

MITES (ACARI: SCUTACARIDAE) ASSOCIATED WITH THE RED IMPORTED FIRE ANT, *SOLENOPSIS INVICTA* BUREN (HYMENOPTERA: FORMICIDAE), FROM LOUISIANA AND TENNESSEE, U.S.A.

Ernst Ebermann¹ and John C. Moser²

1. Institut für Zoologie, Karl-Franzens-Universität, A-8010 Graz, Universitätsplatz 2, Austria (e-mail: ernst.ebermann@uni-graz.at); 2. Southern Research Station, USDA Forest Service, 2500 Shreveport Highway, Pineville, Louisiana 71360, U.S.A. (e-mail: jmoser@fs.fed.us).

ABSTRACT - Four species of *Scutacarus* and one of *Imparipes* (Acari: Scutacaridae) are documented as phoretic from alates and workers of the red imported fire ant (*Solenopsis invicta* Buren) in Louisiana and Tennessee, U.S.A. One, *Imparipes (Imparipes) louisianae* n. sp., and two *Scutacarus nanus* n. sp. and *Scutacarus tertius* n. sp., are described. The biology and phoretic behaviors of all five species are discussed from those collected from the vicinity of Pineville, Louisiana.

Key Words - Acari, Scutacaridae, *Imparipes*, *Scutacarus*, RIFA, phoresy, U.S.A.

INTRODUCTION

A number of species belonging to the mite genera *Imparipes* and *Scutacarus* (Heterostigmata: Scutacaridae) have been taken from the nests and workers of ants (Hymenoptera: Formicidae) from North and South America, Europe and Asia (Ebermann, 1980, 1981; Khaustov and Chydyrov, 2004; Mahunka, 1977a, 1977b, 1982). Here we report five species of *Imparipes* and *Scutacarus* (three of which described as new species) phoretic on alates and workers of the red imported fire ant (*Solenopsis invicta* Buren) (RIFA). The scutacarid species discussed here are part of a larger study (Moser and Blomquist, 2008, in manuscript), listing the phoretic arthropods taken from flying alates of RIFA, mostly from the vicinity of Pineville Louisiana, USA.

MATERIALS AND METHODS

Twenty-two nests were marked in the junior author's suburban yard in Pineville, Louisiana. Nests were checked daily for a 16-month period, May 16, 2004, through September 25, 2005. Some nests died during the two years, and some moved. Consequently, all 22 nests were not sampled at every particular date. In the Southern United States RIFA alates fly between the hours of 11:30 am and 3:00 pm; daily flights are triggered only after a suitable amount of rain and with acceptable minimum

flight temperatures (Tschinkel, 2006). Although the duration of flight lasted about 2.5 hours, alates from each of the individual nests did not fly at the same time. Alates of some nests would fly early in the period, some in the middle, and some at the end of the flight period. Once alates began to fly from a nest, the period of flight for that nest usually lasted 15-30 minutes.

Not every nest produced alates on dates favorable for flights, and because of this, usually only 8-10 of the viable nests were able to be sampled on those days during which flights took place. Due to the limited time available, and because alates did not necessarily take off from every nest during the ~2.5-hour flight period, no attempt was made to collect all of the alates flying daily from each of the study nests producing flying alates on that particular day. Instead, ~10 minutes were spent collecting a sample of as many alates as possible from each nest, before moving on to survey and collect from each of the other active nests. Several rounds of each nest were made during the flight period to assure that all nests had been sampled. Although not ideal, we believe that, given the amount of time and labor available, this method produced a reasonable sample of the relative number of alates that flew from nests in this particular yard.

Alates were plucked from nest surfaces using forceps as the winged females and males prepared to fly, usually from the tips of grass leaves. Female and male alates were placed into separate 1 ml vials of ethanol at the time of collection. When possible, several alate and

Table. 1 Phoretic scutacarid associates of *Solenopsis invicta*.

Scutacaridae	Number found on ants (by caste)	Number found in lactophenol sediments	Number found in alcohol sediments	Total number found
<i>Imparipes louisianae</i> n. sp.	72 47 on ♀ alates; 25 on ♂ alates	106	373	551
<i>Scutacarus andrassy</i> Mahunka ♀ # 46558,48183 ¹	0	1	1	2
<i>Scutacarus</i> cf. <i>deserticolus</i> Mahunka ♀ # 46295,46922 ²	1 on worker	0	1	2
<i>Scutacarus namus</i> n. sp.	0	7	1	8
<i>Scutacarus tertius</i> n. sp.	4 on workers	6	5	15

¹. Both of these specimens were collected in Moser's yard, but from alates flying from different nests. Morphologically, they appear to be the same species.

². These two specimens were collected from quite different localities (TN and LA). Morphologically, they are the same species, but both differ slightly from typical *S. deserticolus*.

dealate queens that had landed after mating flights were also collected, and placed into ethanol vials. Worker ants protecting the alates were often collected serendipitously with the alates. Female and male alates, workers, and associated mites were cleared in a solution of lactophenol and then examined under a stereoscope. Arthropods collected phoretically on the ants were removed

and mounted onto slides in Berlese's medium. Arthropods remaining in the lactophenol sediments were also mounted on slides, identified, and recorded. Many arthropods dropped off of the ants in the vials; therefore, alcohol sediments were also inspected for arthropods, which were then cleared, mounted, identified, and recorded. Additional nests in Pineville were checked spo-

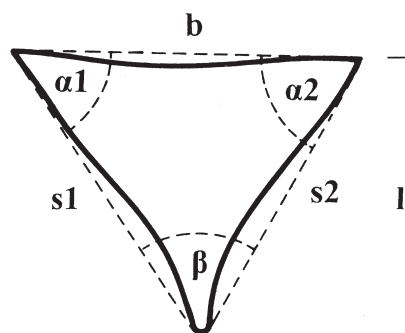


Fig. 1. Measurement of the posterior genital sclerite (pGe) in Scutacaridae - α_1 , α_2 , β = enclosed angles of pGe; b = anterior margin of pGe; s_1 , s_2 = lateral margins of pGe.

radically. In addition, colleagues furnished small amounts of material from Baton Rouge, LA and Pulaski, TN. The scutacarid mites were separated from the other arthropods and sent to the senior author for identification and descriptions.

Abbreviations - Different abbreviations used in the description are as follows: Ag = aggenital plate, Av = average, $\alpha 1$, $\alpha 2$, β = enclosed angles of pge (Fig. 1), aGe = anterior genital sclerite, ap = apodeme, ap po = poststernal apodeme, b = anterior margin of ge, Fe = femur, pGe = posterior genital sclerite (Fig. 1), Ge = genu, l = length of genital sclerite, n = number of measurements, PrTa = pretarsus, pstpl = posterior sternal plate, s1 and s2 = lateral margins of pGe, SD = standard deviation, sol = solenidion, Ta = tarsus, Ti = tibia, TiTa = tibiotarsus, Tr = trochanter, $\approx$ about the same length < = shorter than, > = longer than, $\geq$ = the same length or longer, $\leq$ = the same length or shorter.

Collection depositions - MHNG = Musée d'Histoire Naturelle, Geneva (Switzerland); USNM = National Acarological Collection, US National Museum of Natural History, Smithsonian located at USDA/SEL, Beltsville, MD, 20705, USA; ZMUH = Zoologisches Institut and Zoologisches Museum der Universität Hamburg, Germany.

Voucher slides - All the voucher (and the type) specimens of the species discussed in this paper have been retained in the collections curated by Ebermann, Moser, and other institutions as mentioned in the deposition of type material under each species.

Measurements - Terminology follows Ebermann and Hall (2003). Width: widest part of segment C; width of pstpl: distance between insertion points of setae 3c; posterior genital sclerite pGe (Fig. 1): The length of the anterior (b) and lateral margins (s1, s2) of the genital sclerite and its enclosed angles ($\alpha 1$, $\alpha 2$, β) were measured; the calculated values are given as relative values in the descriptions. All measurements, with average and standard deviation in bracket, are given in micrometers (μm).

RESULTS

Morphological analysis of the phoretic mites collected from the fire ants and the sediments of storage vials revealed a total of 578 individuals of five species belonging to the mite family Scutacaridae (Table 1). Only three specimens were collected in 2004; the remaining 575, *Scutacarus andrassy* Mahunka, 1968 (2 specimens), *Scutacarus* cf. *deserticolus* Mahunka, 1969 (2 specimens), *Imparipes* n. sp., (551 specimens), *Scutacarus* n. sp. (8 specimens) and *Scutacarus* n. sp. (12 specimens), were collected in 2005. The new *Imparipes* and *Scutacarus* species are described here. Because RIFA is an invasive species from Brazil, introduced into the United

States in the early 1900s (Williams *et al.*, 2003), it is possible that one or more of these five species may also be native to Brazil.

Although the three new species described here may be true associates, *S. andrassy* and *S. cf. deserticolus* may be associates only in a general sense, because only two specimens of each were recovered. In addition, it is possible that *S. cf. deserticolus*, at least, may be a species complex, because the two specimens appear slightly different to *S. deserticolus* described from Eurasia (Table. 1).

Parasitoid habits for all five species seem to be ruled out, because their pharyngeal pumps are not conspicuously enlarged; the presence of small pumps may indicate fungivory.

DESCRIPTIONS

Imparipes (Imparipes) louisianae n. sp. (Figs. 2-4)

FEMALE - Body dimensions - Idiosoma length 180-274 (Av = 226, SD = 7.67) (n = 47), holotype 223; width 168-235 (Av = 211, SD = 6.51) (n = 55), holotype 223; width of posterior sternal plate 73-94 (Av = 85, SD = 4.07) (n = 52), holotype 94.

Entire surface of body stippled with fine pores. Free margin of tergite C broad, with fine radiating stripes; c2 with a long alveolar canal; insertion points of c1 and d surrounded by a ring consisting of numerous tiny pores (Figs. 2, 4a); cupulae ia and ih round (Fig. 2).

Body setation - Length of some dorsal setae slightly variable. Not only setae differ between individual specimens but also vary from left to right in same mite.

Dorsum (Fig. 2) - All setae barbed. In holotype tip of right seta c1 broken. Insertion point of c1 with a ring of tiny pores (Fig. 4a). Measurements (n = 15): c1 50-62 (Av = 58, SD = 2.91); c2 43-53 (Av = 49, SD = 2.22); d 53-67 (Av = 62, SD = 2.92); e 38-60 (Av = 49, SD = 4.43); f 60-80 (Av = 73, SD = 4.27); h1 65-84 (Av = 77, SD = 4.72); h2 37-52 (Av = 44, SD = 3.29).

Venter (Fig. 3) - ap1 and ap2 well developed, ap3 weakly sclerotized, ap4 arise near posterior end of ap po, they do not reach half distance between ap po and lateral edge of sternal plate; ap5 strongly reduced.

With exception of 2b and ps2 all setae barbed. Relative length of setae: $1a > 1b < 2a > 2b < 3a \leq 3b > 3c \leq 4a < 4b > 4c$; ps1 > ps2 < ps3; 2b daggerlike, smooth; ps3 tiny, nearly as long as longest barbs of 4a. 4a slightly before 4b, distance $4a-4a > 4a-4b$.

Posterior genital sclerite pGe (Fig. 3) - Slightly sclerotized. Its anterior margin (b) with a very small lip-shaped edge which runs without any transition into



Fig. 2. *Imparipes (Imparipes) louisianae* n. sp. (holotype female) - dorsal view (body length 220 μ m).

anterior margin of segment PS. Measurements of pGe (n = 20): $b > s1$ and $s2$; $l < b$; $\beta > \alpha1$ and $\alpha2$.

Trichobothrium (sc1, not figured) - Club-shaped, thin stemmed, with fine scales, $v1 > v2$.

Legs - Relative length: Leg I < leg II < leg III < leg IV.

Leg I (Fig. 4b) - Setal formula: Tr 1, Fe 3, Ge 4, TiTa 16 (4 sol): Relative length of sol: $\omega2 < \omega1 > \phi2 < \phi1$; $\omega2$ slender, shorter than tubercle, $\omega1$ large, stout, $\phi2$ similar to $\omega2$, $\phi1$ club-shaped. TiTa with well developed claw, tip of claw elongated.

Leg II (Fig. 4c) - Setal formula: Tr 1, Fe 3, Ge 3, Ti 4 (sol ϕ), Ta 6 (sol ω), $\omega > \phi$, ω finger-shaped, free, ϕ partly embedded; Ta with 2 claws and empodium.

Leg III (Figs. 4d-e) - Setal formula: Tr 1, Fe 2, Ge 2, Ti 4 (sol ϕ), Ta 6; Ta with 2 claws and empodium.

Leg IV (Fig. 4f) - Setal formula: Tr 1, Fe 2, Ge 1, Ti 3 (sol ϕ), Ta 6; relative length of tibial/tarsal setae: $dTi > tc' > tc'' > pv'' > pv' > vTi > u' > pl''$; pl'' tiny; length relation between Ta : seta $u' = 1:0.20-1:0.42$ (holotype 0.38), ($Av = 1:0.33$, $SD = 4.70$) (n = 54). Length relation be-

tween Ta: PrTa (without empodium) = $1:1.10-1:1.36$ (holotype 1.24), ($Av = 1:1.23$, $SD = 0.06$) (n = 55). PrTa with two tiny claws and empodium.

MALE AND LARVA - Unknown.

Differential diagnosis - *Imparipes louisianae* n. sp. is well distinguished by following features: 4b located slightly behind 4a, pore accumulations around insertions points of setae c1 and d, strongly reduced apodemata 5, the relative lengths of pretarsus IV and seta u' .

Differentiation from related species - The first-mentioned character (4b) is very rare in *Imparipes* and is known from only a few species from Asia, Europe and South America. Apart from the new species, the only recorded species from the two Americas showing this character are *Imparipes guayaramerinsensis* Mahunka, 1969 from Bolivia and *Imparipes liometopi* Mahunka, 1982 from Mexico. *Imparipes louisianae* resembles *I. guayaramerinsensis* in the setation of dorsum and venter (1a, 1b and 3b are not figured in the description of *I. guayaramerinsensis*), especially in the similar position of 4a and 4b and furthermore in the loss of apodemata 5. The new species also differs from *I. guayaramerinsensis* in some



Fig. 3. *Imparipes (Imparipes) louisianae* n. sp. (holotype female) - ventral view.

characters: The pore accumulations around insertion points of c1 and d as well as the long alveolar canal of c2 do not exist in *I. guayaramerensis* (the absence of the last mentioned characteristic may also be caused by a deficient description). The length ratio between $\omega 1$ and $\phi 2$ (TiTa I) is quite different between the compared species, $\omega 1$ and $\phi 2$ are distinctly longer in *I. louisianae* than in *I. guayaramerensis*. In *I. louisianae* the length relation between Ta : PrTa IV = Ta < PrTa, in *I. guayaramerensis* = Ta > PrTa. In *I. louisianae* pv" > pv', in *I. guayaramerensis* pv" < pv'. In *I. louisianae* the length relation between Ta : seta u' = 1:0.33 (average), in *I. guayaramerensis* u' is distinctly longer than Ta. *Imparipes louisianae* resembles *I. liometopi* in the setation of dorsum and the similar position of 4a-4b. It differs from *I. liometopi* in the following characters: the pore accumulations around sockets of c1 and d of *I. louisianae* do not exist in *I. liometopi*. In *I. louisianae* 1b > 2b, in *I. liometopi* 1b < 2b. In *I. louisianae* 3a not thick-

ened as in *I. liometopi*. In *I. louisianae* ap 5 reduced, in *I. liometopi* well developed. In *I. louisianae* the length relation between Ta : PrTa IV = Ta < PrTa, u' extend to PrTa, in *I. liometopi* = Ta > PrTa, u' strongly reduced. pl"Ta (IV) in *I. liometopi* not present.

Note - *Imparipes guayaramerensis* was described from a single specimen from a soil sample collected in a virgin forest (Mahunka, 1969). *Imparipes liometopi* was found phoretic on the ant *Liometopum apiculatum* (Mayr); it was described as "*Imparipes mexicanus*" (Mahunka, 1982) and later renamed as "*I. liometopi*" (Mahunka and Rack, 1984).

Etymology - The species name "*louisianae*" refers to the State of Louisiana (USA) where the new species was collected.

Type locality - Pineville, Louisiana, USA.

Material - Of the phoretic females described here, 73 were collected as the female ant alates were about to fly. Of these, 8 individual mites were recovered from

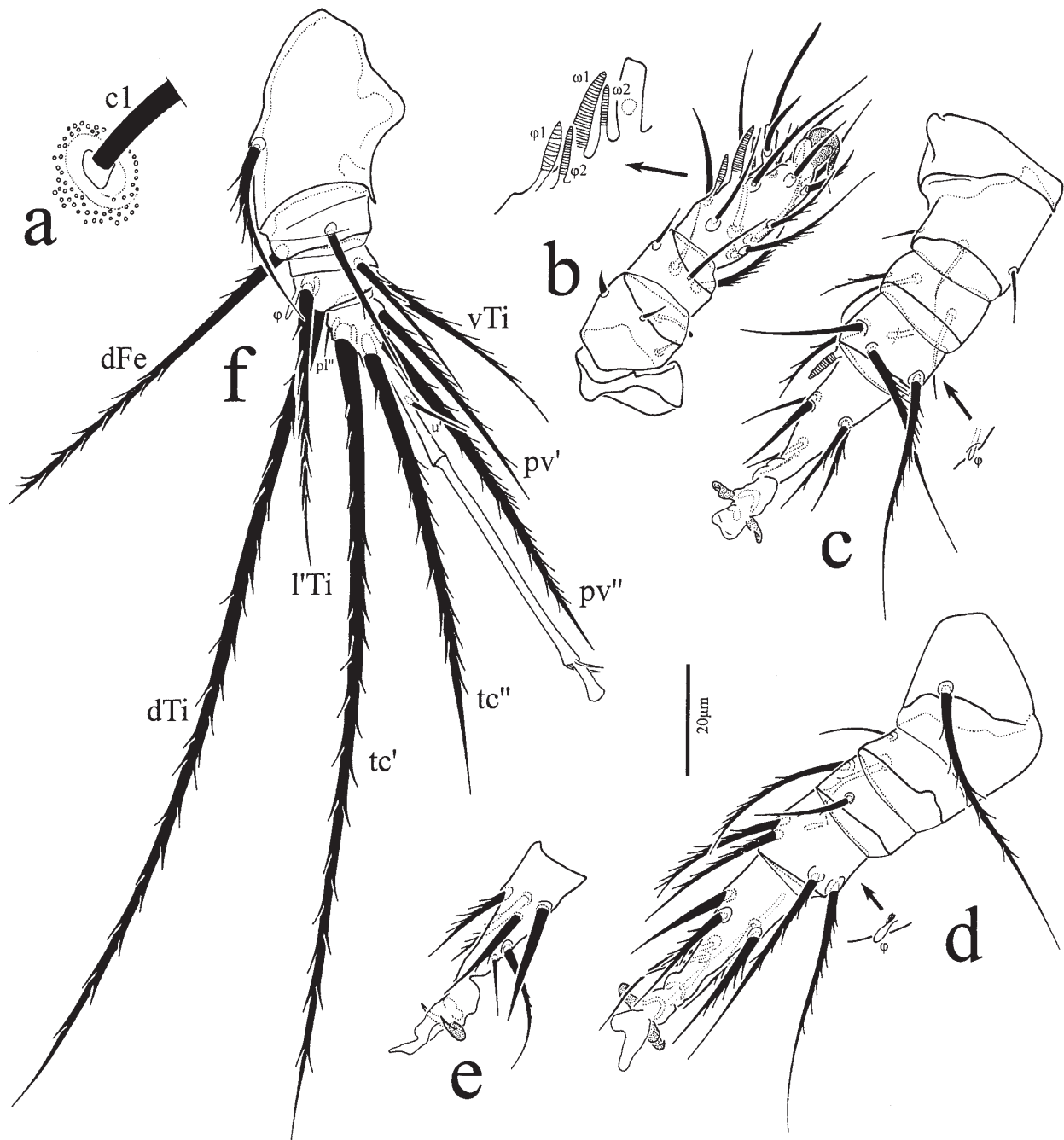


Fig. 4. *Imparipes (Imparipes) louisianae* n. sp. (holotype female) - a. insertions point of c1, surrounded by a ring of numerous tiny pores, b. leg. I, arrow: solenidia in higher magnification, c. leg II, d. leg III, e. leg III, Ta in lateral view, f. leg IV.

RIFA abdomens, 54 from alcohol sediments, and 11 from lactophenol sediments.

Collection data - Holotype (no. 47.653), Moser yard, nest #11, from alcohol sediments of female alates, May 15, 2005, coll. J. Moser; 71 paratypes (nests #1, 7, 8, 9, 11, 13, 18, 20), May 2, 2005-June 9, 2005, coll. J.

Moser; 1 paratype, Blomquist yard, nest #5, February 2, 2005, coll. S. R. Blomquist.

Deposition of type material - Holotype and 50 paratypes in USNM, 10 paratypes in ZMUH, 10 paratypes in MHNG, 2 paratypes and further alcohol preserved mites in J. Moser's collection.

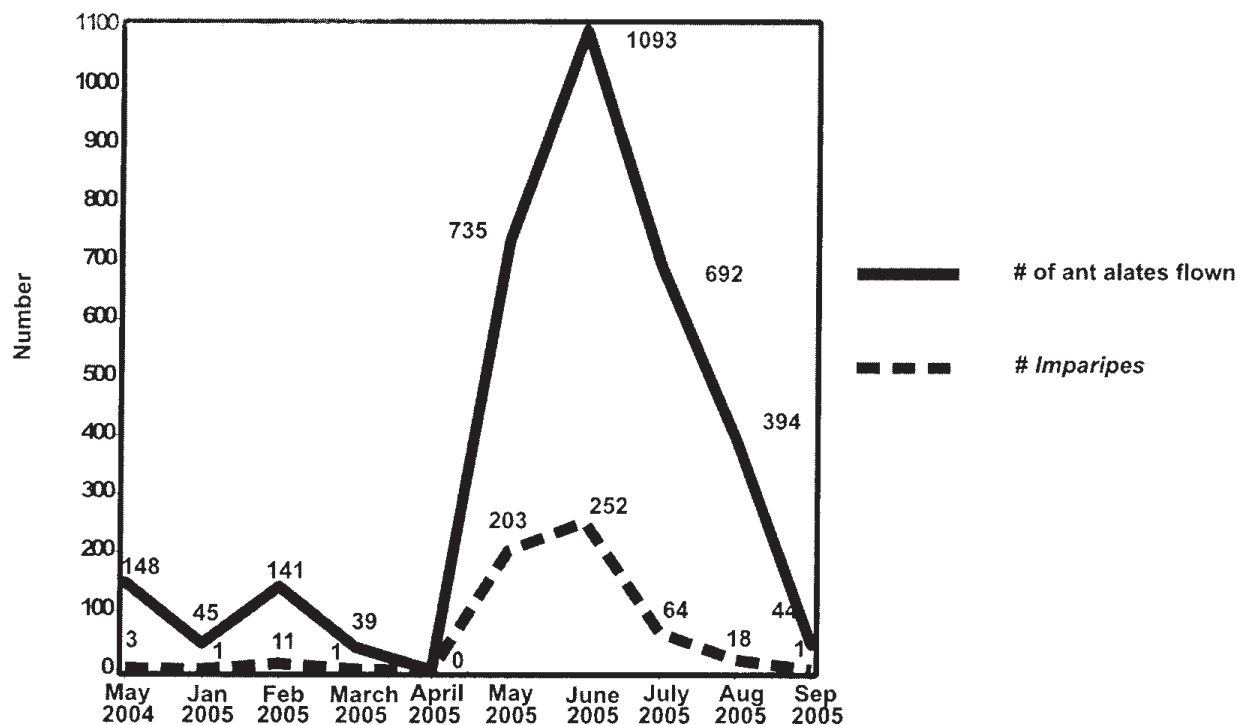


Fig. 5. Emergence numbers and dates for RIFA alates and their phoretic *Imparipes louisianae*.

Ecology - Phoretic females of the 551 *I. louisianae* individuals were present in RIFA nests every month except October through December in 2004 and 2005 (Fig. 5). This mite was taken from alates of 16 of the 22 nests examined; although 52% of the mites were collected from just two of the 16 nests. Individual mites were only weakly attached to their alate hosts; 87 percent were detached and found in the alcohol or lactophenol sediments (Table 1). The thirteen percent that remained on alates were almost twice as common on females as on males (Table 1). Five mites also occurred on workers (Table 1).

Air temperatures in Moser's yard during flight of the ant alates ranged from 22.2-35.6°C, and there was at least one flight of alates from the yard every month of the year. The greatest numbers of phoretic *I. louisianae* were taken in early summer, paralleling numbers of their RIFA alate hosts (Fig. 5). However, numbers of both alates and the mite sharply decreased by the hot mid summer months (Fig. 5). This population decline of *I. louisianae* may also be linked to factors causing the simultaneous decline of RIFA alates by late July or early August (Tschinkel, 2006). These changes may be due to soil surface temperatures exceeding 35°C in summer (see Fig. 14.3 in Tschinkel, 2006). In addition, RIFA colonies become smallest in midsummer, due to RIFA colonies seasonally changing from reproductive to ergonomic phases of reproduction (Tschinkel, 2006).

A few phoretic females of *I. louisianae* were notably taken in January and February, the two coldest months of the year (Fig. 5), indicating that individuals of this mite, like those of RIFA, may be quite active in nests during the cold months. Indeed, mature RIFA colonies are largest in midwinter (Tschinkel, 2006). To escape the cold winter temperatures in Central Louisiana, ant colonies may retreat to depths of 40 to 60 cm (Sanford Porter, pers. comm.).

Although the biology of *I. louisianae* inside the nests is unknown, other species of *Imparipes* and *Scutacarus* taken from ants, bees and wasps are known to feed on fungi (Ebermann 1981, 1991, 1998; Ebermann and Hall, 2003). This suggests that the presence of *I. louisianae* and its associated fungus or fungi may play an important nutritional role for RIFA individuals, similar to that of other insects (Klepzig *et al.*, 2001).

Scutacarus nanus n. sp. (Figs. 6-9)

FEMALE - Body dimensions - Idiosoma length 140-152 (Av = 147) (n = 4), holotype 150; width 123-128 (Av = 125) (n = 5), Holotype 126; width of pstpl 50-54 (Av = 53), holotype = 54.

Entire surface of body stippled with fine pores; edge of tergite C with radial stripes. Cupulae ia and ih relatively large, round.

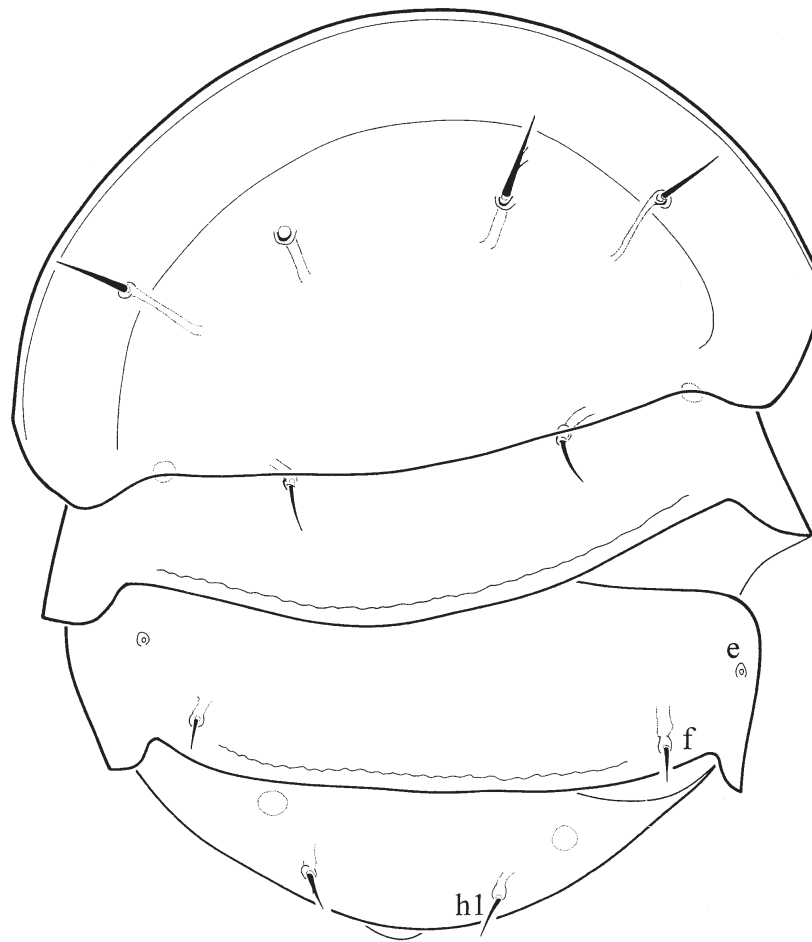


Fig. 6. *Scutacarus nanus* n. sp. (holotype female) - dorsal view (body length 150 μ m).

Dorsum (Fig. 6) - Free margin of tergite C with fine radiating stripes; all setae with highly visible alveolar canals. Setae e and h2 reduced; d, f, h1 very short; c1, c2 smooth or with only a few barbs, d, f, h1 smooth. Measurements: c1 7-13 ($Av = 11$, $SD = 3.54$) ($n = 6$); c2 10-13 ($Av = 12$, $SD = 1.45$) ($n = 8$); d 6-7 ($Av = 7$, $SD = 0.91$) ($n = 8$); f 4-6 ($Av = 5$, $SD = 1.30$) ($n = 8$); h1 6-7 ($Av = 7$, $SD = 0.53$) ($n = 8$).

Venter (Fig. 7) - ap1 well developed, ap2 weakly sclerotized, ap3 reduced, ap4 does not reach half distance to outer margin of pStpl, ap5 well developed, ap po does not reach ap 5.

Ventral setae vary moderately in length. $1a > 1b < 2a > 2b \leq 3a < 3b \approx 3c > 4a < 4b > 4c$, 4a tiny as ps3, insertion points of 4b on outer edge of ap5, standing somewhat behind 4a, 4b do not extend to posterior margin of Ag; ps1 = ps2 > ps3, ps3 tiny; 2b daggerlike, smooth; 1a, 1b, 2a, 3a, 3b, 3c, 4b, 4c smooth or sparsely barbed, 4a and ps3 smooth, ps1 and ps2 densely barbed.

Anterior genital sclerite aGe (Fig. 7) - As in *S. tertius* (Fig. 12), tongue-shaped, arising from a sclero-

tized, oval ring-shaped formation, ring laterally with tape-like elongation.

Posterior genital sclerite pGe (Fig. 8a) - Large, tongue-shaped.

Trichobothrium (sc1, not figured) - Club-shaped, thin stemmed, with fine scales, v1 and v2 hardly visible.

Legs - Leg I (Fig. 9a) - Setal formula: Tr 1(?), Fe 3 (?), only 2 setae visible), Ge 4, TiTa 15 (4 sol); TiTa stout, well developed claw with sharp tip; length of sol $\omega 2 < \omega 1 > \phi 2 < \phi 1$, $\omega 1 > \phi 1 > \omega 2 > \phi 2$; $\omega 1$ finger-shaped, $\omega 2$, $\phi 2$ and $\phi 1$ thin stemmed, club-shaped.

Leg II (Fig. 9b) - Setal formula: Tr 1, Fe 3, Ge 3, Ti 4 (sol ϕ), Ta 6 (sol ω), $\omega > \phi$, ω club-shaped, free, ϕ partly embedded; pl"Ta thickened, spine-shaped, Ta with 2 claws and empodium.

Leg III (Fig. 9c) - Setal formula: Tr 1, Fe 2, Ge 2, Ti 4 (sol ϕ), Ta 6, ϕ club-shaped, half long as Ti, pl"Ta thickened, spine-shaped, Ta with two claws and empodium.

Leg IV (Fig. 9d) - Setal formula: Tr 1, Fe 2, Ge 1, TiTa 6; dFe shorter than length of TiTa, its tip does not



Fig. 7. *Scutacarus nanus* n. sp. (holotype female) - ventral view.

reach half the length of TiTa, TiTa setae $tc' > pv'' > pv'$, tc'' reduced, $v' > l'$.

MALE AND LARVA - Unknown.

Differential diagnosis - *Scutacarus nanus* n. sp. is distinguished by following features: small body size, un-

usually short setae d, f, h1, absence of setae e and h2, broad, tongue-shaped posterior genital sclerite.

Differentiation from related species - Due to some characters as the absence of setae e and h2, the setation of venter and leg IV, the new species is related to the

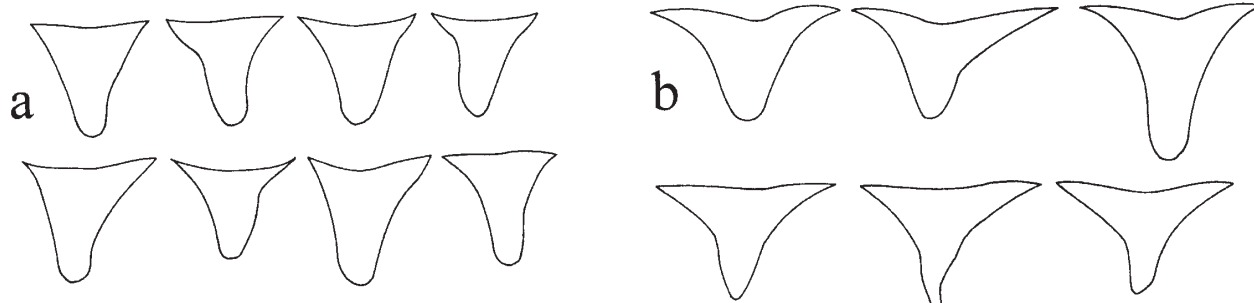


Fig. 8. Posterior genital sclerite (pGe) and its variability - a. *Scutacarus nanus* n. sp. (female), b. *Scutacarus tertius* n. sp. (female).

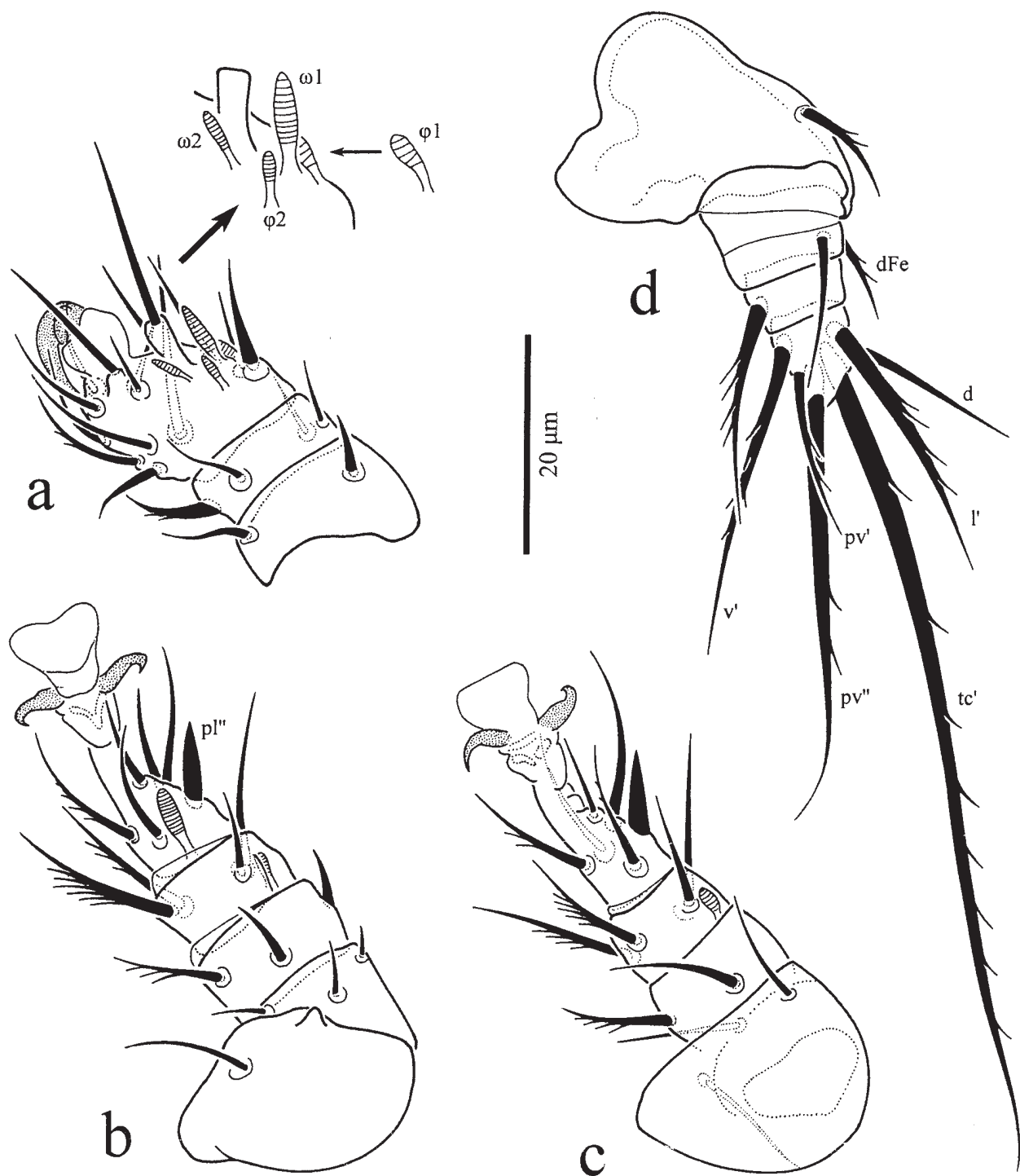


Fig. 9. *Scutacarus nanus* n. sp. (holotype female) - a. leg I, arrow: solenidia in higher magnification, b. leg II, c. leg III, d. leg IV.

“*tackei*-species group”. Three scutacarid species belonging to the *tackei*-group are known from the two Americas: *Scutacarus terrenus* Delfinado and Baker, 1976 (USA),

Scutacarus perditus Mahunka, 1968 (Paraguay) and *Scutacarus deficiens* Mahunka, 1963 (Argentina). *Scutacarus nanus* n. sp. differs from *S. terrenus* mainly in the

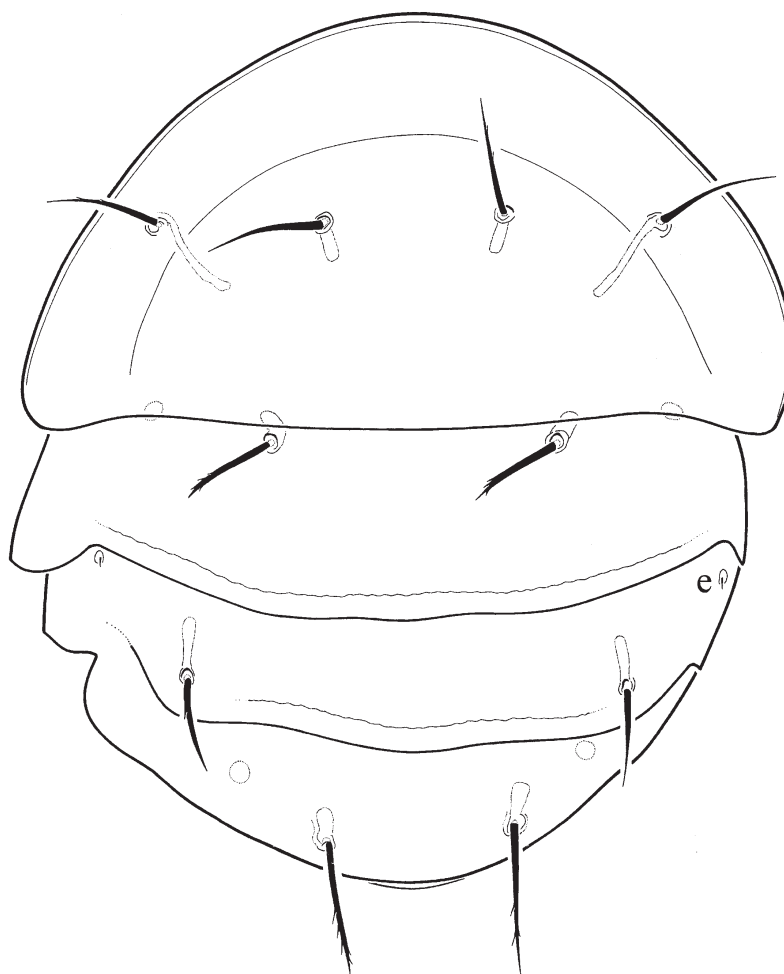


Fig. 10. *Scutacarus tertius* n. sp. (holotype female) - dorsal view (body length 156 μ m).

dorsal setation, in the position of 4a-4b and in the setation of TiTaIV. In *nanus* setae d, f and h1 shorter than in *terrenus*. In *nanus* setae e reduced, in *terrenus* present as tiny hairs. In *nanus* 4a somewhat in front of 4b, in *terrenus* 4a slightly behind 4b. In *nanus* ps1 > ps2, in *terrenus* and *perditus* ps1 > ps2. In *nanus* 6 TiTa setae (IV), of these tc' > tc'' > pv'', in *terrenus* 7 TiTa setae (IV), of these tc' > pv'' > tc''. In *nanus* dorsal setae d, f and h1 considerably shorter than in *S. perditus* and *S. deficiens*. In *nanus* ventral setation similar to *perditus*, but in *nanus* 4b shorter, they do not extend to posterior margin of Ag. In *perditus* 4b extend to insertion points of ps-setae. Setation of leg IV of *nanus* similar to *perditus* and *deficiens*, but in *nanus* tc' and dFe shorter.

Etymology - The species Latin name “*nanus*” refers to the unusually small body size of the new species.

Type locality - Pineville, Louisiana, USA.

Material - 8 phoretic female mites from preflights of the ant species *Solenopsis invicta*, collected from lacto-

phenol sediment of preserved ant specimens, Pineville, LA.

Collection data - Holotype (no. 48.417) and 1 paratype (no. 48.422), Blomquist yard, nest #A, alate ♀♀, preflight, 1405 hrs, June 18, 2005, coll. S. R. Blomquist; 2 paratypes, no. 48.347, Moser yard, nest # 13, alate ♂♂, preflight, 1200 hrs, June 18, 2005, coll. J. Moser; no. 48.196, Moser yard, nest # 18, alate ♀♀, preflight, 1415 hrs, June 17, 2005, coll. J. Moser; 4 paratypes, no. 48.375, 48.376, 48.377, 48.378, Moser yard, nest # 9, alate ♀♀, preflight, 1230 hrs, July 3, 2005, coll. J. Moser.

Deposition of type material - Holotype and 3 paratypes in USNM, 2 paratypes in ZMUH, 1 paratype in MHNG, 1 paratype in J. Moser's collection.

Ecology - Phoretic females of eight *S. nanus* were collected from 3 of the 22 nests in 2005, four each in June and July. Seven specimens were phoretic on female alates, and one from a male alate. All were retrieved from the alcohol or lactophenol sediments. This species is be-



Fig. 11. *Scutacarus tertius* n. sp. (holotype female) - ventral view.

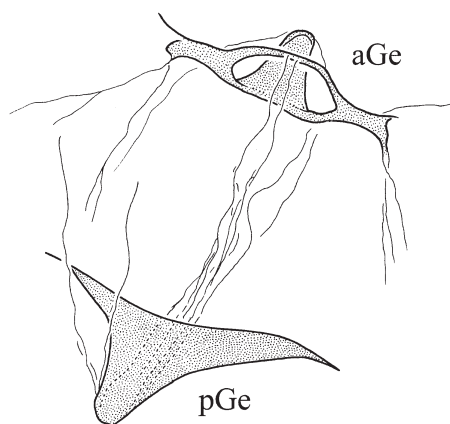


Fig. 12. *Scutacarus tertius* n. sp. (paratype female) - anterior and posterior genital sclerites.

lieved to be fungivorous for the same reasons as those given for *I. louisianae*.

***Scutacarus tertius* n. sp.**
(Figs. 10-13)

FEMALE - Body dimensions - Idiosoma length 161-180 ($x = 173$) ($n = 5$), holotype 161; width 144-185 ($x = 158$) ($n = 6$), holotype 144; width of pstpl 49-60 ($x = 58$), holotype = 60.

Entire surface of body stippled with tiny pores; edge of tergite C with radial stripes. Cupulae ia and ih relatively large, roundish.

Dorsum (Fig. 10) - Free margin of tergite C with fine radiating stripes; alveolar canal of c2 long, slender, alveolar canal of other setae more or less short, broadened, drop shaped. Setae e visible in highest magnification as tiny structure, h2 reduced; dorsal setae smooth or sparsely barbed. Measurements: c1 19-25 ($Av = 23$, $SD = 3.22$) ($n = 13$); c2 18-25 ($Av = 20$, $SD = 3.47$) ($n = 13$); d 17-25 ($Av = 22$, $SD = 4.02$) ($n = 15$); f 13-19 ($Av = 16$, $SD = 3.19$) ($n = 15$); h1 25-31 ($Av = 28$, $SD = 3.60$) ($n = 15$).

Venter (Fig. 11) - ap1 well developed, ap2 weakly sclerotized, ap3 reduced, ap4 does not reach the half distance to the outer margin of pStpl, ap5 weakly sclerotized, ap po extends to ap 5. Relative length of ventral setae: $1a > 1b < 2a > 2b < 3a < 3b < 3c > 4a < 4b > 4c$, insertion points of 4b on outer edge of ap5, transversely aligned with or slightly before 4a, 4b extend to posterior margin of Ag; ps1 = ps2 < ps3, ps3 tiny; 2b daggerlike, smooth; 1a, 1b, 2a, 3a, 3b, 3c, 4b, 4c sparsely barbed, 4a and ps3 smooth, ps1 and ps2 densely barbed.

Anterior genital sclerite (Figs. 11, 12) - As in *S. nanus*.

Posterior genital sclerite (Figs. 8b, 12) - Large, slender, its anterior section laterally acuminate.

Trichobothrium (sc1, not figured) - As in *S. nanus*.

Legs - Leg I (Fig. 13a) - Setal formula: Tr 1 (?), Fe 2, Ge 4, TiTa 15 (4 sol); TiTa stout, well developed claw with sharp tip; length of sol $\omega 2 \approx \omega 1 > \phi 2 < \phi 1$, $\omega 2 \approx \omega 1 > \phi 1 > \phi 2$; $\omega 2$ slender, $\omega 1$ finger-shaped, $\phi 2$ small, $\phi 1$ thin stemmed, club-shaped.

Leg II (Fig. 13b) - Setal formula: Tr 1, Fe 3, Ge 3, Ti 4 (sol ϕ), Ta 6 (sol ω), $\omega > \phi$, ω club-shaped, free, ϕ partly embedded; pl"Ta thickened, spine-shaped, Ta with 2 claws and empodium.

Leg III (Fig. 13c) - Setal formula: Tr 1, Fe 2, Ge 2, Ti 4 (sol ϕ), Ta 6, ϕ club-shaped, partly embedded, pl"Ta thickened, spine-shaped, Ta with two claws and empodium.

Leg IV (Fig. 13d) - Setal formula: Tr 1, Fe 2, Ge 1, TiTa 6; dFe longer than length of TiTa, its tip reaches half the length of TiTa, TiTa setae $tc' > pv'' > pv'$, tc'' reduced, $tc' = v'$.

MALE AND LARVA - Unknown.

Differential diagnosis - *Scutacarus tertius* n. sp. is distinguishable by the combination of following features: strongly reduced setae e, setae h2 absent, the formation of alveolar canals of dorsal setae, the position of 4a-4b, the posterior genital sclerite, the setation of leg IV.

Differentiation from related species - Due to the reduced setae e, the complete absence of h2 and the setation of venter and leg IV, the new species belongs to the "tackei-species group". It shares some similarities with *Scutacarus nanus* n. sp., *Scutacarus deficiens* Mahunka, 1963 (Argentina) and *Scutacarus perditus* Mahunka, 1968 (Paraguay). Differentiation from *S. nanus*: Body size in *tertius* 161-180, in *nanus* 140-152. Absolute and relative length of most body setae and shape of pGe differ between the species. Differentiation from *S. deficiens*: In *tertius* $d \approx f < h1$, in *deficiens* $d < f < h1$. In *tertius* 2a arise in distinct distance behind 1b, $1b < 2a$, in *deficiens* 2a arise laterally, slightly behind the insertion of 1b, i.e. setae 1a, 1b and 2a stand in one line, $1b \approx 2a$. In *tertius* $3b < 3c$, in *deficiens* $3b > 3c$. In *tertius* tip of dFe reach to half the length of Tita IV, in *deficiens* dFe extend beyond the distal end of TiTa IV. Differentiation from *Scutacarus perditus*: In *tertius* $d \approx f < h1$, in *perditus* $d > f \approx h1$, in *tertius* $3c \approx 4c$, 4b extend to posterior margin of Ag; in *perditus* $3c < 4c$, 4c thicker than 3c, 4b extend to posterior end of idiosoma, in *tertius* $ps1 = ps2$, in *perditus* $ps1 > ps2$. Differentiation from *S. terrenus*: *tertius* mainly differs from *terrenus* in the length relationships and position of dorsal and ventral setae as well as in the number of tibiotarsal-setae IV (*tertius* 6, *terrenus* 7).

Etymology - This is the third (Lat. "tertius") new scutacarid species that has been found as an associate of the ant *Solenopsis invicta*.

Type locality - Pineville, Louisiana, USA.

Material - 15 phoretic female mites from alcohol and lactophenol sediment of preserved specimens of the ant species *Solenopsis invicta*.

Collection data - Pineville, AFC, Holotype (no. 46.275), lactophenol sediments, dealate queens, postflight, 1450 hrs, June 1, 2004, coll. S. R. Blomquist; 1 paratype (no. 46.295), alcohol sediments, dealate queens, postflight, 1450 hrs, June 1, 2004, coll. S. R. Blomquist; Pineville, 2 paratypes (no. 47.463, 47.476), Blomquist yard, nest #5, alcohol sediments of alate ♀♀, preflight, 1355 hrs, February 22, 2005, coll. S. R. Blomquist; 3 paratypes (no. 48.419, 48.420, 48.421), Blomquist yard, nest #A, lactophenol sediments, alate ♀♀, preflight, 1405 hrs, June 18, 2005, coll. S. R. Blomquist; 2 paratypes (no. 48.414, 48.415), Blomquist yard, nest #A, alcohol sediments, alate ♂♂, preflight, 1405 hrs, June 18, 2005, coll. S. R. Blomquist; 1 paratype (no. 48.423), Moser yard, nest #13, lactophenol sediments, alate ♀, preflight, 1430 hrs, July 2, 2005, coll. J. Moser; Tomerlin Pasture, Pulaski, Giles Co., TN, 4 paratypes (no. 46.921, 46.924, 47.072, 47.073), phoretic on workers trapped in nests from non-treated plots, September 24, 2004, coll. Tahir

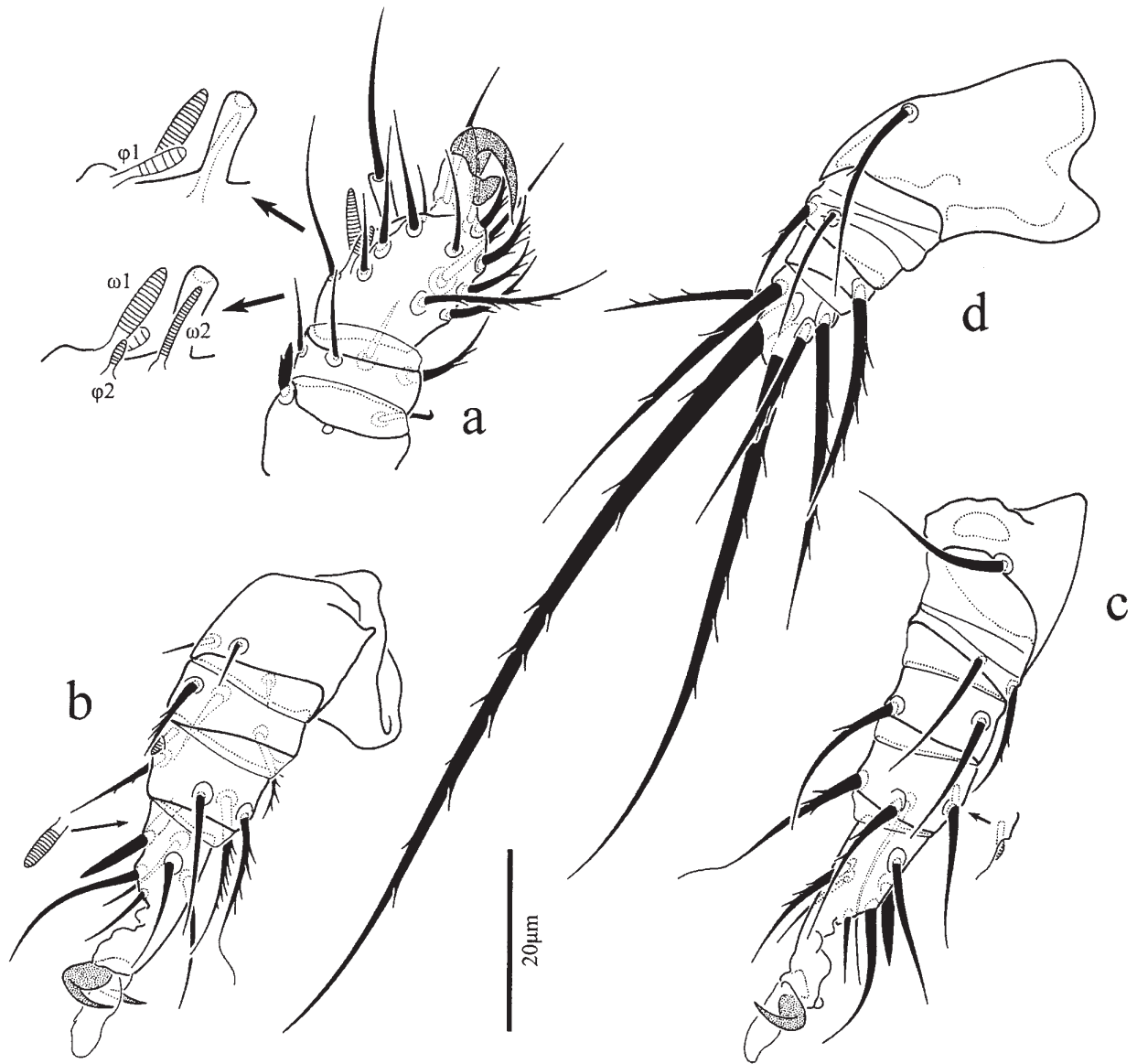


Fig. 13. *Scutacarus tertius* n. sp. (holotype female) - a. leg I, arrow: solenidia in higher magnification, b. leg II, c. leg III, d. leg IV.

Rashid; Baton Rouge, LA, 1 paratype (no. 48.402), lactophenol sediments, 7 ♂♂ and 8 ♀♀, July 2005, coll. Shawn Dash.

Deposition of type material - Holotype and 11 paratypes in USNM, 1 paratype in ZMUH, 1 paratype in MHNG, 1 paratype in J. Moser's collection.

Ecology - Fifteen females of *S. tertius* were taken during 2004 and 2005. All were retrieved from the alcohol or lactophenol sediments. Of the 10 taken in Pineville, Louisiana, six were phoretic on female alates preparing to fly, two from delate females that had landed on a

cement driveway surface, two from preflight male alates, and one from a worker collected serendipitously with alates preparing to fly. The eight alates preparing to fly emerged from four different nests. This species is believed to be fungivorous for the same reasons as those given for *I. louisianae*. Of the 10 females from Pineville Louisiana, two were taken in February, six in June, one in July, and one in August; those from Tennessee were collected in September. The two specimens taken in February suggest that this mite may also be active in nests during the entire year.

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