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Macrochelid mites (Acari: Mesostigmata) associated with dung beetles in Mount Gede-Pangrango National Park, West Java, Indonesia

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Sixteen species of macrochelid mites were collected on the surface of scarab dung beetles in Mount Gede-Pangrango National Park, West Java, Indonesia. Of these, one species, *Macrocheles gedeensis* sp. nov. is described here as new to science. The other fifteen species were *Holostaspella katakurai* Hartini and Takaku, 2003, *H. oblonga* Hartini and Takaku, 2010, *H. villosa* Hartini and Takaku, 2010, *Neopodocinum halimunense* Hartini and Takaku, 2003, *N. subjaspersi* Hartini and Takaku, 2003, *Neopodocinum* sp., *Macrocheles dispar* (Berlese, 1910), *M. entetiensis* Hartini and Takaku, 2005, *M. hallidayi* Walter and Krantz, 1986, *M. jabarensis* Hartini and Takaku, 2003, *M. kraepelini* (Berlese, 1905), *M. pumilus* Hartini, Dwibadra and Takaku, 2009, *M. turgoensis* Hartini, Dwibadra and Takaku, 2009, *M. sukabumiensis* Hartini and Takaku, 2003, and *M. sukaramiensis* Takaku, 2001.

Keywords: Indonesia, Macrochelid mites, Mount Gede-Pangrango National Park

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Introduction

Mount Gede-Pangrango National Park is located in West Java, Indonesia and is inhabited by endangered animal species that are now threatened with extinction. These endangered species include the Javan gibbon (*Hylobates moloch*), Javan leaf monkey (*Presbytis comata comata*), chony leaf monkey (*Trachypithecus auratus auratus*), panther (*Panthera pardus*), leopard cat (*Prionailurus bengalensis javanensis*), barking deer (*Muntiacus muntjak muntjak*), lesser Malay mouse deer (*Tragulus javanicus*), Asian wild dog (*Cuon alpinus javanicus*), southeast Asian porcupine (*Hystrix brachyura brachyura*), stink badger (*Mydaus javanensis*), and yellow-throated marten (*Martes flavigula*) (PHPA team, 2003). The dung of large animals is often a food source or serves as habitat for other animals. These animals include Coleopterans such as scarabaeid beetles, Dipterans (flies), and macrochelid mites. Mites in the family Macrochelidae (Acari) are predators of eggs and larvae of some fly species (Blake, 1981; Halliday, 2000). Macrochelid mites are associated with scarabaeid dung beetles and flies, which serve as a means of dispersal from one dung substrate to another.

In Java, 43 species in four genera (*Holostaspella*, *Neopodocinum*, *Glyptholaspis* and *Macrocheles*) of macrochelid mites have been reported (Hartini and Takaku, 2003a; 2003b; 2012; Hartini *et al*., 2009; 2012; 2013; 2015; Hartini and Dwibadra, 2011). In the present study, one new species is described from Mount Gede-Pangrango.

Materials and Methods

Mite specimens were collected from four locations in Mount Gede-Pangrango National Park i.e: Cibodas, Selabintana, Situgunung and Gunung Putri at various times between 2004-2010.

Mites associated with dung beetles were collected by pitfall traps baited with human dung. The dung beetles were captured in traps, and then fixed in 70% ethanol. Mite specimens were detached from the body of dung beetles and were mounted on prepared slides in PVA (Polyvinyl alcohol-lactic acid) medium, after being cleared in 60% lactic acid. All measurements are given

in micrometers (μm) and if more than two specimens were measured average and range are provided in parentheses. Dorsal chaetotaxy and other terminology follow Krantz (1967), Walter and Krantz (1986a; 1986b), Halliday (1987), Takaku (2001), Hartini and Takaku (2003a; 2003b; 2010) and Hartini *et al*. (2007; 2009). All specimens, including holotype and paratypes of the new species, were deposited in the collection of the Museum Zoologicum Bogoriense, Cibinong, Bogor, Indonesia (MZB).

Systematic Account

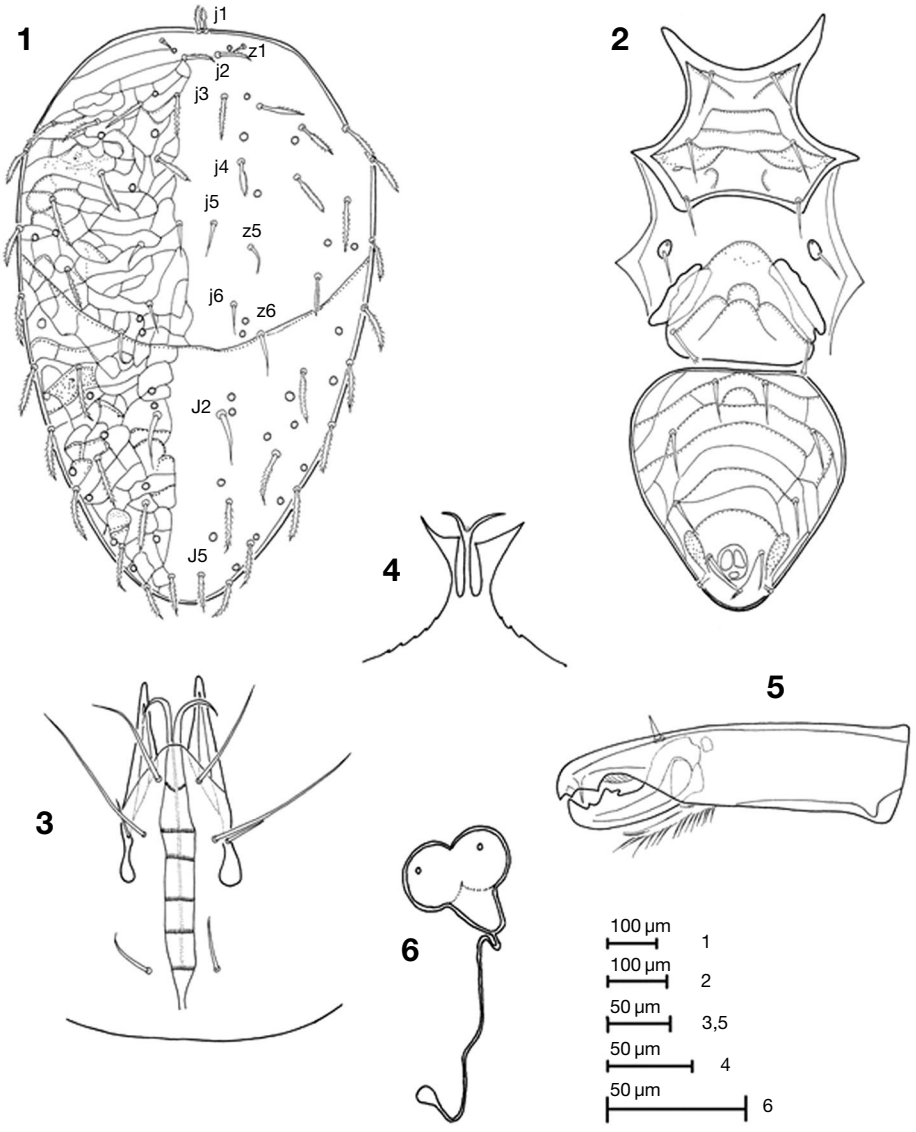
Family Macrochelidae Vitzthum, 1930

***Macrocheles gedeensis* sp. nov. (Figs. 1-6)**

Type series: Holotype: female (MZB. Acar.7091.2) 1130 m above sea level (a.s.l.), Selabintana, Mount Gede-Pangrango, Sukabumi, West Java, S 06°52′14″ E 106° 57′09″, 15 May 2010, Hartini and Dwibadra leg., *ex Synapsis ritsemae* (Coleoptera: Scarabaeidae). Paratype: 14♀♀, other data same as holotype.

Female: Length of dorsal shield 1021 (880-1110), width at level of coxae II 613 (500-690) (n = 15). Specimens reddish brown.

Dorsum (Fig. 1): Dorsal shield oval, attenuated posteriorly, surface ornamented with distinct reticulate pattern and punctation; lateral margin smooth; shield with 28 pairs of dorsal setae and 22 pairs of pores; setae j1-4



Figs. 1-6. *Macrocheles gedeensis* sp. nov., holotype female (MZB.Acar.7091.2). 1, dorsum; 2, venter; 3, ventral view of gnathosoma; 4, epistome; 5, chelicerae; 6, sacculus foemineus.

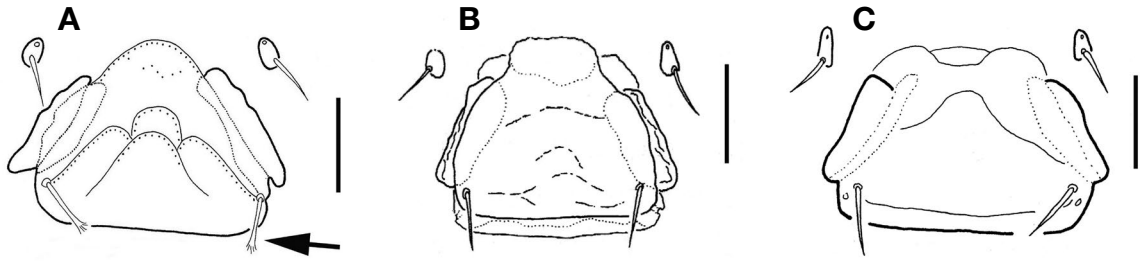


Fig. 7. Epigynial setae of A. *Macrocheles gedeensis* (pilose distally), B. *M. monticola* (simple), and C. *M. persimilis* (simple). Scale bar: a, c = 100 μm, b = 50 μm.

pilose distally; j5, j6, z1, z5, z6, and J2 simple, but in some cases z1 and z6 slightly pilose; J5 bipectinate entirely; other dorsal setae pilose in distal half to distal 2/3.
Venter (Fig. 2): Length of sternal shield, length 192 (170-207.5), width at level of coxae II 167 (150-175) (n = 15); shield ornamented with lines and punctations; linea angulata (l.ang.), two linea arcuata (l.arc.), linea oblique anterior (l.o.a.), linea media transversa (l.m.t.) present and with punctations; l.m.t. not straight; anterior l.arc. faint; linea oblique posteriore (l.o.p.) distinct, with punctation, bifurcated, and connect to l.m.t. Epigynial shield ornamented with arched lines and punctations; shield with a pair of pilose distally setae on posterior corner. Length of epigynial shield 180 (162.5-195), width 216 (185-237.5) (n = 15).

Ventrianal shield pentagonal, shield ornamented with semiconcentric line punctations; length 329 (267.5-370), width 311 (247.5-365) (n = 15); shield with 3 pairs of preanal simple setae, pair of paranal simple setae, and 1 postanal pilose seta. Cribrum located posterior to postanal seta. Ophisthogastric setae simple and pilose. A pair of metapodal shield oblong. Postcoxal pore free from podal shield. Anterior extremities of peritreme located at level of setae z1.
Gnathosoma (Fig. 3): Developed and sclerotized. Epistome (Fig. 4) and chelicera (Fig. 5) fixed digit with simple dorsal seta, robust median tooth, a distal tooth, *pilus dentilis* and terminal hook; movable digit with bidentate tooth, small distal tooth and terminal hook. Length of fixed digit 259 (225-272.5), and movable digit 105 (100-112.5) (n = 15).
Legs: Most leg segments with simple, pilose, and plumose setae, except for coxa, trochanter, and tarsus I with simple setae; and coxa, genu IV with pilose setae. Leg length (except ambulacrum, n = 15); leg I, 763 (640-930); leg II, 720 (580-850); leg III, 738 (680-800); leg IV, 1159 (1040-1260).
Sacculus foemineus: (Fig. 6). Pair of sacculi fused; small cornu rounded distally and sclerotized; spermateca oval.
Male and other stage: Unknown.
Etymology: The species name is derived from type locality.
Remarks: This species is very similar to *Macrocheles persimilis* Hartini, Dwibadra and Takaku, 2007 from Sulawesi, Indonesia, in its dorsal setae and sternal ornamentation. However, *Macrocheles gedeensis* is distinguishable from *M. persimilis* by the following characters as shown in Figs. 7 and 8: (corresponding conditions of *M. persimilis* in parentheses): 1) epigynial setae pilose (simple); 2) linea oblique posterior (l.o.p.) bifurcated and connected to linea media transversa (l.m.t.) (not bifurcated and disjunct to l.m.t; 3) length of dorsal shield more than 1000 μm (less than 1000 μm).

The species also resembles *Macrocheles monticola* Takaku and Hartini, 2001, recorded from Bali, Indonesia in the sternal ornamentation but it differs from the latter in the following characteristics of the female (corresponding conditions of *M. monticola* in parentheses), 1) epigynial setae pilose (simple), as are shown in Fig. 7; 2) most of dorsal setae pilose (simple), as are shown in Fig. 9.

Macrocheles dispar (Berlese, 1910)

Macrocheles dispar has been recorded from Viet Nam, the Philippines, China (Szechuan Province), Taiwan and Indonesia (Java, Sumatra, Kalimantan, Sulawesi, Lombok, and Papua).

Material examined: 129♀♀, Selabintana, Mount Gede-Pangrango National Park, S 06°52′14″ E 106°57′09″, 25-26 May 2004, Kahono, Lilik and Agus leg.; 24-25 May 2006, Hartini, Rofik and Darmawan leg.; 15 May 2010, Hartini and Dwibadra leg.; Situgunung, S 06°49′ 58″ E 106°55′18″, 18-19 April 2004, Kahono, Lilik and Agus leg., *ex Onthophagus* (*Onthophagus*) *cribratus*, *O.* (*O.*) *malangensis*, *O.* (*O.*) *semigranosus*, *O.* (*Sunenaga*) *blumei*, and unidentified species of genus *Onthophagus* (Scarabaeidae).

Macrocheles dispar has been collected from scarabaeid beetle *Catharsius molossus*, *Copris sinicus*, *Onthophagus cervicapra*, *O. hirustulus*, *O. luridipenis*, *O. rudis*, *O. schwaneri*, *O. semiaureus*, *O. tricornis*, *O. trituber*,

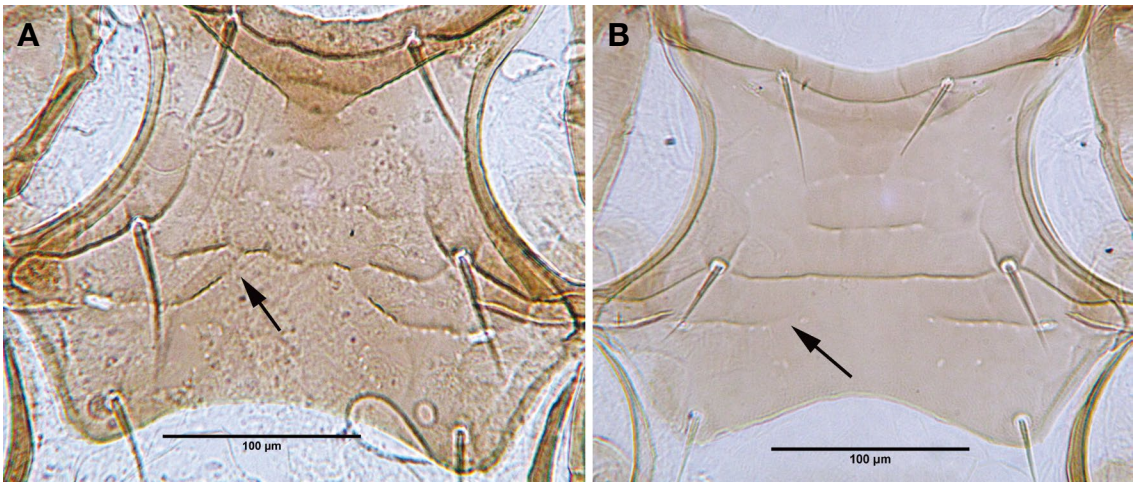


Fig. 8. Sternal shield of A. *Macrocheles gedeensis* with l.o.p. connected to l.m.t. and B. of *M. persimilis* which is disjunct to l.m.t.

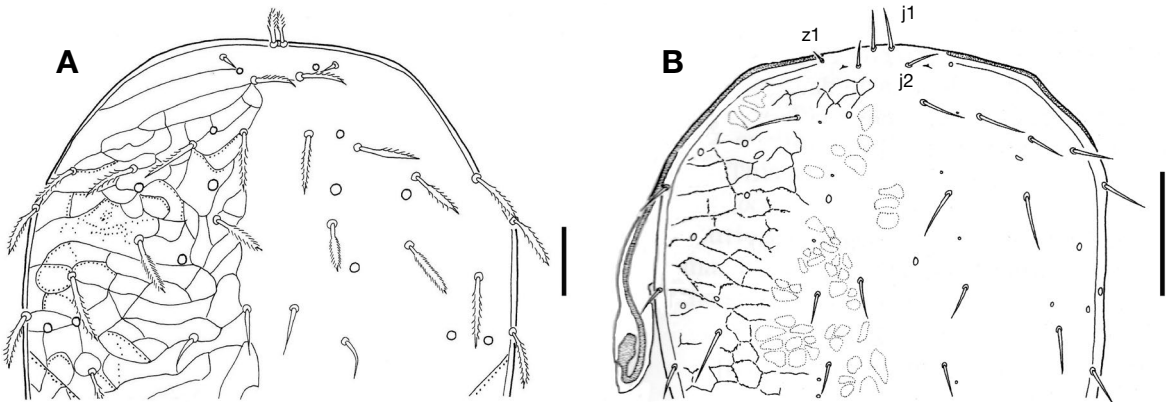


Fig. 9. Dorsal shield of A. *Macrocheles gedeensis* with pilose setae and B. of *M. monticola* with simple setae. Scale bar: 100 µm.

O. vulpes, *O.* (*O.*) *cribratus*, *O.* (*O.*) *javensis*, *O.* (*O.*) *javaecola*, *O.* (*O.*) *malangensis*, *O.* (*O.*) *orientalis*, *O.* (*Gibbonthopagus*) *fuscopunctatus*, *O.* (*Macronthophagus*) *rotundicolis*, *O.* (*Serrophorus*) *mulleri*, *Paragymnopleurus maurus*, *P. rudis*, *P. sparsus javanus*, *Sisyphus thoracicus*, and nest of *Apis dorsata dorsata* (Hymenoptera), and from unidentified species of genera *Aphodius*, *Catharsius*, *Copris*, *Enoplotrupes*, *Onthophagus*, and *Paragymnopleurus* (Scarabaeidae).

Macocheles entetiensis Hartini and Takaku, 2003

This species has been recorded only from Indonesia (Lesser Sunda and Java) (Hartini *et al*., 2005; Hartini and Dwibadra, 2011).

Material examined: 2♀♀, 1130 m a.s.l., Selabintana, Mount Gede-Pangrango National Park, West Java, S 06°52′14″ E 106°57′09″, 24-25 May 2006, Hartini, Rofik and Darmawan leg., *ex O.* (*O.*) *malangensis*.

Macrocheles entetiensis has been collected from scarabaeid beetles *C. molossus*, *O. limbatus*, *O. schwaneri*, *O. uedai*, *O.* (*O.*) *cribratus*, *O.* (*O.*) *javaecola*, *O.* (*O.*) *malangensis*, *O.* (*G.*) *fuscopunctatus*, *O.* (*S.*) *mulleri*, *P. s. javanus*, *S. thoracicus*, and unidentified species of genera *Aphodius*, *Catharsius*, and *Onthophagus* (Scarabaeidae).

Macrocheles hallidayi Walter and Krantz, 1986

This species was described by Walter and Krantz (1986a), and has been recorded from Thailand, Cambodia, Malaysia (Sarawak), India and Indonesia (Java, Madura, Sumatra, Kalimantan, Sulawesi, Bali, Lombok, Sumbawa, Flores, Sumba and Papua).

Material examined: 1♀, Cibodas, Mount Gede-Pangrango National Park, S 06°44′30″ E 107°00′19″, 20 May 2010, Hartini and Dwibadra leg., *ex Onthophagus*.

This species has been collected from the scarabaeid beetles *C. molossus*, *C. sagax*, *Heliocopris bucephalus*, *Onthophagus cervicapra*, *O. liliputanus*, *O. limbatus*, *O. obscurior*, *O. schwaneri*, *O.* (*O.*) *javensis*, *O.* (*O.*) *orientalis*, *Microcopris hidakai*, *Paragymnopleurus maurus*, and nest of *Apis dorsata dorsata* (Hymenoptera) and unidentified species of genera *Aphodius*, *Catharsius*, *Copris*, *Heliocopris*, *Microcopris*, *Oniticellus*, *Onitis*, *Onthophagus*, *Paragymnopleurus* (Scarabaeidae) and trogid beetles.

Macrocheles jabarensis Hartini and Takaku, 2003

This species was described from Indonesia (Hartini and Takaku, 2003a) and has been recorded from Java, Sumatra, Kalimantan, Sulawesi, Lombok, and Sumbawa.

Material examined: 20♀♀, Situgunung, Mount Gede-Pangrango National Park, S 06°49′58″ E 106°55′18″, 18-19 April 2004, Kahono, Lilik and Agus leg.; Selabintana, S 06°52′14″ E 106°57′09″, 24-25 May 2006, Hartini, Rofik and Darmawan leg.; 15 May 2010, Hartini and Dwibadra leg., *ex O.* (*O.*) *semigranosus* and species of the genus *Onthophagus*.

This species has been collected from the scarabaeid beetles *C. molossus*, *Microcopris hidakai*, *Onthophagus aurifex*, *O. borneensis*, *O. cervicapra*, *O. dayacus*, *O. diabolicus*, *O. dux*, *O. incisus*, *O. obscurior*, *O. papulatus*, *O. pasificus*, *O. pastillatus*, *O. rudis*, *O. schwaneri*, *O. semiaureus*, *O. vulpes*, *O. waterstradti*, *O.* (*G.*) *fuscopunctatus*, *O.* (*M.*) *rotundicolis*, *O.* (*O.*) *cribratus*, *O.* (*O.*) *javaecola*, *O.* (*O.*) *javensis*, *O.* (*O.*) *orientalis*, *O.* (*Parascatonomus*) *accedens*, *O.* (*S.*) *mulleri*, *Paragymnopleurus maurus*, *P. s. javanus*, *Sisyphus thoracicus*, nest of *A. d. dorsata* (Hymenoptera) and unidentified species of genera *Catharsius*, *Microcopris*, *Onthophagus*, and *Paragymnopleurus* (Scarabaeidae).

Macrocheles kraepelini (Berlese, 1905)

This species was described by Berlese (1905). Krantz and Filipponi (1964) redescribed and illustrated this species. The male and immature stages were described by Halliday (1986) and Walter and Krantz (1986a). *Macrocheles kraepelini* distributed widely in Pakistan, India, Thailand, Viet Nam, Malaya, Singapore, the Philippines, Samoa, Fiji, Caroline Island, Australia and Indonesia (Java, Sumatra, Kalimantan, Madura, Flores and Kupang).

Material examined: 56♀♀, Cibodas, Mount Gede-Pangrango National Park, S 06°44′30″ E 107°00′19″, 25-26 May 2004, Kahono, Lilik and Agus leg.; Selabintana, 24-25 May 2006, Hartini, Rofik and Darmawan leg.; 15 May 2010, Hartini and Dwibadra leg.; Situgunung, S 06°49′58″ E 106°55′18″, 18-19 April 2004, Kahono, Lilik and Agus leg.; Gunung Putri, S 06°27′ E 106°52′, 3-6 May 2004, Kahono, Lilik and Agus leg., *ex O.* (*O.*) *javensis*, *O.* (*O.*) *malangensis*, *O.* (*S.*) *blumei*, and unidentified species of the genus *Onthophagus*.

Macrocheles kraepelini has been collected from the scarabaeid beetles *C. dayacus*, *C. molossus*, *Copris incertus*, *C. punctipennis*, *Coptodactyla ducalis*, *Onitis fulcatus*, *Onthophagus dux*, *O. laevis*, *O. laminatus*, *O. schwaneri*, *O.* (*O.*) *cribratus*, *O.* (*O.*) *javaecola*, *O.* (*O.*) *javensis*, *O.* (*O.*) *malangensis*, *O.* (*O.*) *orientalis*, *O.* (*P.*) *accedens*, *O.* (*S.*) *mulleri*, *Paragymnopleurus maurus*, *Pachylister chinensis* (Histeridae), and unidentified species of genera *Catharsius*, *Copris*, *Onitis*, *Onthophagus*, *Paragymnopleurus* (Scarabaeidae), compost, and decaying forest litter.

Macrocheles pumilus Hartini, Dwibadra and Takaku, 2009

Macrocheles pumilus distributed only in Indonesia (West and Central Java) (Hartini *et al*., 2009).

Material examined: 7♀♀, Selabintana, Mount Gede-Pangrango National Park, S 06°52′14″ E 106°57′09″, 15 May 2010, Hartini and Dwibadra leg.; Situgunung, S 06°49′58″ E 106°55′18″, 18-19 April 2004, Kahono, Lilik and Agus leg., *ex Onthophagus* sp.

This species has been collected from scarabaeid dung beetles *O.* (*O.*) *javensis* and unidentified species of the genus *Onthophagus*.

Macrocheles sukabumiensis Hartini and Takaku, 2003

This species has been recorded from Indonesia (Java and Kalimantan) (Hartini and Takaku, 2003a).

Material examined: 3♀♀, 1130 m a.s.l., Selabintana, Mount Gede-Pangrango National Park, West Java, S 06° 52′14″ E 106°57′09″, 24-25 May 2006, Hartini, Rofik and Darmawan leg.; Situgunung, S 06°49′58″ E 106° 55′18″, 18-19 April 2004, Kahono, Lilik and Agus leg., *ex O.* (*S.*) *blumei* and unidentified species of the genus *Onthophagus*.

Macrocheles sukabumiensis has been collected from scarabaeid dung beetles *O. accedens*, *O. hirsutulus*, *O.* (*O.*) *javensis* and unidentified species of the genus *Onthophagus*.

Macrocheles sukaramiensis Takaku, 2001

This species was described by Takaku (2001) and has

been recorded from Indonesia (Java, Sumatra and Kalimantan) (Takaku, 2001; Hartini and Dwibadra, 2011).

Material examined: 2♀♀, Situgunung, Mount Gede-Pangrango National Park, S 06°49′58″ E 106°55′18″, 18-19 April 2004, Kahono, Lilik and Agus leg., *ex Onthophagus* sp.

Macrocheles sukaramiensis has been collected from the scarabaeid beetle belonging to genera *Catharsius*, *Copris*, *Onthophagus*, and *Paragymnopleurus*.

Macrocheles turgoensis Hartini, Dwibadra and Takaku, 2009

Macrocheles turgoensis was described by Hartini *et al*., 2009 and distributed only in Indonesia (West and Central Java).

Material examined: 3♀♀, Selabintana, Mount Gede-Pangrango National Park, S 06°52′14″ E 106°57′09″, 15 May 2010, Hartini and Dwibadra leg., *ex Onthophagus* sp.

This species has been collected from scarabaeid dung beetles *C. molossus*, *O.* (*O.*) *javensis* and species belonging to Scarabaeidae.

Holostaspella katakurai Hartini and Takaku, 2003.

This spesies was described by Hartini and Takaku, 2003c and distributed only in Indonesia (Kalimantan, Sumatra and Java).

Material examined: 16♀♀, 1130 m a.s.l., Selabintana, Mount Gede-Pangrango National Park, West Java, S 06° 52′14″ E 106°57′09″, 24-25 May 2006, Hartini, Rofik and Darmawan leg.; 15 May 2010, Hartini and Dwibadra leg., *ex O.* (*S.*) *blumei*, *Synapsis ritsemae* and species of the genus *Onthophagus*.

Holostaspella katakurai has been collected from scarabaeid dung beetles *C. molossus*, *O.* (*O.*) *blumei*, *P. maurus* and unidentified species of the genus *Onthophagus*.

Holostaspella oblonga Hartini and Takaku, 2010

Holostaspella oblonga was recorded from Indonesia (Java and Sulawesi) (Hartini and Takaku, 2010).

Material examined: 1♀, Selabintana, Mount Gede-Pangrango National Park, West Java, S 06°52′14″ E 106° 57′09″, 24-25 May 2006, Hartini, Rofik and Darmawan leg., *ex O.* (*O.*) *javensis*.

This species has been collected from *C. molossus*, *M. hidakai*, *O.* (*O.*) *javensis* and unidentified species of the genus *Copris*.

Holostaspella villosa Hartini and Takaku, 2010

Holostaspella villosa was described by Hartini and Takaku, 2010 and recorded from Indonesia (West Java).

Material examined: 1♀, Selabintana, Mount Gede-Pangrango National Park, West Java, S 06°52′14″ E 106° 57′09″, 24-25 May 2006, Hartini, Rofik and Darmawan leg., *ex O.* (*O.*) *malangensis*.

This species has been collected from scarabaid dung beetles *O.* (*O.*) *malangensis* and *O.* (*M.*) *meneiri*.

Neopodocinum halimunense Hartini and Takaku, 2003

This species was described by Hartini and Takaku, 2003b and recorded in Indonesia (Java and Kalimantan).

Material examined: 88♀♀, 8♂♂, 2 deutonymphs, 24 protonymphs, Cibodas, Mount Gede-Pangrango National Park, S 06°44′30″ E 107°00′19″, 25-26 May 2004, Kahono, Lilik and Agus leg.; Selabintana, S 06°52′14″ E 106°57′09″, 24-25 May 2006, Hartini, Rofik and Darmawan leg.; 15 and 20 May 2010, Hartini and Dwibadra leg., *ex O.* (*S.*) *blumei* and species of genus *Onthophagus*.

Neopodocinum halimunense has been collected from *C. molossus* and unidentified species of the genus *Onthophagus*.

Neopodocinum subjaspersi Hartini and Takaku, 2003

Neopodocinum subjaspersi was described from Indonesia (Hartini and Takaku, 2003).

Material examined: 15♀♀, 7♂♂, 7 deutonymphs, 3 protonymphs, 1130 m a.s.l., Selabintana, Mt. Gede-Pangrango National Park, S 06°52′14″ E 106°57′09″, 25-26 May 2004, Kahono, Lilik and Agus leg.; 24-25 May 2006, S. Hartini, Rofik and Darmawan leg.; Situgunung, S 06°49′58″ E 106°55′18″, 18-19 April 2004, Kahono, Lilik and Agus leg., *ex O.* (*O.*) *semigranosus*, *O.* (*S.*) *blumei* and unidentified species of the genus *Onthophagus*.

This species has been collected from scarabaid dung beetles *C. molossus* and unidentified species of the genus *Onthophagus*.

Neopodocinum sp.

Material examined: 1♂, 1130 m a.s.l., Selabintana, Mount Gede-Pangrango National Park, West Java, Indonesia, S 06°52′14″ E 106°57′09″, 24-25 May 2006, Hartini, Rofik and Darmawan leg., *ex Onthophagus* sp.

Remarks: The specimen of *Neopodocinum* sp. has a

unipartite epistome, which is a specific character of the genus *Neopodocinum*. The hypostomal setae (internal posterior hypostomal setae) are pilose and thick at base of its setae which clearly differentiates it from two other *Neopodocinum* species that were found in this project. Unfortunately, we could not identify this species because we only found a male specimen and most of the dorsal setae of the specimen were broken.

Discussion

In total, we collected 410 macrochelid mites belonging to three genera (*Macrocheles*, *Holostaspella* and *Neopodocinum*). The number of *Macrocheles dispar* specimens collected during this investigation was the largest (129 specimens) of any other species. *Macrocheles dispar* is a common species of macrochelid mite in Indonesia and is distributed widely on large islands of Indonesia (Hartini, 2005).

In this research, we found two genera of scarab beetles: *Onthophagus* and *Synapsis*. Five beetle species belonged to the genus *Onthophagus* (*Onthophagus* (*Onthophagus*) *cribatus*, *O.* (*O.*) *malangensis*, *O.* (*O.*) *semigranosus*, *O.* (*Suenaga*) *blumei*, and *O.* (*O.*) *javensis*), whereas only one, *Synapsis ritsemae* Lansberge, 1874, was in the *Synapsis* genus. This species belongs to family Scarabaeidae, subfamily Scarabaeinae, tribe Coprini, which is distributed in the Greater Sunda Islands (i. e. Java, Sumatra and Borneo) (Zidek and Pokorny, 2010). This is the first report of an association between macrochelid mites and *Synapsis* in Indonesia. Two mite species, *Holostaspella katakurai* and *Macrocheles gedeensis*, were found on *Synapsis ritsemae*, while the other mite species were found on beetle species in the genus *Onthophagus*.

More than 90% of the beetles collected belonged to the genus *Onthophagus*, which suggests that phoretic macrochelid mites may prefer beetles that are abundant in terms of number of individuals in a dung community. This observation supports previous research by Niogret *et al.* (2006) which suggested that overflow populations of *Onthophagus* beetles in a habitat may explain why *Onthophagus* is an effective host for macrochelid mites.

Holostaspella oblonga Hartini and Takaku, 2010 and *H. villosa* Hartini and Takaku, 2010 were associated with only one species of dung beetle each, *O.* (*O.*) *javensis* and *O.* (*O.*) *malangensis*, respectively. However, we could not conclude that this association is a specific host type association, since these species were collected from other species of beetles as well. Hartini and Takaku (2010) collected *H. oblonga* from *Catharsius mollosus*, *Microcopris hidakai* and *O.* (*O.*) *javensis*, while *H. villosa* was found on *O.* (*M.*) *meneiri* in Mount Ciremai National Park, West Java, Indonesia (Hartini, 2015).

A specific host type association may be exhibited by *Macrocheles gedeensis* sp. nov., which associated with one species of dung beetle, *Synapsis ritsemae*. The specialization of the mites is influenced by various factors such as environment determinants and the biology of the host (Hunter and Rosario, 1988, Schwarz *et al.*, 1996). A previous study reported that there were some morphological differences between specialist and generalist mites when morphometric comparisons were taken into account. Specialist mites had a larger body size and longer legs than generalist species. *Macrocheles gedeensis* exhibited the morphological character of the specialist mite in having larger body length (1021 μm) compared to generalist species such as *Macrocheles jabarensis* (736 μm) and *M. dispar* (698 μm).

Information regarding the basic biology, including behavior, of *Synapsis ritsemae* is limited. Therefore, further research is needed in order to determine the exact nature of the relationship between *Macrocheles gedeensis* and its host.

Key to macrochelid mites species associated with scarabaeid dung beetles in Mount Gede-Pangrango National Park (female only)

1. Epistome unipartite ····· 2
− Epistome tripartite ····· 3
2. Anal shield expanded triangularly as "ventrianal" shield and surface of shield strong punctation ····· ·····*Neopodocinum halimunense* Hartini and Takaku, 2003
− Anal shield not expanded and surface of shield smooth ····· *Neopodocinum subjaspersi* Hartini and Takaku, 2003
3. Anterior dorsal setae inserted on anterior protuberance of shield, femur II with spur ····· 4
− Not as above ····· 6
4. Ventrianal shield oval, reduce, Jv2-Zv2 preanal setae inserted on anterior edge of shield, 2 pairs of platelets located between epigynial and ventrianal shield ··· *Holostaspella katakurai* Hartini and Takaku, 2003
− Ventrianal shield longer than wide, Jv2-Zv2 not as above ····· 5
5. Base of coxae IV with fringe, preanal, paranal and postanal setae simple ····· ····· *Holostaspella oblonga* Hartini and Takaku, 2010
− Base of coxae IV without fringe; preanal and postanal setae pilose ····· ····· *Holostaspella villosa* Hartini and Takaku, 2010
6. Dorsal setae 29 pairs; most of dorsal setae plumose ··· *M. turgoensis* Hartini, Dwibadra and Takaku, 2009
− Dorsal setae 28 pairs ····· 7
7. Some dorsal setae entirely pilose or pectinate ····· 8
− Dorsal setae simple or pilose distally except for J5, which is pilose over its entire length ····· 10

8. Dorsal setae pectinate; except z1 simple; surface of dorsal shield with areolate pattern ····· ····· *M. sukabumiensis* Hartini and Takaku, 2003
− Most of dorsal setae entirely pilose ····· 9
9. Genu IV with seven setae, Most of dorsal setae pilose, except for simple j5, j6, z1, z5, z6 and J2; z1 not reaching insertions of j2; stenal shield with two l. arc., bifurcate l.o.p., and distinct punctations ····· ····· *M. hallidayi* Walter and Krantz, 1986
− Genu IV with six setae, Most of dorsal setae pilose; j5 with pilosity in most case; j6, z1, z5, z6, and J2 simple; sternal shield with two l.arc., bifurcate l.o.p., and distinct punctations ····· ····· *M. kraepelini* (Berlese, 1910)
10. Most of dorsal setae simple ····· 11
− Most of dorsal setae pilose distally ····· 12
11. Dorsal setae j1, j4, Z5, and S5 pilose distally; J5 pilose entirely; other setae simple ····· ····· *M. jabarensis* Hartini and Takaku, 2003
− Dorsal setae j1, r2, r3, Z4, Z5, S4, S5 pilose in distal half & two third; and J5 entirely pilose; other setae simple ····· ····· *M. pumilus* Hartini, Dwibadra and Takaku, 2009
12. Anterior half of sternal shield ornamented with symmetric weak reticulate pattern ····· ····· *M. sukaramiensis* Takaku, 2001
− Anterior half of sternal shield with one or two l.arc. ····· 13
13. Sternal shield with two l.arc.; epigynial setae pilose ····· *M. gedeensis* sp. nov.
− Sternal shield with one l.arc. ····· 14
14. Dorsal setae Z1, Z3, S1, and S2 pilose distally ····· ····· *M. entetiensis* Hartini and Takaku, 2005
− Dorsal setae Z1, Z3, S1, and S2 simple ····· ····· *M. dispar* (Berlese, 1910)

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References

Berlese, A. 1905. Acari nuovi. Manipulus IV (Acari do Giava). Redia 2:154-176.

Berlese, A. 1910. Lista di nuove specie e nuovi generi di Acari. Redia 6:242-271.

Blake, W. 1981. Special Habitats. In: R.A. Crowson (ed.). The Biology of the Coleoptera. Academic Press. pp. 457-481.

Halliday, R.B. 1986. Mites of the *Macrocheles glaber* group in Australia (Acarina: Macrochelidae). Australian Journal of Zoology 34(5):733-752.

Halliday, R.B. 1987. Further observations on the dorsal idiosomal chaetotaxy in the Macrochelidae (Acarina). International Journal of Acarology 13(1):51-53.

Halliday, R.B. 2000. The Australian species of *Macrocheles* (Acarina: Macrochelidae). Invertebrate Taxonomy 14: 273-326.

Hartini, S. 2005. Taxonomic and Biogeographic Study of the Family Macrochelidae (Acari: Gamasina) Associated with Dung Beetle (Insecta: Coleoptera: Scarabaeidae) in Indonesia. A Dissertation Ph.D. Hokkaido University, Japan. 217pp.

Hartini, S. 2015. Macrochelid mite in Mt. Ciremai National Park, West Java. Prosiding Seminar Nasional Biodiversitas, UNS 4(2):95-100.

Hartini, S. and D. Dwibadra. 2011. Monograph: Macrochelidae of Java. LIPI Press, Jakarta: xiii+95 pp.

Hartini, S. and G. Takaku. 2003a. Javanese species of the mite genus *Macrocheles* (Arachnida: Acari: Gamasina: Macrochelidae). Zoological Science 20(10):1261-1272.

Hartini, S. and G. Takaku. 2003b. Mites of Macrochelid Genus *Neopodocinum* (Arachnida: Acari: Gamasida: Macrochelidae) associated with dung Beetles in West Java, Indonesia. Species Diversity 8(1):47-65.

Hartini, S. and G. Takaku. 2003c. New species of *Holostaspella* (Arachnida: Acari: Macrochelidae) from Kalimantan. Species Diversity 8:347-351.

Hartini, S. and G. Takaku. 2005 in Hartini, S., G. Takaku, J. Kojima and H. Katakura. 2005. Macrochelid mite fauna in the eastern part of the Lesser Sunda Island, with descriptions of two new species. Entomological Science 8(2):201-209.

Hartini, S. and G. Takaku. 2010. Mites of the genus *Holostaspella* (Acari: Gamasida: Macrochelidae) in Indonesia. Entomological Science 13(1):107-115.

Hartini, S. and G. Takaku. 2012. Macrochelid mites (Acari: Mesostigmata: Macrochelidae) in Sempu Island, East Java, Indonesia. Journal of the Acarological Society of

Japan 21(1):7-14.

Hartini, S., D. Dwibadra and G. Takaku. 2007. Macrochelid mites (Acari: Gamasida: Macrochelidae) associated with dung beetles in Sulawesi, Indonesia. The Acarological Society of Japan 16(2):73-96.

Hartini, S., D. Dwibadra and G. Takaku. 2009. Mites of family Macrochelidae (Acari: Gamasida) associated with dung beetles in Mt Merapi National Park, Jogyakarta, Java, Indonesia. Entomological Science 12(4):416-426.

Hartini, S., D. Dwibadra and G. Takaku. 2012. Records of the *Macrocheles kraepelini* species complex (Acari: Macrochelidae) from Mount Ijen, East Java, Indonesia, with description of a new species. International Journal of Acarology 38(6):528-532.

Hartini, S., S. Kahono and G. Takaku. 2013. Macrochelid mite from a nest of honeybee *Apis dorsata dorsata* in Bogor Botanical Garden, Bogor, West Java, Indonesia. Treubia 40:47-59.

Hartini, S., D. Dwibadra, M. Ohara and G. Takaku. 2015. Macrochelid mites (Acari: Mesostigmata) associated with dung beetles in Baluran National Park, East Java, Indonesia. Treubia 42:23-36.

Hunter, P.E. and R.M.T. Rosario. 1988. Associations of Mesostigmata with other Arthropods. Annals Review of Entomology 33:393-417.

Krantz, G.W. 1967. A review of of the genus *Holostaspella* Berlese, 1904 (Acarina: Macrochelidae). Acarologia 9 (Suppl.):91-146.

Krantz, G.W. and A. Filipponi. 1964. Acari della famiglia Macrohelidae (Mesostigmata) nella collezione del South Australian Museum. Rivista di Parassitologia 25(1):35-54.

Lansberge, G.W. van. 1874. Deux espèces remarkables de Lamellicornes exotiques. Annales de la Société entomologique de Belgique (Compte Rendus) 17:143-144 (CXLIII-CXLIV).

Niogret, J., J.P. Lumaret and M. Bertrand. 2006. Review of the phoretic association between coprophilous insects and macrochelid mites (Acari: Mesostigmata) in France. Elytron 20:99-121.

Niogret, J., J.P. Lumaret and M. Bertrand. 2010. Generalist and specialist strategies in macrochelid mites (Acari: Mesostigmata) phoretically associated with dung beetles (Coleoptera: Scarabaeidae) in Trends in Acarology: Proceedings of the 12th International Congress. In: M.W. Sabelis and J. Bruin (eds.). XV+566 pp. DOI 10.1007/978-90-481-9837-5_55.

PHPA team. 2003. Guidebook 41 National Parks in Indonesia. Ministry of Forestry Republic of Indonesia, UNESCO and CIFOR. 168 pp.

Schwarz, H.H., K. Huck and P. Schmid-Hempel. 1996. Prevalence and Host Preferences of Mesostigmatic Mites (Acari: Anactinochaeta) Phoretic on Swiss Bumble Bees (Hymenoptera: Apidae). Journal of the Kansas Entomological Society 69(4), Supplement: Special Publication Number 2: Proceedings of the Eickwort Memorial Symposium: 35-42.

Takaku, G. 1998. Descriptions of immature stages and male of *Macrocheles hallidayi* Walter and Krantz, 1986 (Acari: *Macrocheles*). Journal of the Acarological Society of Japan 7(1):29-38.

Takaku, G. 2001. Macrochelid mites (Acari: Macrochelidae: *Macrocheles*, *Holostaspella*) associated with scarabaeid beetles in Sumatra, Indonesia. Tropics 10(3):497-507.

Takaku, G., and S. Hartini. 2001. Macrochelid mites (Arachnida: Acari: Macrochelidae: *Glyptholaspis*, *Macrocheles*, *Neopodocinum*) associated with dung beetles in Bali, Indonesia. Species Diversity 6(4):323-345.

Walter, D.E. and G.W. Krantz. 1986a. Description of the *Macrocheles kraepelini* species complex (Acari: Macrochelidae) with two new species. Canadian Journal of Zoology 64(1):212-217.

Walter, D.E. and G.W. Krantz. 1986b. A review of *glaber*-group (s.str.) species of the genus *Macrocheles* (Acari: Macrochelidae), and a discussion of species complexes. Acarologia 27(4):277-294.

Zidek, J. and S. Pokorny. 2010. Review of *Synapsis* Bates (Scarabaeidae: Scarabaeinae: Coprini) with description of a new species. Insecta Mundi 0142:1-21.

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