, showing the trochanter-genu, tibia, and tarsus, respectively, all in anti-axial view. **F.** Pretarsus IV, anti-axial view, not in scale.

IV 310–315. Genitalia (Fig. 2C-D) with eight eugenital setae, of which seven barbed setiform and one deeply trifurcate, appearing smooth. Two pairs of genital papillae.

Immatures.— Unknown.

Etymology.— This species is respectfully dedicated to Associate Professor Chariya

Lekprayoon (Chulalongkorn University), an “archarn” (mentor) and colleague of the author.

Material Examined.— Female holotype (CUMZ-AC2012.15): Thailand, Pang-Nga Province, Surin Archipelago National Park, South Surin Is., around Sabparod Bay (9°24'0"N, 97°52'23" E), forest litter, 8-IV-2012, coll. M. Fuangarworn (Field No. MF2012-11). Paratypes: three females and one male (CUMZ-AC2012.16-19) with same data as holotype; five females and four males (CUMZ-AC2010.20-28) with same data as holotype, but 200 m. from Bonyai Bay (9°24'20"N, 97°51'38" E), forest (bamboo) litter and topsoil, and Field No. MF2012-10; one female (CUMZ-AC2012.29), with same data as holotype, but North Surin Is. (9°27'0"N, 97°52'30"E), accumulated bark-litter around tree base, 7-IV-2012, and Field No. MF2012-08; one female (CUMZ-AC2012.30) with previous data but from leaf-litter around tree base (Field No. MF2012-07). Holotype and most paratypes deposited in the Acari collection at Chulalongkorn University Museum of Natural History, Bangkok, Thailand. Two paratypes will be deposited in the Acarology Collection at the Ohio State University, Columbus, USA.

Distribution.— Known only from the Surin Islands, Pang-Nga Province, Southern Thailand.

Remarks.— One problem in the taxonomy of the genus *Sphaerolichus* is that the type species, *S. armipes*, is poorly known, having been only superficially described by Berlese (1904). A redescription of the type material

in the Berlese collection (Florence) or a study of topotypic material from Florence, Italy, is much needed. The descriptions of the other four species (*S. barbarus*, *S. cuspidonasus*, *S. oculus* and *S. narinusus*) are detailed enough to allow comparisons between these species and the new species without studying the type materials. However, the homologies of their leg setae and solenidia are not well established, and require more detailed studies about their ontogenetic developments.

Although the description and figures of *S. armipes* (Berlese 1904, Pl. I, fig. 14) are poor, they are sufficient to differentiate it from *S. lekprayoonae* n. sp., on the basis of the structure of leg I, which has a prolonged solenidion arising on the tubercle at the dorso-distal end of tibia I, and the lack of the hypertrophied setae behind the dorsal concavity of tibia I. These character states are also found in *S. barbarus*, *S. cuspidonasus*, *S. oculus* and *S. narinusus*. In *S. lekprayoonae* n. sp. all solenidia at the distal end of tibia I are subequal in length, there is no tubercle, and the hypertrophied setae are present behind the dorsal concavity of tibia I. The function of these modified setae is unknown, but their structure is similar to that of the subterminal seta, termed *C*, found on tibia I of the endeostigmatic mite genus *Grandjeanicus*, which forms part of an auditory-stridulatory complex (Coineau et al., 1997). Other unique characters of *S. lekprayoonae* n. sp. include the presence of prodorsal apodemes, the solenidial counts on genua I-IV (1-1-1-0), and the long-stalked famulus. Detailed comparisons between species of *Sphaerolichus* are made in Table 1.

TABLE I. Continue.

	<i>S. armipes</i>	<i>S. barbarus</i>	<i>S. cuspidonanusus</i>	<i>S. oculus</i>	<i>S. narinusus</i>	<i>S. tekprayoonaes</i>
Solenidia on apex of tibia I	one solenidion remarkably elongate, arising on large tubercle	one solenidion remarkably elongate, arising on large tubercle	one solenidion remarkably elongate, arising on large tubercle	one solenidion remarkably elongate, arising on large tubercle	one solenidion remarkably elongate, arising on large tubercle	all distal solenidia subequal in length; apical tubercle absent
Number of trichobothria on tarsus I	no information	3	3	2	no information	3
Famulus on tarsus I	no information	bracteate with short stalk	capitate with lateral bract and short stalk	capitate with lateral bract and short stalk	no information	bracteate with long stalk
Solenidial counts on genua I-IV	no information	2-0-0-0	2-1-0-0	0-0-0-0	2-?-?-? ^b	1-1-1-0
Solenidial counts on tibiae II-IV	no information	2-2-1	1-2-1	1-2-2	1-1-1	2-2-1
Solenidial counts on tarsi II-IV	no information	3-1-0	3-1-0	3-1-0	2-?-?-? ^b	3-1-0
Setal counts on trochanter I-IV	no information	0-1-1-1	0-1-1-1	0-1-1-1	0-1-1-1	0-1-1-1
Setal counts on femora I-IV (trichobothria included)	no information	11-11-10-8	11-11-9-7	11-9-9-8	11-11-10-8	11-12-10-8
Setal counts on genua I-IV	no information	9-6-5-5	9-6-5-5	9-6-5-5	9-6-5-5	8-6-5-5
Setal counts on tibiae II-IV	no information	12-11-21	12-10-19	11-10-14	12-10-19	12-10-19
Setal counts on tarsi II-IV (famulus included)	no information	36-34-28	31-29-26	29-28-27	34-28-27	40-32-25

^a Except for *S. cuspidonanusus* whose total length is of male specimens; ^b In the original description, solenidia on genua II-IV and tarsi III-IV were not mentioned.

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