Two Species of *Microcerella* (Diptera: Sarcophagidae) Found in Highland Arid Landscapes of Argentina, During Forensic Studies

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ABSTRACT Two species of *Microcerella* Macquart were obtained from pig and llama corpses during a decomposition field experiment in highlands desert landscapes of Catamarca, Argentina. We sampled four pig and two llama carcasses. *Microcerella antofagastensis* sp. nov. is described, and *M. quimaliensis* (Lopes, 1982) is redescribed. Illustrations of male and female terminalia of both species are provided and should allow a correct identification. Notes on the biology of both species are given.

KEY WORDS *Microcerella antofagastensis*, *Microcerella quimaliensis*, Sarcophaginae, llama decomposition, pig decomposition

Adult and immature stages of a variety of species of Sarcophagidae are associated with vertebrate carrion and dung. This behavior could be important in medical and forensic investigations. Although it is easy to distinguish Sarcophagidae from other Calyptratae, identification to species mainly relies on characters of the male genitalia, which can be very difficult for the nonspecialist (Pape 1996, Pape and Dahlem 2010). Many females in this family either are described poorly or lack description, and they are difficult to associate with described males. Previous works have emphasized rearing of immatures as the best way to associate males with females of the same species (Lopes 1973, Bänziger and Pape 2004, Mulieri et al. 2010, Pape and Dahlem 2010). Published decomposition field studies often do not include species level information on Sarcophagidae. This may be because of the difficulty involved in identifying the species.

The New World genus *Microcerella* Macquart currently encompasses 76 species (Pape 1996, Mulieri and Mariluis 2009, Mulieri et al. 2010), with a low proportion of females recognized and described (Lopes 1981, 1982). Natural feeding and breeding behavior of New World Sarcophagidae still are poorly known for most species. At present, the biology of *Microcerella* species is very poorly known. Based on specialized structures of larval instars and some fragmentary observations, previous authors have suggested saprophagous habits for these flesh flies, especially on dead invertebrates (Crouzel 1950, Lopes 1969). The records of *Microcerella* species breeding on vertebrate carcasses or from forensic studies are very few, and are restricted to tropical or humid areas of South America. All these records refer to a single species, *M. halli* (Engel 1931) (Moura 2004, Moretti et al. 2009). However, it is important to emphasize that the temperate and arid landscapes present in the Andean chains, where *Microcerella* richness seems to be especially high, have not been explored for necrophagous Sarcophagidae.

During the faunistic survey on flies of forensic importance breeding in pig carcasses in highland desert landscapes of Catamarca Province, Argentina, we collected a large number of sarcophagids. The aim of this work is to describe a previously unknown sarcophagid species; to redescribe *Microcerella quimaliensis* (Lopes), whose female was unknown; and to report the presence of adults and larvae of both species on corpses in the surveyed environments.

Materials and Methods

Study Area. The study was conducted in the Department Antofagasta de la Sierra, Catamarca Province, located in the eastern slope of the Andean chains at an altitude of >3,500 m (Fig. 1). Biogeographically, the site is situated in the southern portion of the Puna Province, corresponding to the South American transition zone (Morrone 2006). The Puna environment is a typical highland desert, with arid climate, intense solar radiation, high levels of temperature amplitude between day and night, low atmospheric pressure, low humidity, high evaporation, and rainfall range of 18–400 mm for the entire Argentinean Puna. The dominant vegetation consists of shrub steppe with *Acantholippia* sp. bushes and bare soil; other typical species are *Adesmia* spp., *Festuca orthophylla* Pilger, and *Stipa chrysophylla* Desvaux. There also are wet meadows, which are saturated with water a great part of the year,

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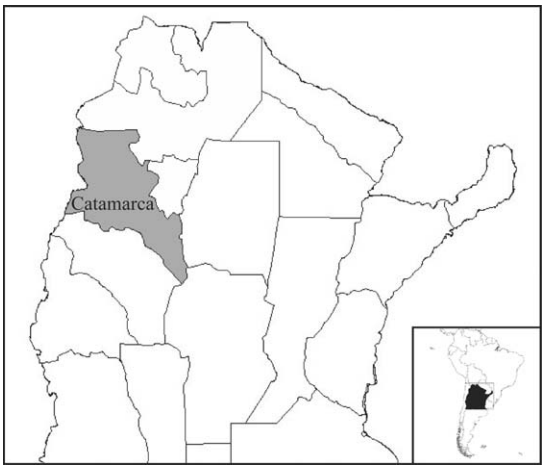


Fig. 1. Map of North Argentina illustrating Catamarca province where both *Microcerella* species were collected.

where dominant species are *Juncus* spp. *Cortaderia* spp., and *Scirpus atacamensis* Kuntze.

In this place we simultaneously placed two pigs (*Sus scrofa* L.) (60 d old, weighing approximately 17–18 kg) to study the decomposition process, one of them in direct sunlight (sunny pig), and the other in the shade (shady pig). In addition, a corpse of an llama (*Lama glama* L.) (180 d old, weighing 28 kg) was placed at a sunny location.

The three animals were slaughtered in the experimental field by the commercial slaughter method for each animal (pig killed by a stab in the heart, llama killed by sliced throats). Each body was placed inside a wooden cage covered with wire mesh (120 by 100 by 150 cm), which was placed on 5 cm of loose soil, previously mixed. Inside each wooden cage, a modified Malaise trap (an inverted funnel-shaped frame made with a fine mesh, with a container device on its top) was placed over the animal. The cages were separated from each other by a distance 100 m or more. The carcasses were sampled daily for 25 d from 17 November 2009 to 11 December 2009. Larvae were collected from the corpse with a punch. The punch is a plastic cylinder (35 cm^3) used to take a small portion of larval masses present in the bodies. One half of this sample was transferred to the laboratory for rearing and getting adults, the remaining half of the immatures were killed with hot water (80°–90°C) and were stored in alcohol 70% for subsequent studies. The adults were killed with acetone and stored in plastic containers for subsequent taxonomic examinations.

Additional and complementary samplings were performed on two newborn pig carcasses of 1 kg placed in a wet meadow, and on another corpse of an adult llama (weighing 30–40 kg) found in the vicinity of Salar del Hombre Muerto above 4,000 m. All these additional substrates were located within a radius of 100 km of the village Antofagasta de la Sierra. In these cases, only adults were sampled with an entomological net.

Taxonomic Work. Several male specimens collected were pinned and their terminalia were exposed based on techniques described by previous authors (Lopes 1973, Dahlem and Naczi 2006). This preparation allows the examination of phallic and other genitalic structures. The identification of males of *M. quimaliensis* was established using the original description (Lopes 1982).

To study the morphology of the female terminalia, the abdomen of selected specimens were detached and transferred to 90% lactic acid for 2 wk. After clearing, the genital structures were removed and transferred to concave glass slides with glycerine. After the study, the dissected parts were placed in a plastic microvial with glycerine and pinned under the specimen.

The terminology used for external morphology follows McAlpine (1981). The terminology used for genital structures of the male largely follows Sinclair (2000). Particularly, the features of the male distiphallus follow Giroux et al. (2010) except for the harpes (or lateral plates), that were interpreted in the sense of Mello-Patiu and Pape (2000). Terminology of the genital structures of the females follows Shewell (1987). Distance measurements between two points were obtained digitally with a Nikon DS-L1 camera control unit (Nikon, Tokyo, Japan) (m = mean, n = number of specimens measured). Illustrations were produced from photographs obtained with a Nikon DS-6M digital camera mounted on a Nikon SMZ 800 stereomicroscope. Body length of the males was measured from the antennal base to the posterior margin of abdominal tergite five as described by Giroux and Wheeler (2009).

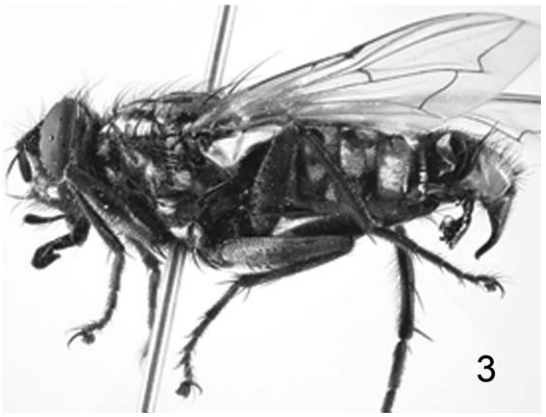
The following acronyms for specimen depositories are used in descriptions: Administración Nacional de Laboratorios e Institutos de Investigación "Dr. Carlos G. Malbrán", Departamento Vectores, Buenos Aires, Argentina (ANLIS); Instituto Argentino de Investigaciones de las Zonas Áridas, Mendoza, Argentina (IADIZA).

Label information of name-bearing types is given with individual lines separated by a forward slash (/) and individual labels separated by a double forward slash (//). The additional notes regarding the label data are given in square brackets.

Microcerella antofagastensis sp. nov.
(Figs. 2, 4, 6–14)

Male. (Fig. 2). Body length = 10–6.67 mm (m = 9.04 mm, n = 10).

Head. Head length at antennal base 1.04–1.27 (m = 1.14, n = 10) head length at vibrissal level. Parafacial and fronto-orbital plates with silvery microtomentum; parafacial plate with a row of setae (stronger at the lower part); fronto-orbital plate with sparse black setulae; postcranium with silvery microtomentum, the upper half of the postcranium (occiput) with black setulae; eyes bare; frontal vitta blackish with bronze tinge; frons at its narrowest point 0.13–0.21 (m = 0.19, n = 10) head width; 10–11 frontal setae, the row of



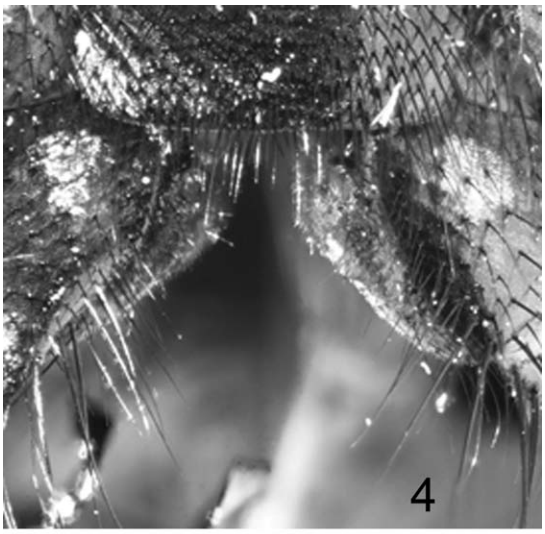
Figs. 2–3. Habitus of *Microcerella* (lateral view). (2) *M. antofagastensis* sp. nov. (3) *M. quimaliensis.*

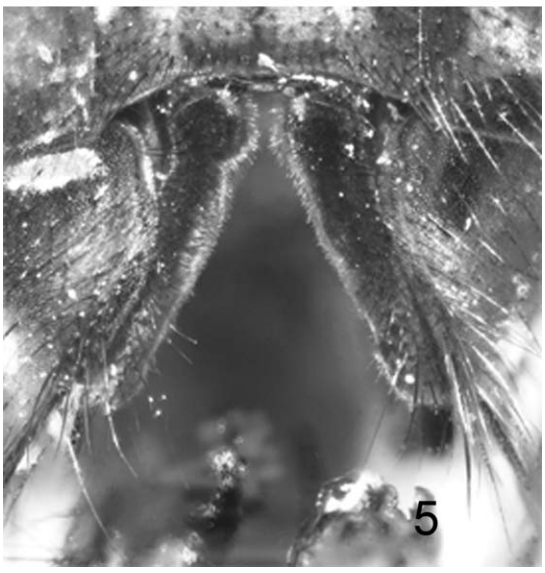
frontals diverging strongly at the level of pedicel; reclinate orbital setae present; inner vertical setae strong and reclinate, outer vertical setae 0.5× the inner vertical and divergent; ocellar triangle black with silvery microtomentum, with one pair of divergent and proclinate ocellar setae and supplementary setulae; post ocellar and paravertical setae present; postocular setae black in one row; genal groove and genal dilation with silvery microtomentum; postgena with silvery microtomentum; gena and postgena with black setae; face with silvery microtomentum; facial ridge black with silvery microtomentum, with setae and stronger setulae close to vibrissa and fine setulae reaching the lower half; 6–7 subvibrissal setae; antenna black, first flagellomere black with dark brown microtomentum, length 0.31–0.37 (m = 0.35, *n* = 10) head height, arista pubescent with hairs shorter than largest diameter of arista; palpus blackish with black setae.

Thorax. Black, with silvery microtomentum; prescutum and scutum with intermediate and lateral stripes with silvery microtomentum and three black bands; scutellum with intermediate stripes and apical spot of silvery microtomentum; postpronotal lobe, and anepimeron with spots of silvery microtomentum; notopleuron and anepisternum with spots of golden microtomentum; katepisternum with a spot of silvery microtomentum at upper half, and one spot of golden microtomentum on the inferior part; proepisternum silvery, bare. Chaetotaxy: 1–3 proepisternal setae, and one proepimeral setae not well differentiated, katepisternals three on the same level, postalar wall bare; acrostichals 2–3 (not well differentiated or weak) +0, dorsocentrals 3–4 + 3 (spaced for 3), intra-alars 1 + 2 (anterior pair weak), supra-alars 2 + 3 (the middle pair stronger), anterior postpronotal 1, basal postpronotal 2, postalars 2, notopleurals four (two big and two small); scutellum with two pairs of lateral scutellar setae, one pair of weak and cruciate apical sucutellar setae, and a pair discal setae. Wing hyaline, yellowish at basal part, tegula black, whitish basicosta, veins pale brown (yellowish at basal part), R_1 bare, R_{4+5} setulose in proximal 0.25 or less of distance to r-m, costal spine not differentiated, third costal sector without ventral setae, cell r_{4+5} open at wing apex, lower calypteres yellowish. Legs with coxae, trochanter, femora and tibiae with silvery microtomentum; middle trochanter without a ventral pad of short and stout spines; middle femur without posteroventral ctenidium on its apical portion, with rows of anterior, anteroventral and posteroventral setae; middle tibia with three anterdorsal setae, one anteroventral, two posterodorsal and one posterior setae; hind trochanter with a ventral pad of short and stout spines; hind femur with rows of anterodorsal, anterior, anteroventral and posteroventral setae; hind tibia with two anterodorsal setae, 1–2 anteroventral seta, and two posterodorsal setae; middle and hind femora, and hind tibiae somewhat villous; tarsi blackish.

Abdomen. Black; sternites exposed with silvery microtomentum; T1 + 2–T5 with dorsal spots of silvery microtomentum; T3–T4 with lateral spots of golden microtomentum; T1 + 2–T4 with one pair of lateral marginal setae; T5 with a complete row of marginal setae; ST2–ST4 with fine setae; ST5 V-shaped, brown, with internal lobes covered with bronze microtomentum and bearing setulae in apical (posterior) portion (Fig. 4).

Terminalia. Syntergosternite 7 + 8 shining black or dark brown, with a median spot of silver microtomentum, having a marginal row of three pairs of strong setae and some smaller basally black hair-like setae; epandrium orange reddish with black hair-like setae (stronger dorsally); cerci reddish with cercal base 1.48–1.84 (m = 1.69, *n* = 10) cercal prong (Fig. 6); cercus slightly curved forward with pointed apex in profile (Fig. 7); surstylus covered with somewhat long setae (Fig. 7); pregonite broad and curved with few setulae at base (Fig. 10); postgonite hook-shaped with one strong setae (Fig. 11); phallus with vesica flat and broad, forming a hemispherical dome in lateral view, with a pair of sclerotized spines in ventral surface (Fig. 8), and a shallow apico-median incision forming two lobes at apical margin; juxta (or apical plate) well developed with several paired structures: a bifid apicodorsal juxtal process (Fig. 9), a pair of less sclerotized juxtal lobes from the apico-lateral juxtal margins, involving the well-sclerotized internal extensions of the apico dorsal juxtal process (Fig. 8); lateral styli and median stylus exposed (lateral view), harpes (or lat-





Figs. 4–5. Male Sternite five (ventral view). (4) *M. antofagastensis* sp. nov. (5) *M. quimaliensis.*

eral plates) curved upward below the vesica in lateral view (Fig. 8).

Female. Body length = 6.44–9.99 mm (m = 8.79 mm, n = 10).

Head. Differs from the male by possessing a wider frons 0.34–0.38 (m = 0.36, n = 10) head width; two fronto-orbital proclinate setae; first flagellomere larger, length 0.40–0.47 (m = 0.44, n = 10) head height.

Thorax. Similar to male. Dorsocentrals 3 + 1 (preescutelar pair), intra-alars 1 + 0, one prepisternal seta strong and proepimeral setae absent. Scutellum without apical an discal setae.

Abdomen. Similar to male, somewhat broader.

Terminalia. Tergite six entire dorsally (Fig. 12), large and pointed in lateral view (Fig. 13), orange, covered with pale golden microtomentum at basal part and silvery microtomentum at distal part, with a complete row of small marginal setae and supplementary short marginal setulae (Figs. 12–13). Sternites covered by T6; ST6 wider than ST5, orange-reddish or blackish, with a row of marginal setae; ST 7 + 8 reddish, with a row of setae at midlegth, slightly convex beyond the row of setae (ST8), and with a flattened apical area covered with sparse microsetulae (Fig. 14); hypoproct rounded, membranous, not exposed (covered by Sternite 7 + 8) with few short setulae; cerci covered by setulae.

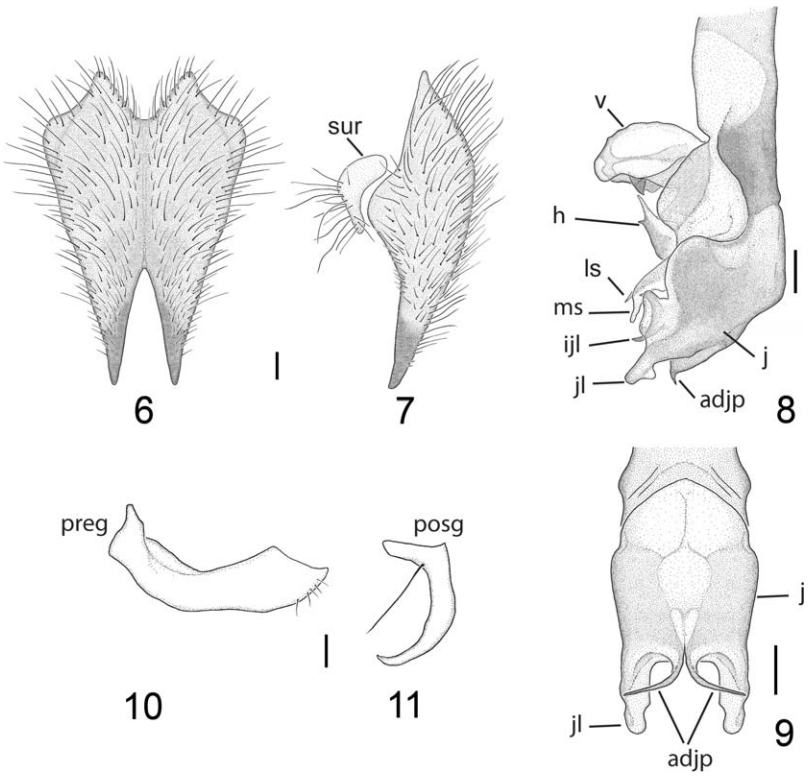
Type Material. HOLOTYPE: 1 ♂ (IADIZA), [obtained as larva, breeding on sunny pig carrion] "Argentina, Catamarca 8 km/NE Antofagasta de la Sierra/ 26° 01′32.3″ S 67° 20′36.5″ W/3,578 m.a.s.l., 25-XI-2009/ Sustr. Cerdo Sol Muestra L9A1/col: F. Aballay". Paratypes 1 ♂, 3 ♀ (ANLIS), [obtained as larva, breeding on shaded pig carrion] "Argentina, Catamarca 8 km/NE Antofagasta de la Sierra/26° 01′32.3″ S, 67° 20′36.5″ W/3,578 m.a.s.l., 25-XI-2009/Sustr. Cerdo Sol Muestra L9A1/col: F. Aballay [collector]".

Etymology. This species is named after the collection site of Antofagasta de la Sierra, Catamarca province, Argentina.

Material Examined. ARGENTINA. Catamarca: 8 ♀, Antofagasta de la Sierra, Punta de la Peña 26° 01′39.95″ S 67°20′35.95″ W, 3,578 m., 19-XI-2009 F. Aballay leg., on sunny pig carcass (IADIZA); 1 ♀, 64 km N Antofagasta de la Sierra 25° 35′28.2″ S 67°13′51.3″ W, 4,300 m, 20-XI-2009 F. Aballay leg. (IADIZA); 1 ♀, 34 km N Antofagasta de la Sierra 25° 49′44″ S 67° 17′04″ W, 4,143 m., 20-XI-2009 F. Aballay leg. (IADIZA); 4 ♀, 8 km NE Antofagasta de la Sierra 26° 01′36.73″ S 67°20′41.02″ W, 3,580 m., 30-XI-2009 F. Aballay leg., on sunny pig carcass (IADIZA); 3 ♂, 8 km NE Antofagasta de la Sierra 26° 01′33.4″ S 67° 20′42.5″ W, 3,585 m., 22–28-XI-2009 F. Aballay leg., obtained as larvae on carcass of llama (*Lama glama*) (ANLIS); 3 ♀, same data except (IADIZA); 1 ♂, 3 ♀, same data except XI–XII-2009, obtained as adult (ANLIS); 1 ♂, eight Km NE Antofagasta de la Sierra 26° 01′38.2″ S 67°20′31.6″ W, 3,595 m., 3-XII-2009 F. Aballay leg., on wet pig carcass (ANLIS); 2 ♀, same data except 7–8-XII-2009 (IADIZA); 9 ♂, 135 ♀, 8 km NE Antofagasta de la Sierra 26° 01′32.3″ S 67°20′36.5″ W, 3,578 m., XI–XII-2009 F. Aballay leg., obtained as adults on sunny pig carcass (IADIZA); 4 ♂, 3 ♀, same data except 22–25-XI-2009, obtained as larvae on sunny pig carcass (ANLIS); 11 ♂, 16 ♀, same data except 22–27-XI-2009 (IADIZA); 7 ♂, 181 ♀, 8 km NE Antofagasta de la Sierra 26° 01′38.2″ S 67°20′31.6″ W, 3,595 m., XI–XII-2009 F. Aballay leg., obtained as adult on shaded pig carcass (IADIZA); 16 ♂, 4 ♀, same data except 19–25-XI-2009, obtained as larvae on sunny pig carcass (ANLIS); 8 ♂, 25 ♀, same data except 22–28-XI-2009 (IADIZA); 13 ♀, same data except (IADIZA).

Distribution. Argentina: Catamarca.

Remarks. The new species is presumably close related to those *Microcerella* sharing similar features of phallic structures, such as the juxta constituted by slender paired projections or processes (e.g., *M.*



Figs. 6–11. Male terminalia of *M. antofagastensis* sp. nov. (6) Dorsal (or posterior) view of the cerci. (7) Lateral view of the cerci and surstylus. (8) Lateral view of the phallus. (9) Ventral (or apical) view of the phallus showing juxtal processes. (10) Lateral view of the pregonite. (11) Lateral view of the postgonite. Scale bars: 0.1 mm. Abbreviations: adjp, apico-dorsal juxtal process; ijp, internal juxtal process; h, harpes; j, juxta; jl, juxtal lobes; ls, lateral styli; ms, median stylus; posg, postgonite; preg, pregonite; sur, surstylus; v, vesica.

coniceti, *M. curicoensis*, *M. mallochi*), leaving the median stylus and lateral styli quite exposed in lateral view. Among this group of species, the sister-species of *M. antofagastensis* is *M. curicoensis*, which is very similar in its external and genitalic morphology. Both species posses a similar bifid apico-dorsal juxtal process with inner projections, being the latter structure misinterpreted as lateral plates by Lopes in the original description of *M. curicoensis* (see Fig. 45, Lopes 1982). In addition, the general shape of vesica (hemispherical or globose, in lateral view) are similar in both species. We have compared several specimens of *M. curicoensis* collected in Argentinean Patagonia (deposited in ANLIS). Comparatively, the males of the new species have larger and slender bifid juxtal projections (in apical view) than *M. curicoensis*. Moreover, *M. antofagastensis* have shorter internal projections of juxta, hardly visible beyond the ventral (anterior) margins of the juxta in lateral view. The cerci are shorter in the new species and not apically sinuous as in *M. curicoensis*, and the pregonite is broader apically.

Among the females, both species are almost indistinguishable, except by the shape of the posterior margin of ST 7 + 8 which is bilobed in the new species (Fig. 14) and rounded in *M. curicoensis*.

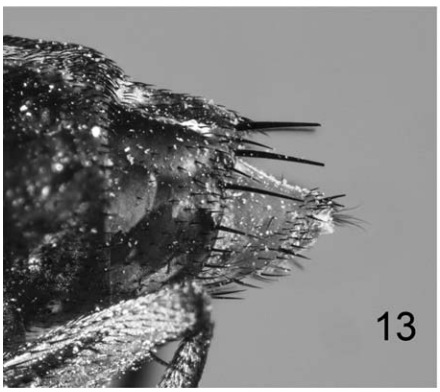
Microcerella quimaliensis (Lopes 1982)
(Figs. 3, 5, 15–22)

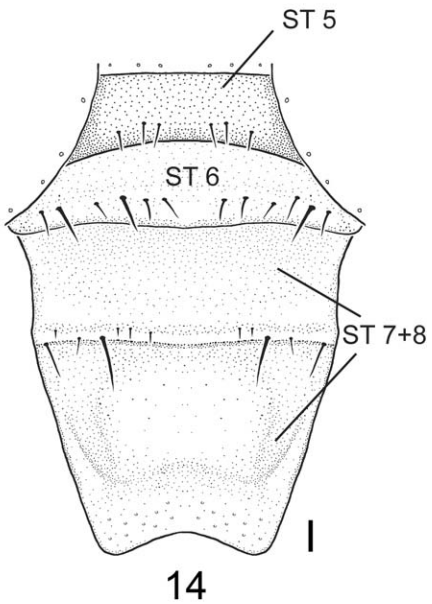
Penaisca quimaliensis Lopes 1982: 362 (key) and 365–367 + Figs. 47–53 (description). Chile: Atacama, Cerro Aguas Dulces, Quimal.

Microcerella quimaliensis; Pape 1990: 49 (new combination). Pape 1996: 257 (catalog).

Male. (Fig. 3). Body length = 9.06–10 mm (m = 9.49 mm, $n = 5$).

Head. Head length at antennal base 0.98–1.02 (m = 1.00, $n = 5$) head length at vibrissal level. Parafacial and fronto-orbital plates with silvery microtomentum; parafacial plate with a row of setae (stronger at the lower part); fronto-orbital plate with sparce black setulae; postcranium with silvery microtomentum and black setulae; eyes bare; frontal vitta blackish; frons at its narrowest point 0.20–0.27 (m = 0.22, $n = 5$) head width; 7–9 frontal setae, the row of frontals diverging strongly anteriorly at the level of pedicel; reclinate orbital setae present; inner vertical setae strong and reclinate (somewhat divergent), outer vertical setae 0.5x the inner vertical and divergent; ocellar triangle black with silvery microtomentum, with one pair of divergent and proclinate ocellar setae and supplemen-





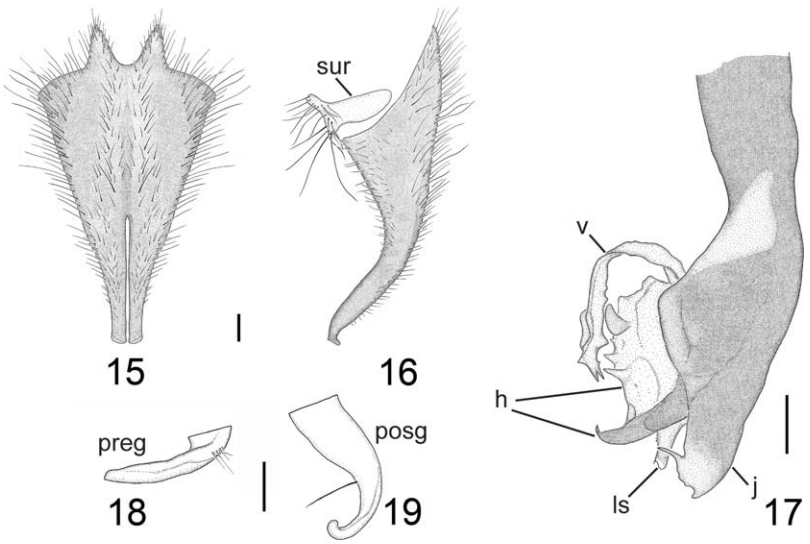
Figs. 12–14. Female terminalia of *M. antofagastensis* sp. nov. (12) Dorsal view. (13) Lateral view. (14) Sternites of the terminalia. Scale bars: 0.1 mm. Abbreviations: ST, sternite.

tary setulae; post ocellar and paravertical setae present; postocular setae black in one row; genal groove and genal dilation with silvery microtomentum; postgena with silvery microtomentum; gena and postgena with black setae; face with silvery microtomentum; facial ridge black with silvery microtomentum, with setae and stronger setulae close to vibrissa and fine setulae reaching the lower half; 6–7 subvibrissal setae; antenna black, first flagellomere black with dark brown microtomentum, length 0.29–0.37 (m = 0.34, $n = 5$) head height, arista pubescent with hairs shorter than largest diameter of arista; palpus blackish with black setae.

Thorax. Black, with silvery microtomentum; prescutum and scutum with intermediate and lateral stripes with silvery microtomentum and three black bands; scutellum with intermediate stripes and apical spot of silvery microtomentum; postpronotal lobe, notopleuron, anepimeron, anepisternum and katepisternum with spots of silvery microtomentum; proepisternum silvery, with black setulae on anterior part. Chaetotaxy: 3–4 proepisternal setae (one stronger, and well developed), and one proepimeral setae, katepisternals three on the same level, postalar wall bare; acrostichals 0 + 0, dorsocentrals 3 + 3 (spaced for 3), intra-alars 1 + 2, supra-alars 1 + 3 (the middle pair stronger), anterior postpronotal 1, basal postpronotal 2, postalars 2, notopleurals four (two big and two small); scutellum with two pairs of lateral scutellar setae, one pair of apical sucutellar setae, and a pair of discal setae. Wing hyaline, yellowish at basal part, tegula black, whitish basicosta, veins brown distally, yellowish at basal part with stem vein blackish, R_1 bare, R_{4+5} setulose in proximal 0.3 or less of distance to r-m, costal spine not differentiated, third costal sector without ventral setae, cell r_{4+5} open at wing apex, lower calypteres orange-yellowish. Legs with coxae, trochanters and femora with silvery microtomentum; middle trochanter without a ventral pad of short and stout spines; middle femur without posteroventral ctenidium on its apical portion, with rows of anterior, anteroventral and posteroventral setae; middle tibia with two anterdorsal setae, one ventral, and two posterodorsal; hind trochanter with a with a ventral pad of short and stout spines; hind femur with rows of anterodorsal, anterior, anteroventral and posteroventral setae; hind tibia with three anterodorsal setae, one anteroventral seta, and 2–3 posterodorsal setae; hind femora tibiaewith long hairs on anterior surface; tarsi blackish.

Abdomen. Black; sternites exposed with silvery microtomentum; T1 + 2–T5 with dorsal spots of silvery microtomentum; T3–T5 with lateral spots of golden microtomentum; T1 + 2–T4 with one pair of lateral marginal setae; T5 with a complete row of marginal setae; ST2–ST4 with fine setae; ST5 V-shaped, black, covered on inner margin with bronze microtomentum, with basal ventral lobes, and bearing long setulae (Fig. 5).

Terminalia. Syntergosternite 7 + 8 shining black, with a median spot of silver microtomentum, having a marginal row of three pairs of strong setae and some smaller basally black hair-like setae; epandrium orange reddish with black hair-like setae (stronger dorsally); cerci with cercal base 0.85–1.22 (m = 1.08, $n = 5$) cercal prong (Fig. 15); cercus, blackish, strongly



Figs. 15–19. Male terminalia of *M. quimaliensis*. (15) Dorsal (or posterior) view of the cerci. (16) Lateral view of the cerci and surstylus. (17) Lateral view of the phallus. (18) Lateral view of the pregonite. (19) Lateral view of the postgonite. Scale bars: 0.1 mm. Abbreviations: h, harpes; j, juxta; ls, lateral styli; posg, postgonite; preg, pregonite; sur, surstylus; v, vesica.

curved forward covered with fine setulae (Fig. 16); surstylus small with few apical setae somewhat longer (Fig. 16); pregonite curved with small setulae in basal part (Fig. 18); postgonite hook shaped with one strong setae (Fig. 19); phallus with vesica flattened and curved with a median incision forming two apical lobes, bearing few spines at apical ventral surface; juxta (or apical plate) well developed and sclerotized, deeply cleft (in dorsal view) with slender process at ventral (anterior) margin (Fig. 17); lateral styli tubular with microserration, projected downward, and median stylus not exposed (lateral view), harpes (or lateral plates) complex, with strongly sclerotized hook-shaped process at distal part, and a less sclerotized but well developed basal part bearing spines and small lobes (Fig. 17).

Female. Body length = 8.54–10 mm (m = 9.03 mm, n = 10).

Head. Differs from the male by possesing a wider frons 0.34–0.40 (m = 0.37, n = 10) head width; one well differentiated fronto orbital proclinate setae; first flagellomere larger, length 0.35–0.46 (m = 0.41, n = 10) head height.

Thorax. Similar to male. Dorsocentrals 3 + 1 (preescutelar pair), intra-alars 1 + 1, 1–3 prepisternal seta and one strong proepimeral setae. Scutellum without apical and discal setae.

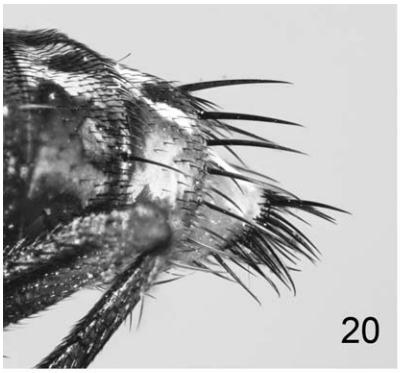
Abdomen. Similar to male, somewhat broader.

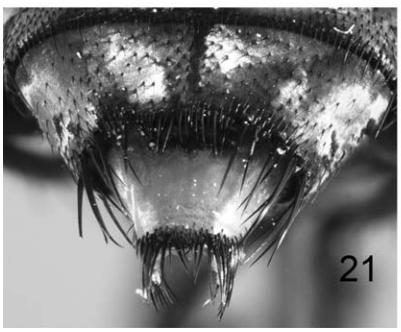
Terminalia. Tergite six entire dorsally (Fig. 20), large and pointed in lateral view (Fig. 20), black at basal part, orange at distal part, covered with silvery microtomentum, with a complete row of strong and long marginal setae (Figs. 20–21). Sternites covered by T6; ST6 wider than ST5, orange-reddish, with a row of marginal setae; ST7 + 8 orange-reddish (sometimes darker at basal part), with a row of setae at midlength, distal part of ST7 + 8 with a median hump covered with setulae, and flattened areas at laterals (with few setulae) (Fig. 22); hypoproct rounded, membranous, not exposed (covered by ST7 + 8) with few longer setulae at posterior margin; cerci covered by setulae.

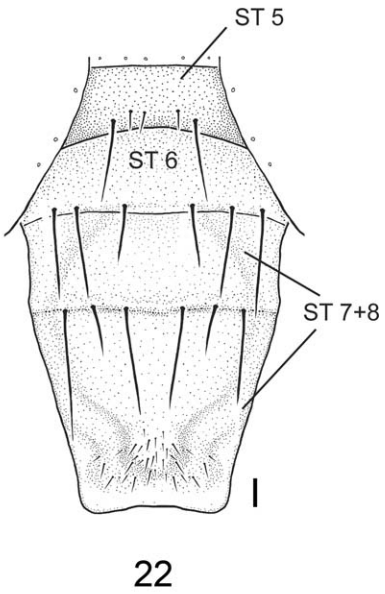
Material Examined. Argentina: Catamarca: 2 ♀, 8 km S Salar del Hombre Muerto 25° 32′57.5″ S, 67°05′40.7″ W, 4,108 m, 27-XI-2009 F. Aballay leg., on carcass of llama (*Lama glama*); 4 ♀, 8 km NE Antofagasta de la Sierra 26° 01′36.73″ S, 67°20′41.02″ W, 3,580 m, 30-XI-2009 F. Aballay leg., on sunny pig carcass; 2 ♀, same data except 26° 01′38.2″ S 67° 20′31.6″ W, 3,595 m, 27-XII-2009 on shaded pig carcass (IADIZA); 1 ♀, 64 km N Antofagasta de la Sierra 25° 35′28.2″ S, 67°13′51.3″ W, 4,300 m, 20-XI-2009 F. Aballay leg. (IADIZA); 3 ♂, 1 ♀, 8 km NE Antofagasta de la Sierra 26° 01′38.2″ S, 67° 20′31.6″ W, 3,595 m, 5-XII-2009 F. Aballay leg., on wet pig carcass (ANLIS); 4 ♀, 8 km NE Antofagasta de la Sierra 26° 01′33.4″ S, 67° 20′42.5″ W, 3,585 m, 21-XI-2009 F. Aballay leg., obtained on carcass of llama (*Lama glama*), (ANLIS); 1 ♀, same data except 28-XI-2009 (IADIZA); 1 ♀, same data except 2-XII-2009 (ANLIS); 1 ♀, same data except 26° 01′32.3″ S, 67° 20′36.5″ W, 3,578 m, 23-XI-2009 obtained as larvae on sunny pig carcass (IADIZA); 2 ♂, same data except 24–25-XI-2009 (ANLIS); 57 ♀, obtained as adults, same data except, 20–30-XI-2009 (IADIZA); 8 ♀ same data except 2–10-XII-2009 (IADIZA); 4 ♂, 5 ♀, km NE Antofagasta de la Sierra 26° 01′38.2″ S, 67° 20′31.6″ W 3,595 m, XI–XII-2009, F. Aballay leg., obtained as larvae on shady pig carcass (ANLIS); 10 ♂, 8 ♀, same data except (IADIZA); 1 ♂, 2 ♀, obtained as adults, same data (ANLIS); 36 ♀, same data (IADIZA).

Distribution. Argentina: Catamarca (new record); Chile: Atacama.

Remarks. This species was known previously by its original description based on a single male from Quimal (23° 02′ S 68° 50′ W), Atacama province







Figs. 20–22. Female terminalia of *M. quimaliensis*. (20) Dorsal view. (21) Lateral view. (22) Sternites of the terminalia. Scale bars: 0.1 mm. Abbreviations: ST, sternite.

(Chile) obtained at 3,000 m. (Lopes 1982). Specimens of *M. quimaliensis* are separated easily from *M. antofagastensis* by the absence of acrostichals setae and by the silvery coloration of the pleural spots. However, the shape of the cerci (very long and curved) and the features of phallic structures herein redescribed provide good diagnostic characters to identify it among the *Microcerella* species.

Discussion

The repeated catches of high number of adults and larvae of *M. antofagastensis* and *M. quimaliensis* during pig and llama decomposition provide strong evidence that both species are true flesh-consumers on large vertebrate carcasses. Large larval masses occurred in the cranium, thorax, abdomen, and anus in pig carcasses. In llama carcass, larvae were collected only in cranium and thorax. Both species were captured as larvae or adults on pig carcasses. Adults of both species were obtained on llama carcasses, but only *M. antofagastensis* were collected as larvae from this substrate. This finding is important because there are only a few records of sarcophagids breeding in large vertebrate corpses in the Neotropics (Pape and Dahlem 2010).

In contrast to the very well-documented calliphorid flies, the Sarcophagidae are poorly studied as forensic tools. The emergence of both sarcophagid species from our study animals constitutes the first report on sarcophagids of forensic importance in desert landscapes of southern South America. In Brazil, previous studies on insects of medico-legal importance typically have reported species of *Helicobia*, *Oxysarcodexia*, *Peckia*, *Sarcodexia*, and *Sarcophaga* associated with pig carcasses in the decomposition process (Carvalho et al. 2000, Barros et al. 2008, Barbosa et al. 2009). In addition, a single study undertaken in Colombia, in the "paramo" landscape at 3,000 m., reported the presence of specimens of the genus *Microcerella* (Martinez et al. 2007). The few previous records of *M. halli* breeding on vertebrate carcasses were obtained from small corpses such as rats (Moura 2004) or snakes (Moretti et al. 2009), but colonization of small corpses appears to be more common among sarcophagids than colonization of large corpses. The few taxonomic keys referred to flies of forensic importance have included the genus *Microcerella* on the basis of this fragmentary information (Carvalho and Mello-Patiu 2008, Buenaventura et al. 2009).

In Argentina only two species, *Sarcophaga* (*Liopygia*) *argyrostoma* (Robineau-Desvoidy, 1830) and *S.* (L.) *crassipalpis* Macquart, 1839 were obtained by Oliva (1997) in forensic cases. For the rest of the studies on Argentinean carrion flies, the identification of Sarcophagidae has reached, at most, the genus level (Battán Horenstein et al. 2005, 2010; Aballay et al. 2008). Our results are the first report of *Microcerella* species of forensic importance in southern South America.

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