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Javanese Species of the Mite Genus *Macrocheles* (Arachnida: Acari: Gamasina: Macrochelidae)

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ABSTRACT—Twelve mite species of the genus *Macrocheles* (Acari: Macrochelidae) were collected from the body surface of dung beetles in Java, Indonesia. Of these, three species, i.e., *Macrocheles jabarensis*, *M. jongsolensis*, and *M. sukabumiensis*, were described as new to science. Female of *M. dispar* was redescribed. Two species, i.e., *M. baliensis* and *M. sukaramiensis*, were recorded from Java for the first time. The occurrence of five species previously recorded from Java, i.e., *M. hallidayi*, *M. kraepelini*, *M. limue*, *M. oigru*, and *M. merdarius*, were reconfirmed. Taxonomic status of *M. sp. aff. glaber* was not settled in the present study, because we could not obtain the male and immatures which are indispensable for exact identification. In total 15 species of the genus *Macrocheles*, including 3 species already recorded but not collected in this research (*M. crista*, *M. krantzi*, and *M. subbadius*), are known from Java up to date.

Key words: *Macrocheles*, Macrochelidae, mites, Java, Indonesia

INTRODUCTION

More than 20 mite species of the family Macrochelidae have been recorded and described from Indonesia: 10 species from Sumatra, 12 species from Java, and 11 species from Bali (Oudemans, 1903; Berlese, 1905, 1910, 1911, 1921; Vitzthum, 1925, 1926; Krantz, 1965, 1967a, b; Walter and Krantz, 1986a, b; Takaku, 1998, 2001; Takaku and Hartini, 2001). *Macrocheles* is a genus of the family Macrochelidae, and nine species of the genus were recorded and described from Java: *M. crista* (Berlese, 1910), *M. dispar* (Berlese, 1910), *M. hallidayi* Walter and Krantz, 1986, *M. kraepelini* (Berlese, 1905), *M. krantzi* Evans and Hyatt, 1963, *M. limue* Samšiňák, 1962, *M. merdarius* (Berlese, 1889), *M. oigru* Walter and Krantz, 1986 and *M. subbadius* (Berlese, 1904).

As the result of our investigation of macrochelid mites in Java in 2002, we found twelve species of the genus *Macrocheles* associated with dung beetles. Three of these species are described here as new to science, and two species are new records from Java.

All the mite specimens were collected from the ventral surface of scarabaeid dung beetles and were fixed in 70% ethyl alcohol. A part of the specimens were dissected under a stereoscopic microscope after clearing in lactic acid. Each

body part was mounted on a slide in Hoyer's medium or PVA (polyvinyl alcohol-lactic acid mixture) medium. Observations and photographs were made with compound, phase contrast, and differential interference contrast microscope. Illustrations were prepared with the aid of a drawing tube.

All measurements are given in micrometres (µm). Measurements in each description are provided as averages and range in parentheses, if more than two specimens were measured. Dorsal chaetotaxy follows Halliday (1987). Other terminology, especially the description of sternal ornamentation, follows Walter and Krantz (1986b). The holotypes will be deposited in the collection of the Museum Zoologicum Bogoriense, Bogor, Indonesia (MZB), and remaining specimens will be deposited in the MZB and the Zoological Collections of the Graduate School of Science, Hokkaido University, Sapporo, Japan (ZIHU).

DESCRIPTIONS

Family **Macrochelidae** Vitzthum, 1930

Genus ***Macrocheles*** Latreille, 1829

Macrocheles baliensis Takaku and Hartini, 2001

Macrocheles baliensis Takaku and Hartini, 2001: 327–329, figs. 1–6.

Material examined. Thirty three females, alt. 530 m, Kendalsari, Luwuk Waru, Malang, East Java, 26–28 August 2000, S. Hartini leg., ex *Onitis* sp.; 3 females, alt. 600 m, Cimenyan, Sukadamai, Jonggol, Bogor, West Java, 14

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November 2001, G. Takaku and S. Hartini leg., *ex Onthophagus* sp.

Habitat. Aphodiini sp., *Onitis* sp., *Onthophagus* sp. (Scarabaeidae)

Distributions. Indonesia [Java (new record), Bali].

Macrocheles crista (Berlese, 1910)

Holocaelaeno crista Berlese, 1910: 249.

Macrocheles crista: Krantz, 1967a: 35–37, fig. 50.

The present species was originally described in the genus *Holocaelaeno* (Macrochelidae) by Berlese (1910). Krantz (1967a) transferred this species to the genus *Macrocheles* on the basis of specimens in the Berlese collection, Florence.

Material examined. Although this species was not collected in our investigation, Berlese (1910) recorded this species from Java.

Habitat. *Copris affinis* (Scarabaeidae).

Distribution. Indonesia (Java).

Macrocheles dispar (Berlese, 1910)

(Figs. 1–6)

Holostaspis dispar Berlese, 1910: 251.

Macrocheles (Coprholaspis) dispar: Berlese, 1918: 151; Vitzthum, 1925: 13–16.

Macrocheles dispar: Walter and Krantz, 1992: 244, fig. 1D.

The present species was described by Berlese (1910). Walter and Krantz (1992) provided a photograph of the sternal shield and diagnosis of the species. However, the female dorsal setae show some variation, and males and immatures have not been described. Here we redescribe the adult female of this species on the basis of the materials collected in Java.

Female. Length of dorsal shield 698 (580–895), width at level of coxae II 401 (355–475) (n=20). Living specimens yellowish brown.

Dorsum (Fig. 1). Dorsal shield oval, attenuated posteriorly; surface with reticulation and punctations; lateral margin of the shield smooth; shield with 28 pairs of dorsal setae and 22 pairs of pores; j1 plumose distally; j4, z2, z4, r2-4, S5, J5, and Z5 pilose distally; j2, j3 and s2 simple in most specimens, but in some cases pilose distally; other setae simple.

Venter (Fig. 2). Length of sternal shield 141 (122.5–182.5), width at level of coxae II 135 (125–155) (n=20); sternal shield ornamented with lines and punctations; linea angulata (l.ang.), linea media transversa (l.m.t.), and linea oblique posteriores (l.o.p.) with distinct punctations; l.o.p. not connected with l.m.t.; l.m.t. complete; center of posterior half of the shield with small punctations; shield with 3 pairs of simple setae and 2 pairs of pores; all setae long, but not surpassing insertions of setae behind them. Metasternal shield small and free; each shield with 1 simple seta and an anterior pore.

Length of epigynial shield 132 (107.5–157.5), width 154

(107.5–192.5); surface ornamented with lines and punctations medially; shield with pair of simple setae on lateral side.

Ventrianal shield pentagonal and ornamented with semiconcentric lines; length 228 (192.5–275), width 210 (182.5–245) (n=20); shield with 3 pairs of preanal setae, 1 pair of paranal setae, and 1 postanal seta; all setae simple. Ophisthogaster with simple and/or pilose setae and a pair of oblong metapodal shields. Postcoxal pore free from podal shield. Peritreme with stigmata at level between coxae III and IV; anterior extremities of peritreme located at level of setae z1.

Gnathosoma (Fig. 3) well developed and sclerotized; deutosternal groove with 5 transverse rows of denticles; 3 pairs of hypostomal setae and 1 pair of palpcoxal setae present; all setae simple; internal posterior hypostomal setae longer than other setae. Palpal chaetotaxy of trochanter, femur, and genu 2-5-6. Tectum (Fig. 4) with median process and pair of lateral elements; median process bifurcated distally and with small spicules; lateral elements smooth. Fixed digit of chelicera (Fig. 5) with simple dorsal seta, robust median tooth, small distal tooth, *pilus dentilis*, and terminal hook; movable digit with bidentate median tooth, minute distal tooth, and terminal hook; length of fixed digit 194 (175–250) and movable digit 75 (65–90) (n=19).

Legs. Most leg segments with simple, pilose, and plumose setae, except for coxae I–IV, trochanters I–III, femur II, genu I, tibiae I–III, and tarsus I with only simple setae. Leg chaetotaxy typical for the genus. Genu IV with 6 simple and pilose setae, and its chaetotaxy 1, 2/1, 2/0, 0.

Leg length (except ambulacrum, n=20): leg I, 630 (455–830); leg II, 561 (510–775); leg III, 548 (495–735); leg IV, 804 (725–1030).

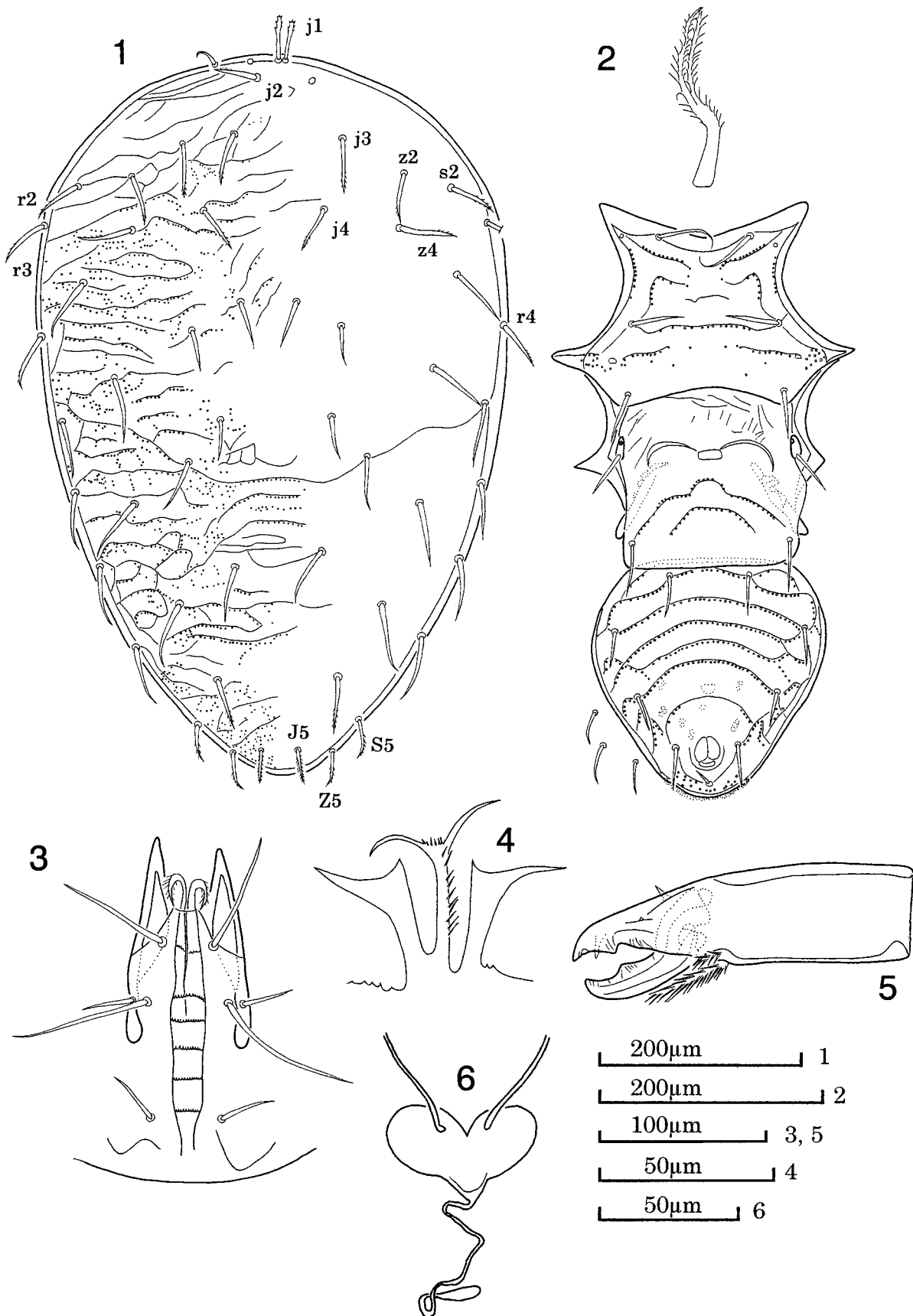
Sacculus foemineus (Fig. 6). Pair of sacculi fused; small cornu rounded distally and sclerotized; spermatheca oval.

Male and other stages. Unknown.

Material examined. Nine females, alt. 980 m, Mt. Salak, Sukamantri, Ciomas, Bogor, West Java, 10–13 September 2001, Sarino leg., *ex Onthophagus* sp. and *Catharsius* sp.; 7 females, alt. 950 m, Mt. Halimun National Park, Cikaniki, Bogor, West Java, 27–28 February 2001, Rofik and Sarino leg., *ex Onthophagus* sp.; 1 female, alt. 600 m, Sukadama, Sukamakmur, Jonggol, Bogor, West Java, 1 July 2001, S. Hartini and Ida leg., *ex Onthophagus* sp.; 1 female, alt. 900 m, Mt. Gede Pangrango National Park, Bodogol, Cicurug, Sukabumi, West Java, 7–9 July 2000, E. Cholik leg., *ex Catharsius* sp.; 1 female, Pegandan, Sampangan, Gajah Mungkur, Semarang, Central Java, 1 June 2001, Hengky leg., *ex Copris* sp.

Habitat. *Catharsius molossus* and genera *Aphodius*, *Catharsius*, *Copris*, *Enoplotrupes*, *Onthophagus*, *Paragymnopleurus* (Scarabaeidae).

Distribution. Indonesia (Java, Sumatra), Viet Nam, the Philippines, China (Szechuan), Taiwan.



Figs. 1–6. *Macrocheles dispar*, female. 1, dorsum; 2, venter; 3, ventral view of gnathosoma; 4, tectum; 5, chelicera; 6, *sacculus foemineus*.

***Macrocheles hallidayi* Walter and Krantz, 1986**

Macrocheles hallidayi Walter and Krantz, 1986a: 214–216, figs. 12, 13.

Macrocheles hallidayi: Walter and Krantz, 1986b: 289, fig. 1b; Takaku, 1998: 30–36, figs. 1–14; Takaku, 2001: 501, figs. 3, 9; Takaku and Hartini, 2001: 325.

The female of this species was adequately described and illustrated by Walter and Krantz (1986a), the male and immature stages were described on the basis of Sumatran specimens by Takaku (1998). Some specimens of *M. hallidayi* were also collected from Bali (Takaku and Hartini, 2001).

Material examined. Four females, collected from cow dung, alt. 600 m, Cimenyan, Jonggol, Bogor, West Java, 1 July and 3 September 2000, S. Hartini leg., ex *Onthophagus* sp.; 4 females, alt. 900 m, Mt. Pangrango National Park, Bodogol, Cicurug, Sukabumi, West Java, 7–9 July 2000, E. Cholikh leg., ex *Onthophagus* sp.; 21 females, alt. 950 m, Mt. Halimun National Park, Cikaniki, Bogor, West Java, 30–31 January, 6 July and 25–26 November 2000, 27–28 February and 27 April 2001, E. Cholikh, Rofik, Woro and Sarino leg., ex *Onthophagus* sp.; 31 females, alt. 980 m, Mt. Salak, Sukamantri, Ciomas, Bogor, West Java, 10–13 September 2001, Sarino leg., ex *Onthophagus* sp. and *Copris* sp.; 6 females, Singorejo, Demak, Central Java, 11 December 1999, S. Hartini leg., ex *Onthophagus* sp.; 12 females, alt. 380 m, Bugangan, Candi, Ungaran, Semarang, Central Java, 24 February 2001, S. Hartini leg., ex *Copris* sp. and *Onitis* sp.; 4 females, Kedungmundu, Mangunharjo, Tembalang, Semarang Selatan, Central Java, 10 January 2000, S. Hartini leg., ex Scarabaeidae; 4 females, Kembangarum, Bambangkerp, Ngaliyan, Semarang, Central Java, 27 January 2001, S. Hartini leg., ex *Onitis* sp.; 1 female, Pegandan, Sampangan, Semarang, Central Java, 6 January 2000, S. Hartini leg., ex Scarabaeidae.

Habitat. *Heliocopris bucephalus*, *Catharsius sagax*, and genera *Copris*, *Onitis*, *Onthophagus* (Scarabaeidae).

Distribution. India, Thailand, Cambodia, Indonesia (Java, Madura, Sumatra, Bali), and Malaysia (Sarawak).

***Macrocheles kraepelini* (Berlese, 1905)**

Holostaspis kraepelini Berlese, 1905: 164, fig. 26.

Macrocheles (Coprholaspis) kraepelini: Berlese, 1918: 146; Vitzthum, 1926: 34–35.

Macrocheles (Coprholaspis) multihamatus Vitzthum, 1926: 29–34, figs. 20–22.

Macrocheles kraepelini: Krantz and Filipponi, 1964: 40–42, figs. 3–5, tav. II figs. 1, 2; Halliday, 1986: 743, figs. 2, 33–39; Wallace, 1986: 8–9, fig. 2F, pl. 1(3); Walter and Krantz, 1986a: 212–213, figs. 1–3; Walter and Krantz, 1986b: 289; Halliday, 2000: 298–299; Takaku, 2001: 500–501, figs. 2 and 8.

The female of the present species was described by Berlese (1905) on the basis of material from Tjibodas, West

Java. Krantz and Filipponi (1964) redescribed and illustrated this species. The male and immature stages were described by Halliday (1986) and Walter and Krantz (1986a).

Material examined. Thirty nine females, alt. 980 m, Mt. Salak, Sukamantri, Ciomas, Bogor, West Java, 10 September and 1–3 October 2001, Sarino leg., ex *Onthophagus* sp.; 66 females, 3 males, alt. 950 m, Mt. Halimun National Park, Cikaniki, Bogor, West Java, 30–31 January, 9–10 August, 5–6 September, 26–30 October, 25–26 November, 21–23 December 2000, 27 January, 27–28 February, 24–25 March, 26 April, 25–26 June, 23–24 July, 20–21 August and 22–23 September 2001, E. Cholikh, Rofik, Sarino and Woro leg., ex *Onthophagus* sp.; 2 females, alt. 980 m, Mt. Gede Pangrango National Park, Bodogol, Cicurug, Sukabumi, Bogor, West Java, 7 September 2000, E. Cholikh leg., ex *Onthophagus* sp.; 2 females, alt. 600 m, Sukadamai, Sukamamur, Jonggol, Bogor, West Java, 1 July 2000, S. Hartini and Ida leg., ex *Onthophagus* sp.; 1 female, Dempet, Demak, Central Java, 1 July 2000, S. Hartini leg., ex *Onthophagus* sp.

Habitat. *Catharsius molossus*, *Copris incertis*, *Coptodactyla ducalis*, *Onitis falcatus*, *Onthophagus laminatus*, *Onthophagus* sp. (Scarabaeidae), *Pachylister chinensis* (Histeridae), breadfruit compost, decaying forest litter.

Distribution. Pakistan, India, Thailand, Viet Nam, Malaya, Singapore, the Philippines, Samoa, Fiji, Caroline Island, Australia, Indonesia (Java, Madura, Sumatra, Sulawesi).

***Macrocheles krantzi* Evans and Hyatt, 1963**

Macrocheles krantzi Evans and Hyatt, 1963: 351, figs. 58–61.

Macrocheles ? krantzi: Krantz and Filipponi, 1964: 44, tav. IV, figs. 13 and 14.

Macrocheles krantzi: Wallace, 1986: 12, fig. 2E, pl. 2(9); Roy, 1998: 298; Halliday, 2000: 299; Takaku and Hartini, 2001: 326.

A description and a figure of this species were given by Evans and Hyatt (1963), and variations in sternal ornamentation and dorsal setae were documented by Krantz and Filipponi (1964).

Material examined. This species was not collected in our investigation.

Habitat. Genera *Scarabaeus*, *Onthophagus* (Scarabaeidae), and dung. This species has been collected from poultry manure in West Java by Hartini and Aziz (1992); although their paper included some misidentification, *M. krantzi* was reconfirmed by GT on the basis of voucher specimens deposited in MZB.

Distribution. India, Sri Lanka, Australia, Indonesia (Java, Bali).

***Macrocheles limue* Samšičák, 1962**

Macrocheles limue Samšičák, 1962: 202–203, figs. 34–36, pls. 7, 8.

Macrocheles eurygaster Krantz, 1981: 3-7, figs. 1–20.

Macrocheles limue: Walter and Krantz, 1986b: 283, fig. 3; Roy, 1991: 750; Roy, 1996: 311-314, figs. 1–14; Takaku, 2001: 501–502, figs. 4 and 10; Takaku and Hartini, 2001: 324–325.

All stages of this species were adequately described by Krantz (1981) under the name *Macrocheles eurygaster*.

Material examined. Eight females, alt. 600 m, Sukadamai, Sukamakmur, Jonggol, Bogor, West Java, 8 September 2000, S. Hartini leg., ex *Onthophagus* sp. and *Onitis* sp.; 1 female, Cibinong, Bogor, West Java, 30 June 2000, S. Hartini leg., ex *Onthophagus* sp.; 1 female, Central Java, 23 January 2001, S. Hartini leg., ex *Onthophagus* sp.; 4 females, Kendalsari, Luwukwaru, Malang, East Java, 26–28 August 2001, S. Hartini leg., ex *Onitis* sp.; 3 females, alt. 300 m, Bukit Mentari, Mt. Kerikil, Pasuruhan, East Java, 30 August 2001, S. Hartini leg., ex *Onitis* sp.

Habitat. Genera *Allonitis*, *Aphodius*, *Catharsius*, *Copris*, *Garreta*, *Heliocopris*, *Heteronitis*, *Liatongus*, *Onitricellus*, *Onitis*, *Onthophagus*, *Scarabaeus* (Scarabaeidae), and compost, soil, cow dung, elephant dung, leaf litter, and so on.

Distribution. Ethiopia, Chad, Cameroon, Guinea, Zaire, Rwanda, Zambezi, Burundi, Kenya, Uganda, South Africa, Swaziland, India, China, the Philippines, Indonesia (Java, Sumatra, Bali).

***Macrocheles merdarius* (Berlese, 1889)**

Holostaspis merdarius Berlese, 1889, fasc. 52(1), fig. 103.

Macrocheles merdarius: Sellnick, 1940: 27, 86–87, figs. 69–71; Evans and Browning, 1956: 21–23, figs. 24–26, pl. 2, fig. 7; Bregetova and Koroleva, 1960: 145–146, figs. 106(3), 111, 112(2, 3); Axtell, 1963: 628, fig. 6; Filipponi and Pegazzano, 1963: 83–88, figs. V, VI, tav. XXIV; Ishikawa, 1968: 201; Krauss, 1970: 17, fig. 10; Karg, 1971: 134, 139, figs. 148e and 150a; Emberson, 1973: 120, pl. 1, fig. 4; Wallace, 1986: 9, fig. 2C, pl. 1(4); Hyatt and Emberson, 1988: 113–114, fig. 19B–D, pl. 2A; Krantz and Whitaker, 1988: 241–242; Haitlinger, 1991: 86; Mařán, 1994: 203; Halliday, 2000: 301–302; Takaku and Hartini, 2001: 326–327.

A description, a figure, and synonymy were published by Filipponi and Pegazzano (1963) in their review of the *M. subbadius* species group.

Material examined. Two females, alt. 600 m, Sukadamai, Sukamakmur, Jonggol, Bogor, West Java, 1 July 2000, S. Hartini and Ida leg., ex *Onthophagus* sp.; 3 females, alt. 980 m, Mt. Salak, Sukamantri, Ciomas, Bogor, West Java, 10–13 September 2001, Sarino leg., ex *Onthophagus* sp.

Habitat. Genera *Aphodius*, *Catharsius*, *Copris*, *Coptodactyla*, *Euoniticellus*, *Geotrupes*, *Lepanus*, *Liatongus*, *Notopodaria*, *Onthophagus*, *Pentodon*, *Phanaeus*, *Synapsidis* (Scarabaeidae), other beetle families Histeridae,

Lucanidae, Silphidae, Trogidae, mammals Rodentia, and soil, leaf litter, cow dung, compost, manure, and so on.

Distribution. Cosmopolitan. In Indonesia, this species is known from Java and Bali.

***Macrocheles oigru* Walter and Krantz, 1986**

Macrocheles oigru Walter and Krantz, 1986b: 281–282, figs. 4 and 5.

Macrocheles oigru: Takaku, 2001: 500, figs. 1 and 7; Takaku and Hartini, 2001: 324.

This species was adequately described and illustrated by Walter and Krantz (1986b).

Material examined. Thirty two females, alt. 600 m, Sukadamai, Sukamakmur, Jonggol, Bogor, West Java, 3 September, 25 October and 1 July 2000, S. Hartini and Ida leg., ex *Onitis* sp.; 10 females, alt. 980 m, Mt. Salak, Sukamantri, Ciomas, Bogor, West Java, 10–13 September 2001, Sarino leg., ex *Copris* sp. and *Onthophagus* sp.; 3 females, alt. 380 m, Bugangan, Candi, Ungaran, Semarang, Central Java, 24 February 2001, S. Hartini leg., ex *Onitis* sp.; 12 females, alt. 560 m, Kendalsari, Luwukwaru, Malang, East Java, 26–28 August 2001, S. Hartini leg., ex *Onitis* sp.; 1 female, alt. 480 m, Sentul, Purwodadi, Pasuruhan, East Java, 29 August 2001, S. Hartini leg., ex Scarabaeidae.

Habitat. *Onitis philemon*, *Onitis faliatus*, *Onitis* sp., *Copris* sp., *Onthophagus* sp. (Scarabaeidae)

Distribution. India, Indonesia (Java, Sumatra, Bali).

***Macrocheles subbadius* (Berlese, 1904)**

Holostaspis subbadius Berlese, 1904: 264.

Macrocheles subbadius: Filipponi and Pegazzano, 1963: 73–78, figs. I, II, pl. XXII; Hyatt and Emberson, 1988: 111–113, fig. 19A, pl. 6E; Halliday, 2000: 315.

Detailed description and synonymy of the present species were given by Filipponi and Pegazzano (1963).

Material examined. This species was not collected in our investigation.

Habitat. Manure, dung beetle culture, fruit fly, house fly genera *Stomoxys*, *Fannia*, and rodent *Peromyscus*.

Distribution. Europe, Saudi Arabia, Russia, U.S.A., Hawaii, China, Australia, New Zealand, Indonesia (Java).

***Macrocheles sukaramiensis* Takaku, 2001**

Macrocheles sukaramiensis Takaku, 2001: 502–504, figs. 13–18.

A description and a figure of the female were given by Takaku (2001).

Material examined. Thirty two females, 4 males, alt. 980 m, Mt. Salak, Sukamantri, Ciomas, Bogor, West Java, 10–13 September 2001, Sarino leg., ex *Catharsius* sp. and *Onthophagus* sp.

Habitat. *Catharsius molossus*, *Catharsius* sp., *Onthophagus* sp. (Scarabaeidae)

Distribution. Indonesia [Java (new record), Sumatra].

***Macrocheles* sp. aff. *glaber* (Müller, 1860)**

The present species is assignable to the *glaber* species complex (Walter and Krantz, 1986b) because of the following female characteristics: 1) dorsal setae j1, j4, Z4, and S5 pilose distally; 2) sternal ornamentation distinct; 3) ventrianal shield not greatly expanded and without strongly dimpled reticulations. Dorsal setae of the present species are significantly shorter than those of *M. oigru*, and general features of this species agree with those of *M. glaber*. However, for accurate identification of *M. glaber* and allies, it is necessary to collect mites alive, rear male progeny from them individually, and then observe characters of male and/or immature (Halliday, 1986). In this investigation, we could not culture the female or collect the male and immatures, so that we cannot confirm the taxonomic status of the present species.

Material examined. Six females, alt. 600 m, Sukadamai, Sukamakmur, Jonggol, Bogor, West Java, 1 July 2000, S. Hartini and Ida leg., ex *Onthophagus* sp.; 5 females alt. 600 m, Cimenyan, Sukamakmur, Jonggol, Bogor, West Java, 3 September 2000, S. Hartini leg., ex *Onitis* sp.; 9 females, alt. 980 m, Mt. Salak, Sukamantri, Ciomas, Bogor, West Java, 10–13 September 2001, Sarino leg., ex *Copris* sp.; 1 female, alt. 680 m, Soekarno Hatta, Malang, East Java, 28 August 2001, S. Hartini leg., ex *Onitis* sp.

***Macrocheles jabarensis* sp. nov.**

(Figs. 7–12)

Female. Length of dorsal shield 736 (620–905), width at level of coxae II 411 (340–535) (n=20). Living specimens yellowish brown.

Dorsum (Fig. 7). Dorsal shield oval, attenuated posteriorly, surface ornamented with reticulation and punctations, lateral margin of shield smooth; shield bearing 28 pairs of dorsal setae and 22 pairs of pores; j1 plumose distally; S5, and Z5 pilose in distal half; J5 entirely pilose; other setae simple; in some cases, j4 pilose distally.

Venter (Fig. 8). Sternal shield length 143 (122.7–182.5), width at level of coxae II 152 (127.5–167.5) (n=20); l.ang., l.m.t., and l.o.p. distinct; l.m.t. complete; l.arc. distinct or present as a part of reticulation; shield with 3 pairs of simple setae and 2 pairs of pores; length of the setae similar to each other. Metasternal shield oval and free; each shield with 1 simple seta and an anterior pore.

Length of epigynial shield 124 (100–162.5), width 171 (150–215); surface ornamented with lines; shield with pair of simple setae and pores on lateral side.

Ventrianal shield with punctations along semiconcentric lines, and longer than wide; length 241 (195–297.5), width 226 (177.5–182.5); shield with 3 pairs of preanal setae, pair of paranal setae, and 1 postanal seta; all setae simple, except for pilose postanal seta. Ophisthogaster with more than 20 pairs of simple setae and a pair of oblong metapodal shields. Postcoxal pore free from podal shield. Peritreme

with stigmata at level between coxae III and IV; anterior extremities of peritreme located at level of setae z1.

Gnathosoma (Fig. 9) well developed and sclerotized; deutosternal groove with 5 transverse rows of denticles; 3 pairs of hypostomal setae and 1 pair of palpcoxal setae present; all setae simple; internal posterior hypostomal setae longer than other setae. Palpal chaetotaxy of trochanter, femur, and genu 2-5-6. Tectum (Fig. 10) with median process and pair of lateral elements; median process bifurcate distally and with small spicules; lateral margin serrate. Fixed digit of chelicera (Fig. 11) with simple dorsal seta, robust median tooth, small distal tooth, *pilus dentilis*, and terminal hook; movable digit with bidentate median tooth, minute distal tooth, and terminal hook; length of fixed digit 193 (175–242.5) and movable digit 87 (60–100) (n=20).

Legs. Most leg segments with simple, pilose and plumose setae, except for coxae I–IV, trochanters I–III, genu I, tibia I and II, tarsus I with only simple setae.

Leg chaetotaxy typical for the genus. Genu IV with 6 simple and pilose setae and its chaetotaxy 1, 2/1, 2/0, 0.

Leg length (except ambulacrum, n=20): leg I, 628 (500–810); leg II, 572 (385–710); leg III, 570 (440–740); leg IV, 815 (655–1085).

Sacculus foemineus (Fig. 12). A pair of fused sacculi; cornu rounded distally and sclerotized; spermatheca oval.

Male and other stages. Unknown.

Type series. Holotype: female (MZB.Acar.2335), alt. 950 m, Mt. Halimun National Park, Cikaniki, Bogor, West Java, 27–28 September 2000, Rofik and Sarino leg., ex *Onthophagus* sp. Paratypes: 14 females, other data same as for holotype; 2 females, alt. 900 m, Mt. Gede Pangrango National Park, Bodogol, Cicurug, Sukabumi, West Java, 7–9 July 2000, E. Cholik leg., ex *Catharsius* sp.; 3 females, alt. 980 m, Mt. Salak, Sukamantri, Ciomas, Bogor, West Java, 10–13 September 2001, Sarino leg., ex *Onthophagus* sp.

Etymology. The species name is derived from abbreviation of Jawa Barat (=West Java).

Remarks. Sternal ornamentation of the present species is similar to that of *M. dispar* (Berlese, 1910) recorded from Southeast Asia. However, j4, z4, and r2-4 are simple in *M. jabarensis*, while those setae are pilose distally in *M. dispar*.

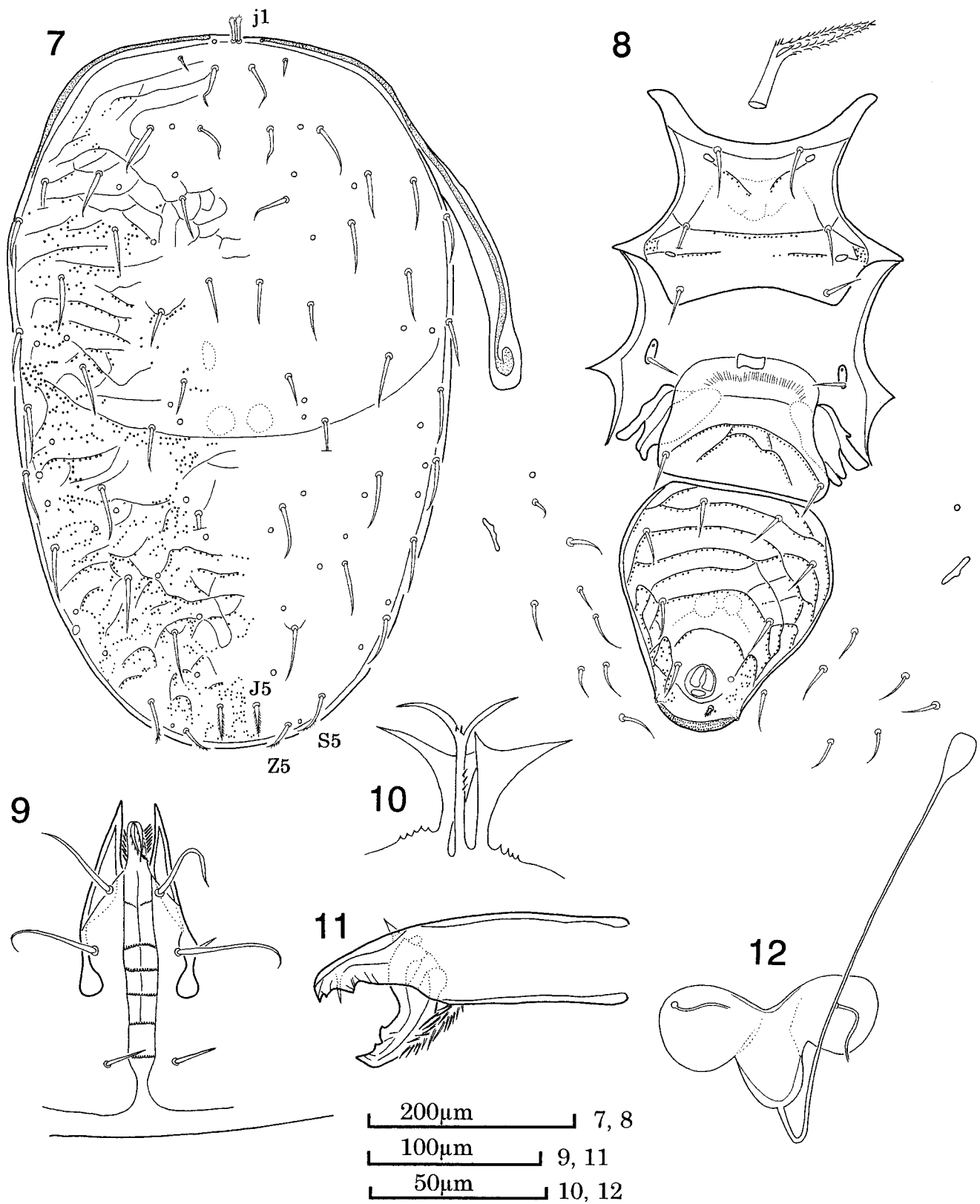
***Macrocheles jongsolensis* sp. nov.**

(Figs. 13–18)

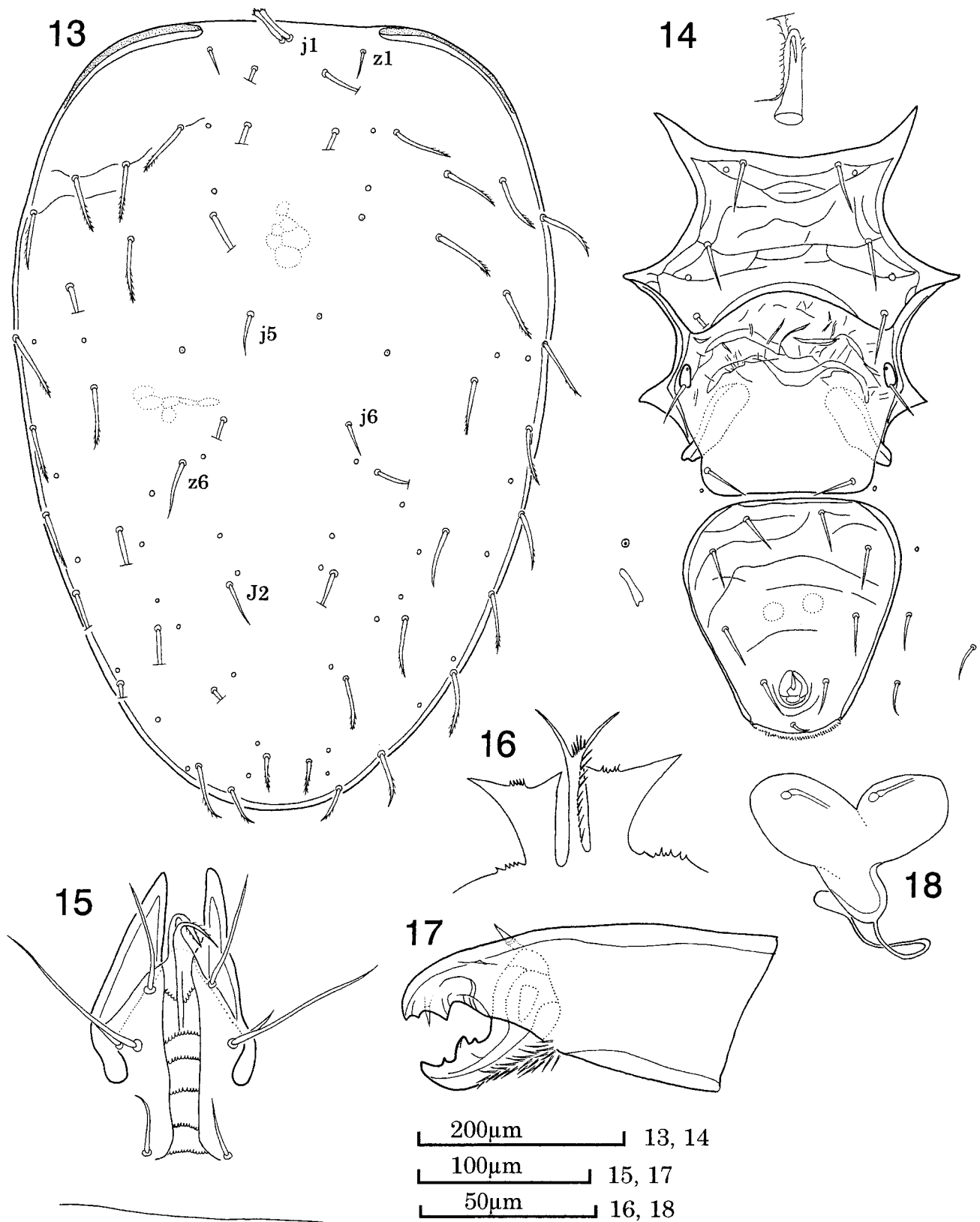
Female. Length of dorsal shield 728 (715–735), width at level of coxae II 480 (460–500) (n=4). Living specimens yellowish brown.

Dorsum (Fig. 13). Dorsal shield oval, attenuated posteriorly; surface ornamented with faint reticulation and punctations; lateral margin of shield smooth; shield bearing 28 pairs of dorsal setae and 22 pairs of pores; j1 plumose distally; j3, j5, j6, z1, z5, z6, and J2 simple; other setae pilose distally.

Venter (Fig. 14). Sternal shield wider than long; length 125, width at level of coxae II 171 (170–172.5) (n=4); ornamentation of sternal shield weak and without punctations;



Figs. 7–12. *Macrocheles jabarensis* sp. nov., female, holotype. 7, dorsum; 8, venter; 9, ventral view of gnathosoma; 10, tectum; 11, chelicera; 12, sacculus foemineus.



Figs. 13–18. *Macrocheles jongsolensis* sp. nov., female, holotype. 13, dorsum; 14, venter; 15, ventral view of gnathosoma; 16, tectum; 17, chelicera; 18, sacculus foemineus.

anterior half of shield ornamented with lines; l.ang., l.o.a., and l.o.p. present; l.m.t. complete; l.o.p. connected to l.m.t. Shield with 3 pairs of simple setae and 2 pairs of pores; all setae long, but not surpassing insertions of setae behind them. Metasternal shield oval and free.

Length of epigynial shield 158 (127.5–140), width 168 (152.5–187.5) (n=4); surface without punctations and lines; shield with pair of simple seta on posterolateral corners.

Ventrianal shield with semiconcentric faint lines, longer than wide; length 231 (222.5–235), width 208 (205–212.5) (n=4); shield with 3 pairs of preanal setae, pair of paranal setae, and 1 postanal seta; all setae simple. Opisthogaster with simple setae; a pair of oblong metapodal shields. Postcoxal pore free from podal shield. Peritreme with stigmata at level between coxae III and IV; anterior extremities of peritreme located at lateral of setae z1.

Gnathosoma (Fig. 15) well developed and sclerotized; deutosternal groove with 5 transverse rows of denticles; 3 pairs of hypostomal setae and 1 pair of palpcoxal setae present; all setae simple; internal posterior hypostomal setae longer than other setae; palpal chaetotaxy of trochanter, femur, and genu 2- 5- 6. Tectum (Fig. 16) with median process and pair of lateral elements; median process bifurcate distally and with small spicules; lateral margin smooth. Fixed digit of chelicera (Fig. 17) with simple dorsal seta, robust median tooth, small distal tooth, *pilus dentilis*, and terminal hook; movable digit with bidentate median tooth, small distal tooth, and terminal hook; arthrodial process strongly pilose and long; length of fixed digit 220 (212.5–232.5) (n=3) and movable digit 86 (85–87.5) (n=4).

Legs. Most leg segments with simple, pilose, and plumose setae, except for coxae I–IV, trochanters I–III, genu I, tibiae I, III, tarsi I, III, IV with only simple setae and tarsus II with thick simple setae.

Leg chaetotaxy typical for genus. Genu IV with 6 simple and plumose setae and its chaetotaxy 1, 2/1, 2/0, 0.

Leg length (except ambulacrum, n=4): leg I, 581 (555–615); leg II, 568 (537.5–602.5); leg III, 544 (520–565); leg IV, 730 (702.5–742.5).

Sacculus foemineus (Fig. 18). A pair of connected broadly sacculi; cornu distinct and sclerotized; spermatheca oval.

Male and other stages. Unknown

Type series. Holotype: female (MZB.Acar.2343.1), alt. 600 m, Sukadamai, Sukamakmur, Jonggol, Bogor, West Java, 25 October 2000, S. Hartini leg., *ex Gymnopleurus* sp. Paratypes: 3 females (MZB.Acar.2343.2–4), other data same as for holotype.

Etymology. The species name is derived from type locality.

Remarks. The present species is very similar to *Macrocheles transversus* Evans and Hyatt, 1963 from Africa in its sternal ornamentation as follows: 1) l.ang. joined into one line; 2) l.o.p. connected with l.m.t.; 3) sternal punctations absent. However, the shape of some dorsal setae are different between the two species. The majority of dorsal setae

are distally pilose in the present species, while they are simple in *M. transversus*. For example, z2, z4, and Z1–Z5 of the present species are pilose distally, whereas those of *M. transversus* are simple, except for Z5.

Macrocheles sukabumiensis sp. nov.

(Figs. 19–24)

Female. Length of dorsal shield 745 (700–795), width at level of coxae II 444 (425–530) (n=21). Living specimens yellowish brown.

Dorsum (Fig. 19). Dorsal shield oval, attenuated posteriorly; surface with areolate pattern; lateral margin of the shield smooth; shield with 28 pairs of dorsal setae and 22 pairs of pores; j1 plumose for most of its length; z1 short and simple; J5 and Z5 shorter than surrounding setae and pectinate; j6 fine with pilosity weak in some specimens; other setae pectinate for most of their length.

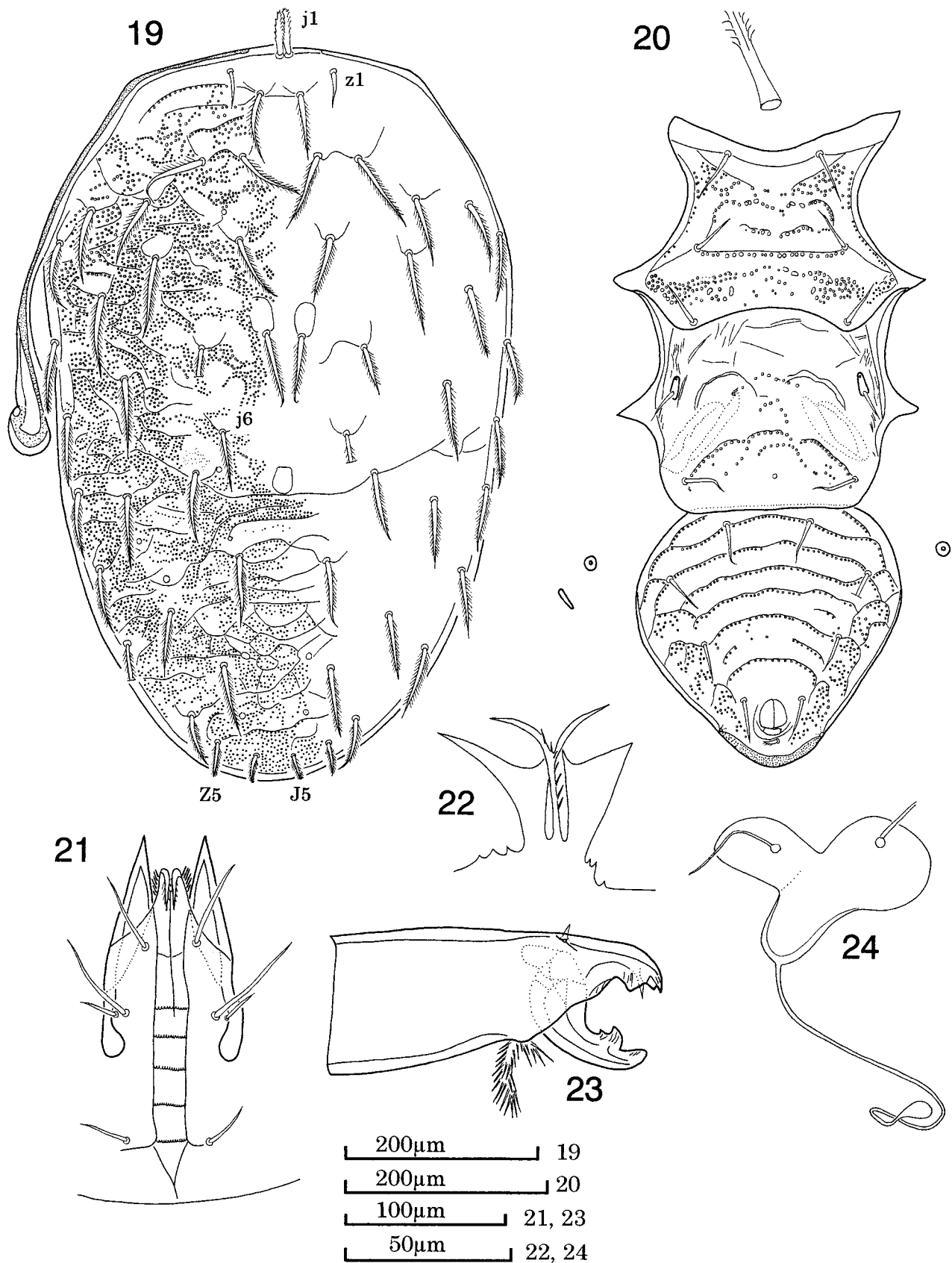
Venter (Fig. 20). Length of sternal shield 156 (150–175), width at level of coxae II 161 (150–175) (n=21); surface of shield with strong punctations around l.ang.; l.o.a., l.o.p., and l.arc. with punctations along those lines; l.m.t. almost complete and with distinct punctations; paired punctate areas present in posterior half of shield; shield with 3 pairs of simple setae and 2 pairs of pores; all setae long, but not surpassing insertions of setae behind them. Metasternal shield oval and free; each shield with 1 simple seta and an anterior pore.

Length of epigynial shield 119 (105–135), width 194 (170–225) (n=21); surface ornamented with lines and punctations anteriorly and medially; shield with pair of simple setae.

Ventrianal shield pentagonal, broad, with punctations along transverse lines and laterally; length almost same as width; length 264 (235–295), width 257 (235–285) (n=21); shield with 3 pairs of preanal setae, pair of paranal setae, and 1 postanal seta; all setae simple, except for pilose postanal seta. Opisthogaster with simple and/or pilose setae; a pair of oblong metapodal shields. Postcoxal pore free from podal shield. Peritreme with stigmata at level between coxae III and IV; anterior extremities of peritreme located at level between seta z1 and j1.

Gnathosoma (Fig. 21) well developed and sclerotized; deutosternal groove with 5 rows of denticles; 3 pairs of hypostomal setae and 1 pair of palpcoxal setae present; all setae simple; internal posterior hypostomal setae longer than other setae. Palpal chaetotaxy of trochanter, femur, and genu 2–5–6. Tectum (Fig. 22) with median process and pair of lateral elements; median process bifurcate distally and with small spicules; lateral margin smooth. Fixed digit of chelicera (Fig. 23) with simple dorsal seta, robust median tooth, small distal tooth, *pilus dentilis*, and terminal hook; movable digit with bidentate median tooth, minute distal tooth, and terminal hook; length of fixed digit 211 (205–215) (n=7) and movable digit 75 (72.5–90) (n=19).

Legs. Most leg segments with simple and plumose setae, except for coxae I–IV, trochanters I–IV, tibia II and



Figs. 19–24. *Macrocheles sukabumiensis* sp. nov., female, holotype. 19, dorsum; 20, venter; 21, ventral view of gnathosoma; 22, tectum; 23, chelicera; 24, *sacculus foemineus*.

tarsi I and III with only simple setae.

Leg chaetotaxy typical for the genus. Genu IV with 6 simple and plumose setae and its chaetotaxy 1, 2/1, 2/0, 0.

Leg length (except ambulacrum, n=21): leg I, 640 (585–705); leg II, 580 (535–620); leg III, 560 (515–605); leg IV, 806 (700–865).

Sacculus foemineus (Fig. 24). A pair of fused sacculi; cornu rounded distally and sclerotized; spermatheca oval.

Male and other stages. Unknown

Type series. Holotype: female (MZB.Acar.2134.3), alt. 900 m, Mt. Gede Pangrango National Park, Bodogol, Cicurug, Sukabumi, Bogor, West Java, 7–9 July 2001, E. Cholik leg., ex *Onthophagus* sp. Paratypes: 3 females other data same as for holotype; 13 females, alt. 950 m, Mt. Halimun National Park, Cikaniki, Bogor, West Java, 6 July 2001, Rofik and Sarino leg., ex *Onthophagus* sp.; 4 females, alt. 980 m, Mt. Salak, Sukamantri, Ciomas, Bogor, West Java, 10–13 September 2001, Sarino leg., ex *Onthophagus* sp.

Etymology. The species name is derived from the type locality.

Remarks. The present species is similar to *Macrocheles plumosus* Evans and Hyatt, 1963 collected in the expedition to Sarawak, Malaysia. However, *Macrocheles sukabumiensis* is distinguishable from *M. plumosus* by the following characters: (corresponding conditions of *M. plumosus* in parentheses): 1) j1 normal length and more than distal half plumose (short and palmate); 2) z1 simple (pilose); 3) median part of sternal shield ornamented with punctations and lines, and without conspicuous reticulation (covered entirely by conspicuous reticulation); 4) genu IV with six simple and plumose setae (all setae strongly pilose).

Besides the abovementioned characters, punctate areas in the posterior half of the sternal shield of the present species are smaller than those of *M. plumosus*, and punctations in lateral side of ventrianal shield of the present species are weaker than those of *M. plumosus*.

Key to the species of the genus *Macrocheles* in Java (female only)

1. All dorsal setae simple, short, and spine-like, except for pilose J5 (and j1 slightly pilose in *M. baliensis*, *M. krantzi*, and *M. limue*). 2
- Some dorsal setae pilose or plumose or pectinate at least distally. 6
2. Posterior edge of sternal shield close to metasternal shield; l.ang. convergent medially; ventrianal shield expanded laterally. *M. limue* Samšňák, 1962
- Posterior edge of sternal shield disjunct from metasternal shield; l.ang. not as above; ventrianal shield subtriangular or pentagonal, not expanded. 3
3. L.o.a. of sternal shield connected by lines. 4
- L.o.a. absent or not connected by lines. 5
4. Lines of sternal shield with distinct punctations; genu IV with 7 setae. *M. subbadius* (Berlese, 1904)
- Lines and punctations of sternal shield very faint; genu IV with 6 setae. *M. merdarius* (Berlese, 1889)

5. Anterior half of sternal shield ornamented with somewhat reticulate pattern of punctate lines. *M. baliensis* Takaku and Hartini, 2001
- Ornamentation of sternal shield faint and without reticulate ornamentation. ... *M. krantzi* Evans and Hyatt, 1963
6. All dorsal setae pilose in most length, except for simple z1. *M. sukabumiensis* sp. nov.
- Some dorsal setae, at least j6, z5, z6, and J2, simple. 7
7. Some dorsal setae entirely pilose or pectinate. 8
- Dorsal setae simple or pilose distally, except for J5 pilose for the entire length. 10
8. Dorsal setae j3, j4, z4, s4, and s5 simple. *M. crista* (Berlese, 1910)
- Dorsal setae j3, j4, z4, s4, and s5 pilose. 9
9. Genu IV with 7 setae. *M. hallidayi* Walter and Krantz, 1986
- Genu IV with 6 setae. ... *M. kraepelini* (Berlese, 1905)
10. Sternal ornamentation developed; l.o.p. bifurcated and reached to l.m.t. 11
- Sternal ornamentation reduced; l.o.p. not bifurcated and disjunct from l.m.t. 13
11. Most dorsal setae pilose distally, except for simple j3, j5, j6, z5, z6, and J2. *M. jongsolensis* sp. nov.
- Most dorsal setae simple; j1, j4, Z5, and S5 pilose distally. 12
12. Most dorsal setae elongate and surpassing insertions of setae behind them. *M. oigru* Walter and Krantz, 1986
- Dorsal setae not elongate and not reaching insertions of setae behind them. ... *M. sp. aff. glaber* (Müller, 1860)
13. Most dorsal setae pilose distally, except for simple j5, j6, z5, z6, J2, Z1, and Z3; anterior half of sternal shield ornamented with slight reticulate pattern. *M. sukaramiensis* Takaku, 2001
- Most dorsal setae simple; j1, S5, and Z5 pilose distally; anterior half of sternal shield with one l.arc. 14
14. Dorsal setae j4, r2–4, and z4 pilose distally. *M. dispar* (Berlese, 1910)
- Dorsal setae j4 simple or pilose distally; r2–4 and z4 simple. *M. jabarensis* sp. nov.

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REFERENCES

- Axtell RC (1963) Acarina occurring in domestic animal manure. *Ann Entomol Soc Amer* 56: 628–633
- Berlese A (1889) Acari Myriopoda et Scorpiones Hucusque in Italia. *Reperta fasc. 52 N. 1*, Tipografia del Seminario, Padova
- Berlese A (1904) Acari nuovi. *Manipulus Ilus. Redia* 1: 258–280
- Berlese A (1905) Acari nuovi. *Manipulus IV. Redia* 2: 154–176
- Berlese A (1910) Lista di nuove specie e nuovi generi di Acari. *Redia* 6: 242–271
- Berlese A (1911) Acarorum species novae quindecim. *Redia* 7: 429–435
- Berlese A (1918) Centuria quarta di Acari nuovi. *Redia* 13: 115–192
- Berlese A (1921) Centuria quinta di Acari nuovi. *Redia* 14: 143–195
- Bregetova NG, Koroleva EV (1960) The macrochelid mites (Gamasoidea, Macrochelidae) in the USSR. *Parazitol Sb* 19: 32–154 [In Russian with English summary]
- Emberson RM (1973) Macrochelid mites in N. Z. (Acarina: Mesostigmata: Macrochelidae). *N Z Entomol* 5: 118–127
- Evans GO, Browning E (1956) British mites of the subfamily Macrochelinae Trägårdh (Gamasina–Macrochelidae). *Bull Br Mus (Nat Hist) Zool* 4: 1–55
- Evans GO, Hyatt KH (1963) Mites of the genus *Macrocheles* Latr. (Mesostigmata) associated with coprid beetles in the collections of the British Museum (Natural History). *Bull Br Mus (Nat Hist) Zool* 9: 327–401
- Filipponi A, Pegazzano F (1963) Specie italiane del gruppo *subbadius* (Acarina, Mesostigmata, Macrochelidae). *Redia* 48: 69–91
- Haitlinger R (1991) List of mites occurring on insects in Poland. *Wiad Parazytol* 37: 85–90
- Halliday RB (1986) Mites of the *Macrocheles glaber* group in Australia (Acarina: Macrochelidae). *Aust J Zool* 34: 733–752
- Halliday RB (1987) Further observations on the dorsal idiosomal chaetotaxy in the Macrochelidae (Acarina). *Internat J Acarol* 13: 51–53
- Halliday RB (2000) The Australian species of *Macrocheles* (Acarina: Macrochelidae). *Invertebr Taxon* 14: 273–326
- Hartini S, Aziz J (1992) Mites in poultry litter from Bogor Municipality, West Java. *Parasitol Indonesia* 5: 105–112
- Hyatt KH, Emberson RM (1988) A review of the Macrochelidae (Acari: Mesostigmata) of the British Isles. *Bull Br Mus (Nat Hist) Zool* 54: 63–125
- Ishikawa K (1968) Studies on the mesostigmatid mites associated with the insects in Japan (1). *Rep Res Matsuyama Shinonome Jr Coll* 3: 197–218
- Karg W (1971) Acari (Acarina), Milben. Unterordnung Anactinochaeta (Parasitiformes). *Die freilebenden Gamasina (Gamasides), Raubmilben. Tierw Deutsch* 59: 1–475
- Krantz GW (1965) A review of the genus *Neopodocinum* Oudemans, 1902 (Acarina, Macrochelidae). *Acarologia* 7: 139–226
- Krantz GW (1967a) A review of the genus *Holocaelaeno* Berlese, 1910 (Acarina: Macrochelidae). *Acarologia* 9 (Suppl.): 1–89
- Krantz GW (1967b) A review of the genus *Holostaspella* Berlese, 1904 (Acarina: Macrochelidae). *Acarologia* 9 (Suppl.): 91–146
- Krantz GW (1981) Two new *glaber* group species of *Macrocheles* (Acari: Macrochelidae) from Southern Africa. *Internat J Acarol* 7: 3–16
- Krantz GW, Filipponi A (1964) Acari della famiglia Macrochelidae (Mesostigmata) nella collezione del South Australian Museum. *Riv Parassitol* 25: 35–54
- Krantz GW, Whitaker JO (1988) Mites of the genus *Macrocheles* (Acari: Macrochelidae) associated with small mammals in North America. *Acarologia* 29: 225–259
- Krauss W (1970) Die europäischen Arten der Gattungen *Macrocheles* Latreille 1829 und *Geholaspis* Berlese 1918. *Acarologie Schrift Vergleich Milben* 14: 1–43
- Latreille PA (1829) Les Arachnides (Arachnides). In "Le Règne Animal. Second edition, Vol. 4" Ed by G Cuvier, Dèterville, Paris, pp 206–291
- Mašán P (1994) The mesostigmatic mites (Acarina, Mesostigmata) associated with the dung beetles (Coleoptera, Scarabaeidae) in South Slovakia. *Biologia Bratisl* 49: 201–205
- Oudemans AC (1903) *Acarologische Aanteekeningen*, VIII. *Entomol Ber* 1: 100–103
- Roy RK (1991) A catalogue of the soil mesostigmatid mites (Acari) collected from Palni Hills and Western Ghats, Southern India. In "Advances in Management and Conservation of Soil Fauna" Ed by GK Veeresh, D Rajagopal, CA Viraktamath, Oxford & IBH, New Delhi, pp 749–753
- Roy RK (1996) Redescription of *Macrocheles limue* Samšiňák (Acarina: Macrochelidae). *J Bombay Nat Hist Soc* 93: 311–314
- Roy RK (1998) The genus *Macrocheles* Latreille (Acarina: Macrochelidae) in India: morphological variations and geographical distribution. *J Bombay Nat Hist Soc* 95: 295–300
- Samšiňák (1962) Neue entomophile Acari aus China. *Acta Soc Entomol Cecho* 59: 186–204
- Sellnick M (1940) Die Milbenfauna Islands. *Medd Göteborgs Mus Zool Adv* 83: 1–129
- Takaku G (1998) Descriptions of immature stages and male of *Macrocheles hallidayi* Walter and Krantz, 1986 (Acari: Macrochelidae). *J Acarol Soc Jpn* 7: 29–38
- Takaku G (2001) Macrochelid mites (Acari: Macrochelidae: *Macrocheles*, *Holostaspella*) associated with scarabaeid beetles in Sumatra, Indonesia. *Tropics* 10: 497–507
- Takaku G, Hartini S (2001) Macrochelid mites (Arachnida: Acari: Macrochelidae: *Glyptolaspis*, *Macrocheles*, *Neopodocinum*) associated with dung beetles in Bali, Indonesia. *Spec Div* 6: 323–345
- Vitzthum HG (1925) Fauna Sumatrensis (Beitrag No. 5). *Acarinae. Suppl Entomol* 11: 1–79
- Vitzthum HG (1926) Malayische Acari. *Treubia* 8: 1–98
- Vitzthum HG (1930) *Acarologische Beobachtungen*. *Zool Jahrb Abt Sys Ökol Geog Tiere* 59: 281–350
- Wallace MMH (1986) Some macrochelid mites (Acari: Macrochelidae) associated with Australian dung beetles (Coleoptera: Scarabaeidae). *Acarologia* 27: 3–15.
- Walter DE, Krantz GW (1986a) Description of the *Macrocheles kraepelini* species complex (Acari: Macrochelidae) with two new species. *Can J Zool* 64: 212–217
- Walter DE, Krantz GW (1986b) A review of *glaber*-group (s. str.) species of the genus *Macrocheles* (Acari: Macrochelidae), and a discussion of species complexes. *Acarologia* 27: 277–294
- Walter DE, Krantz GW (1992) A review of *glaber*-like species with reduced sclerotization and ventral ornamentation: the *scutatus* subgroup (Acari: Macrochelidae). *Internat J Acarol* 18: 241–249

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