*Obuloides crinitus* sp. nov., sixth African species of the gall forming mites of the genus *Obuloides* Baker and Tuttle, 1975 (Acari: Tenuipalpidae), with a key to known species

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Obuloides crinitus sp. nov., sixth African species of the gall forming mites of the genus Obuloides Baker and Tuttle, 1975 (Acari: Tenuipalpidae), with a key to known species

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Abstract

A new species of Obuloides, Obuloides crinitus sp. nov., is described based on females and males collected from the galls and twigs of Grewia occidentalis (Tiliaceae) in South Africa. Obuloides crinitus is closely related to O. namibiensis and O. rajamohani but can be distinguished by the finely granulated shields, a character that no other species of this genus has. Another notable difference is the length of prodorsal setae v2, which are longer and more strongly serrated compared to the other species of this genus which have very short and mostly smooth setae. Males of this species lack setae d1. A key to known species is provided.

Keywords: flat mites, Obdulia, Obuloides, Tiliaceae, gall-forming mites, southern Africa

Introduction

Flat mites (Acari: Tenuipalpidae) represent some of the most economically important plant-feeding mite species in the world (Jeppson et al. 1975; Mesa et al. 2009; Beard & Ochoa 2011; Beard et al. 2015). The importance of flat mites as agricultural pests has increased significantly over the past four to five decades mainly because of their increasingly obvious quarantine importance (Gerson 2008; Childers & Rodrigues 2011; Beard et al. 2015). Flat mites of the genus Obuloides Baker and Tuttle, 1975 are, however, not well studied and their impacts as agricultural pests and importance in quarantine remains to be determined.

Prior to this study, only seven species of the genus Obuloides were recorded worldwide, of which five from southern Africa were recently described from Grewia flava and Grewia occidentalis (Tiliaceae) galls: one from Namibia—O. namibiensis Ueckermann, Theron and Tiedt, 2010, and four from South Africa—O. occidentalis Ueckermann, Theron and Tiedt, 2010, O. ruginosus Ueckermann, Theron and Tiedt, 2010, O. inquilinus Ueckermann, Theron and Tiedt, 2010, and O. flavae Ueckermann, Theron and Tiedt, 2010. Baker and Tuttle erected the genus in 1975, describing O. rajamohani in India from galls on Hibiscus sp. (Malvaceae) induced by eriophyte mites (Eriophyes hibisci). Corpuz-Raros (1978) added a second species, O. rimandoi, collected from galls on Grewia multiflora (Malvaceae) and Litsea perrottetii (Lauraceae) in the Philippines. The latter two species of Obuloides were recently re-described by Ueckermann et al. (2010).
Obuloides resembles the genera Larvacarus Baker & Pritchard, 1952, Obdulia Pritchard & Baker, 1958, Capedulia Meyer, 1979 and Krugeria Meyer, 1979, in the complete reduction of the palpi but differs in other characters (Meyer 1979; Latifi et al. 2018). The closest resemblance of Obuloides occurs between Obdulia and Capedulia; however it can be separated by two pairs of dorsocentral setae (c1 and d1) and five pairs of dorsolateral setae (c3, d3, e3, h1, and h2); and the venter devoid of shields in the genital-anal area. When Ueckermann et al. (2010) observed their new species and the types of O. rajamohani and O. rimandoi, they added that tarsi I and II lack solenidia in the females but each only bears a rod-like seta. However, in the males each of tarsi I and II does bear a solenidion. To date, these genera of the plant feeding flat mites are the only ones known to have been described from plant galls. Here we describe and illustrate the eighth species of the genus, Obuloides Baker and Tuttle, 1975, collected from the galls and twigs of Grewia occidentalis in South Africa.

Material and methods

Galls and twigs from Grewia occidentalis containing the new species were collected from Swellendam, Garden Route, South Africa. Individuals of the new species were observed and collected in galls and between the twigs. Specimens were slide mounted in Heinze’s PVA (Walter & Krantz 2009) and were then dried at 45–47 °C overnight. Slides were studied and illustrated using a drawing tube on a Zeiss Axioskop™ compound equipped with DIC and Phase Contrast. The hand drawings were cleaned and processed in Adobe Photoshop™ (Adobe Systems Incorporated, San Jose, California). Dimensions are listed for the holotype with variations in measurements of paratypes in brackets. The notation of the dorsal body setae follows Mesa et al. (2009) and Ueckermann et al. (2010), and all measurements are in micrometers (µm). Setae were measured from the setal base to the tip of the seta; distances between setae were measured between setal bases. Legs were measured from tip of tarsus to the end of trochanter. Where possible, holotype and paratype material of other species of the genus were observed and measured in the same way as the new species for comparison purposes. Body length includes gnathosoma, and was measured from the tip of the gnathosoma to the distal end of the body. Body width was measured as the distance between edges of the body above leg III.

Family Tenuipalpidae Berlese, 1913
Genus Obuloides Baker and Tuttle, 1975

Type species: Obuloides rajamohani Baker and Tuttle, 1975
Detailed diagnostic characters of the genus Obuloides are provided by Ueckermann et al., 2010.

Obuloides crinitus Maake & Ueckermann sp. nov. (Figures 1–11)

Diagnosis—This species is closely related to O. namibiensis and O. rajamohani as all three have one pair of genital setae; the female and male of the new species are characterized by the large granulated prodorsal shield; opisthosomal shields large and anteriorly granulated (granules not exceeding beyond setae c1 and c3), with line ornamentations which gives it a creased appearance; all dorsal
setae thick, serrated and very long; the dorsocentral setae, \(c1\), of female, the longest seta, about twice as long as first pair of prodorsal setae \(v2\), dorsocentral setae, \(d1\), absent in male.

**Female (n = 4)**—Length of body 180 (173–203); width 104 (100–120); lengths of legs: leg I 53 (58), leg II 46 (50–53), leg III 46 (50–53), leg IV 53 (58).

**Dorsum (Fig. 1)**—Prodorsal shield distinct, large and granulated, with setae \(v2\), \(sc1\), \(sc2\) and two pairs of eyes. Opisthosomal shield anteriorly granulated, with granules not exceeding beyond setae \(c1\) and \(c3\). Line ornamentations present giving a creased appearance. All dorsal setae thick, long and serrate, passing the base of setae next behind. The dorsocentral setae, \(c1\), longest, about twice size of prodorsal setae \(v2\).

Lengths of setae: \(v2\) 35 (23–36), \(sc1\) 47 (40–46), \(sc2\) 48 (44–45), \(c1\) 70 (60–63), \(c3\) 46 (40–42), \(d1\) 49 (47–48), \(d3\) 48 (45–48), \(e3\) 47 (47–49), \(h1\) 47 (50), \(h2\) 49 (51–52). Distances between dorsal setae: \(v2-v2\) 26 (25), \(sc1-sc1\) 49 (47–48), \(sc2-sc2\) 62 (65–66), \(c1-c1\) 19 (19–21), \(c3-c3\) 56 (59–64), \(d1-d1\) 8 (8), \(d3-d3\) 65 (66–67), \(e3-e3\) 54 (54–57), \(h1-h1\) 13 (14–15), \(h2-h2\) 33 (33–34).

**Venter (Fig. 2)**—Covered with lobed striae. Three pairs of ventral setae present, with first pair \((Ia)\) long 42 (38–40); distances between setae \(Ia-Ia\) 21 (21–25); \(3a\) and \(4a\) minute. Anogenital area with one pair each of \(ag\), \(g\) and two pairs of \(ps\) setae.

**Gnathosoma (Fig. 3)**—Rostrum narrows distally, palpi completely reduced, consisting of a solenidion and seta, solenidium clearly thicker than setae and not extending beyond anterior margin of rostrum. Peritremes each ending in a small bulb.

**Legs (Figs. 4–5)**—Leg chaetotaxy as follows: coxae 2-2-2-1; trochanters 1-1-1-1; femora 3-3-3-1; genua 1-1-0-0; tibiae 4-4-2-2; tarsi 6-6-4-5. Coxa III with two pairs of setae \((3b\) and \(3c)\).

**MALE (n = 2)**—Dimensions: Length of body 231–237; width 102–103; lengths of legs: Leg I 77–79, leg II 70–71, leg III 69–71, leg IV 76–79.

**Dorsum (Fig. 7)**—Body elongate-oval, gradually narrowing caudally into a slender blunt ending process, flanked by two pairs of short smooth stylets. Prodorsal shield smaller than opisthosomal shields; the former loosely granulated, with setae \(v2\), \(sc1\), \(sc2\) and two pairs of eyes. Opisthosomal shield only carries setae \(c1\) and \(c3\); line ornamentations giving a creased appearance. Dorsal setae same as females, except for setae \(h2\) which ends in a long, sharp point; opisthosomal setae \(h1\) shortest. The striae on the slender terminal end of the opisthosoma “spider-like; ends carrying two rather strong ‘stylets or setae’, flanked by a pair of minute setae.

Lengths of setae: \(v2\) 34–38, \(sc1\) 46–50, \(sc2\) 40–47, \(c1\) 70, \(c3\) 37–39, \(d3\) 38–41, \(e3\) 46–50, \(h1\) 24, \(h2\) 66–70. Distances between dorsal setae: \(v2-v2\) 23–24, \(sc1-sc1\) 42–45, \(sc2-sc2\) 59–61, \(c1-c1\) 24–26, \(c3-c3\) 58–60, \(d3-d3\) 64–66, \(e3-e3\) 56–57, \(h1-h1\) 11–12, \(h2-h2\) 33–35.

**Venter (Fig. 8)**—Covered with fine lobed striae. Three pairs of ventral setae present, with first pair \((Ia)\) very long 45–50; distances between setae \(Ia-Ia\) 24; \(3a\) and \(4a\) minute. Striae behind leg IV dark and pronounced, shows very thick ridges/folds with fine striae in between the ridges (Appendix 2). The opisthosomal setae ends with a pair of minute setae flanking a single strong stylet (Fig. 9).

**Gnathosoma**—Rostrum similar to that of female except that rudimentary palp bears a longer solenidion extending to the anterior margin of rostrum.

**Legs (Figs. 9–10)**—Chaetotaxy of coxa, trochanter and tibia are similar to that of female; femora 4-4-1-1; genua 2-2-0-0; tarsi 7(7)–7(7)-5-5.

**Aedeagus**—As depicted in Fig. 11, (see also Appendix 1).

**Deutonymph (n = 2)**—Dimensions: Length of body including gnathosoma 190–211, width 118–122. Lengths of setae: \(v2\) 44–40, \(sc1\) 47–48, \(sc2\) 46–47, \(c1\) 55–60, \(c3\) 43–50, \(d1\) 48–50, \(d3\) 44–50, \(e3\) 44–49, \(h1\) 48–50, \(h2\) 50–52. Distances between dorsal setae: \(v2-v2\) 26–27, \(sc1-sc1\) 52, \(sc2-sc2\) 72, \(c1-c1\) 19–23, \(c3-c3\) 62–65, \(d1-d1\) 8, \(d3-d3\) 73, \(e3-e3\) 62–63, \(h1-h1\) 16, \(h2-h2\) 39.
FIGURES 1–6, Obuloides crinitus sp. nov., female: 1. idiosoma—dorsal view; 2. venter; 3. rostrum; 4. leg I; 5. leg II; 6. deutonymph (anogenital area).
Dorsum—Dorsum mainly striate as in female. All dorsal setae long and serrate. Lengths of setae: v2 44–40, sc1 47–48, sc2 46–47, c1 55–60, c3 43–50, d1 48–50, d3 44–50, e3 44–49, h1 48–

**Venter (Fig. 6)**—Anogenital area with one pair each of ag, g, and ps setae.

**Legs**—Leg chaetotaxy: coxae 2-2-2-1; trochanters 1-1-1-0; femora 3-2-1-1; genua 0-0-0-0; tibiae 4-4-2-2; tarsi 6-6-4-5.

**Etymology**—“crinitus” derived from the Latin word translated “long—haired”, referring to the long dorsal setae of this species.

**Type materials**—The holotype female, three female, two male and two deutonymph paratypes from galls and twigs of Grewia occidentalis, 07 November 2016, Bontebok Chalets, Swellendam, Garden Route, South Africa, collected by Charmie Craemer. These are deposited in the National Collection of Arachnida, Agricultural Research Council, Biosystematics Division, Plant Health and Protection, Pretoria, South Africa, accession number ACY: 18/114.

**Remarks**

At first glance the new species, *O. crinitus*, may be confused with *O. rajamohani*, with the dorsum of both species almost completely covered with prodorsal and opisthosomal shields, and all dorsal setae long and serrated, except setae v2 shorter and smooth in *O. rajamohani*. The new species has a single pair of aggenital, genital and two pairs of pseudanal setae similar to *O. rajamohani* and *O. namibiensis*, but *O. crinitus* can be distinguished easily from these two by the finely granulated prodorsal and opisthosomal shields, a character that no other species of this genus has. Another notable unique character for the new species is the length of setae v2 (females: 23–36; deutonymph: 40–44; males: 34–38), which are longer and strongly serrated (setae v2 very short and smooth in other known species: females: 6–16; deutonymph: 4–9; males: 3–13 long, and not reaching the base of setae behind (sc1) (Ueckermann et al., 2010).

When comparing the distances between setae of all the southern African species, it was very clear that measurements between setae in this genus can be used as important taxonomic characters (see comparative materials). *Obuloides occidentalis*, for example, is clearly separated from the other species even with just the distances between setae. It shows the greatest separation between c3–c3 (83–86), e3–e3 (84–87), h2–h2 (64), and 1a–1a (26–28). It is observed in here that *O. ruginosus* and *O namibiensis* have the shortest c1–c1 distance (10–14) as compared to the other species with a higher distances (15–23), the highest recorded for *O. occidentalis*. The new species, *O. crinitus*, has the shortest d1–d1 (8) distance, followed by *O. ruginosus* and *O. namibiensis* (10–12), and then ranging from 14–26 in the other southern African species. The distance between h2–h2 of the new species for females (33–34) and males (33–35) is the shortest relative to the other species which range between 40–64. Although these measurements were not statistically tested for significance, they are indicative enough to suggest that with more individuals per species than were analysed in this study, morphometrics could be used in mite taxonomy and could allow quantitative description of the shape and form of mites.

**Key to the species of Obuloides** Baker & Tuttle, 1975 (based on females and males)

1. Female, venter with one pair of genital setae (g1 present, g2 absent) ............................... 2  
   - Female, venter with two pairs of genital setae (g1–2 present) ........................................ 4
2. Dorsal shields of female reduced, Prodorsal shield small, oval to round; setae v2, sc1,sc2 and eyes not on the shield .......................................................... O. namibiensis  
   - Female dorsum almost covered with two large shields; prodorsal shield large, v2, sc1, sc2 and eyes inserted on the shield ......................................................... 3
3. Dorsal shields granulated; opisthosomal shield anteriorly granulated (granules not exceeding beyond setae c1 and c3); prodorsal setae v2 long (23–36 long) ....................................... O. crinitus n. sp
Comparative materials: Based on the study of holotype and paratypes specimens, we supplement the descriptions presented in Ueckermann et al. (2010) with the following data:

**O. namibienisis:** Female: Distances between dorsal setae (Holotype; *Acy11/278)*: v2–v2 24 (23), sc1–sc1 38 (37–41), sc2–sc2 60 (58–63), c1–c1 10 (11–14), c3–c3 54 (56–58), d1–d1 11 (11–12), d3–d3 58 (60–62), e3–e3 54 (55), h1–h1 15 (16–19), h2–h2 40 (38–41); distances between ventral setae *la–la* 23 (21–22); lengths of legs: Leg I 70 (69–71), leg II 64 (62–68), leg III 64 (63–67), leg IV 71 (69–71).

**Male** (n = 1 paratype; *Acy11/278*): Distances between dorsal setae: v2–v2 27, sc1–sc1 41, sc2–sc2 70, c1–c1 18, e3–e3 79, d1–d1 24, d3–d3 79, e3–e3 70, h1–h1 25, h2–h2 48; distances between ventral setae *la–la* 20; lengths of legs: Leg I 96, leg II 84, leg III 84, leg IV 96.

**O. occidentalis:** Female: Distances between dorsal setae (Holotype; *Acy11/289)*: v2–v2 25 (19–25), sc1–sc1 49 (44–47), sc2–sc2 72 (71–73), c1–c1 22 (23), c3–c3 84 (83–86), d1–d1 25 (25–26), d3–d3 86 (85–88), e3–e3 85 (84–87), h1–h1 30 (28–30), h2–h2 64 (64); distances between ventral setae *la–la* 28 (26–27); lengths of legs: Leg I 65 (67–69), leg II 57 (59–60), leg III 58 (59–60), leg IV 65 (67–69).

**O. ruginosus:** Female: Distances between dorsal setae (Holotype; *Acy11/279)*: v2–v2 18 (18), sc1–sc1 38 (36), sc2–sc2 62 (56–58), c1–c1 12 (10), c3–c3 61 (60–61), d1–d1 10 (11), d3–d3 66 (68–71), e3–e3 63 (61–65), h1–h1 19 (16–17), h2–h2 46 (50); distances between ventral setae *la–la* 23 (19–21); lengths of legs: Leg I 75 (65–66), leg II 70 (55–57), leg III 70 (55–57), leg IV 75 (66–67).

**Male** (n = 1 paratype, *Acy11/282*): Distances between dorsal setae (measured in the present study; paratype (n = 1): v2–v2 16, sc1–sc1 35, sc2–sc2 70, c1–c1 19, c3–c3 68, d1–d1 20, d3–d3 73, e3–e3 62, h1–h1 14, h2–h2 42; distances between ventral setae *la–la* 20; lengths of legs: Leg I 82, leg II 74, leg III 75, leg IV 82.

**O. flavae:** Female: Distances between dorsal setae (Holotype; *Acy11/280* (n = 1 paratype, *Acy11/280*): v2–v2 20 (21), sc1–sc1 36 (37), sc2–sc2 59 (62), c1–c1 19 (17), c3–c3 64 (65), d1–d1 15 (17), d3–d3 67 (69), e3–e3 64 (60), h1–h1 22 (17), h2–h2 45 (45); ventral setae *la–la* 20 (21); lengths of legs: Leg I 66 (77), leg II 59 (72), leg III 58 (71), leg IV 67 (77).

**Male** (n = 1 paratype, *Acy11/280*): Distances between dorsal setae (measured in the present study; paratype (n = 1): v2–v2 22, sc1–sc1 40, sc2–sc2 57, c1–c1 21, c3–c3 71, d1–d1 24, d3–d3 72, e3–e3 53, h1–h1 11, h2–h2 47; distances between ventral setae *la–la* 14; lengths of legs: Leg I 73, leg II 62, leg III 61, leg IV 73.
O. inquilinus: Female: Distances between dorsal setae (Holotype; Acy11/283, Acy11/288) :

- $v_2$–$v_2$ 20 (20–22),
- $sc_1$–$sc_1$ 39 (39–41),
- $sc_2$–$sc_2$ 56 (63–66),
- $c_1$–$c_1$ 15 (15–18),
- $c_3$–$c_3$ 63 (66–70),
- $d_1$–$d_1$ 14 (14–16),
- $d_3$–$d_3$ 67 (71–72),
- $e_3$–$e_3$ 58 (65–67),
- $h_1$–$h_1$ 17 (17–20),
- $h_2$–$h_2$ 42 (47–50); distances between ventral setae $1a$–$1a$ 20 (20–21); lengths of legs:
- Leg I 74 (75–80),
- Leg II 65 (70–75),
- Leg III 66 (70–75),
- Leg IV 73 (75–80).

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References


Appendix

APPENDIX 1. A photograph of *Obuloides crinitus* sp. Nov., male: dorsal view showing the missing setae *d1* and aedeagus pointed by the arrow.

APPENDIX 2. A photograph of *Obuloides crinitus* sp. Nov., male: ventral view showing very thick ridges/folds with fine striae in between the ridges. Legs III and IV indicated.