

RECOGNITION OF *MEGASELIA ARIZONENSIS* (MALLOCH, 1912) (DIPTERA: PHORIDAE), A COMMON NORTH AMERICAN FLY¹

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ABSTRACT. Many specimens of the common North American phorid fly, *Megaselia arizonensis* (Malloch), are currently unidentifiable using the revision of Borgmeier (1964) because of errors in the redescription and key. These errors are corrected, the key revised, and the male genitalia of this species illustrated for the first time, making this species easy to recognize.

INTRODUCTION

The phorid fly genus *Megaselia* Rondani is an extremely large group of small, poorly known flies. Worldwide, *Megaselia* includes about 1,600 species, roughly 40% of the known Phoridae. Their small size makes identification challenging, but progress has been made, especially by Disney (e.g., 1989), who has been slide-mounting specimens for closer scrutiny.

Disney's work on *Megaselia* is global in scope, but it is most intensive on European species. The last major revision of Nearctic Region species was that of Borgmeier (1964, 1966), which has been supplemented by works listed in Disney (1994) and some others by Disney and various colleagues (Disney et al., 2009; Disney and Rettenmeyer, 2007; Disney et al., 2011; Reeves and Disney, 1999; Stoepler and Disney, 2013).

Recently, we began a project on urban biodiversity in Los Angeles, California, after making some surprising early discoveries of new range extensions (Disney and Brown, 2009). This work has necessitated the extensive use of Borgmeier's keys, and we have uncovered errors in his work that confuse the recognition of some species. In particular, as has been noted by Disney, over-reliance on characters that vary among individual flies, such as wing vein ratios and halter color (Disney, 1980), makes the identity of many specimens of some species almost impossible. One such problematic species is *Megaselia arizonensis* (Malloch), the subject of this report.

MATERIALS AND METHODS

Specimens were collected as part of the Biodiversity Science: City and Nature (BioSCAN) project, in which Malaise traps (of the type described by Townes, 1972) were operated in Los Angeles backyards across a "natural" to urban gradient. Ninety-five percent ethanol was used as a killing and preservation agent. Some specimens were cleared with cold 10% KOH overnight, neutralized with 5% acetic acid, dehydrated in 95% ethanol and clove oil, and slide mounted in Canada balsam. All are deposited in the collection of the Natural History Museum of Los Angeles County (LACM).

Wing measurements were made with an eyepiece micrometer in a dissecting microscope. Costal division 1 is the distance from the humeral crossvein to R₁ (Fig. 1), division 2 is R₁ to R₂₊₃, and division 3 is from R₂₊₃ to the end of the costa. Attempting to get more precision in these measurements requires further conventions, as at higher magnifications wing veins appear thick, and starting points for measurements need to be established. Following Schmitz (1938), we consider costal division 1 to begin at the anterior margin of the humeral cross vein and to end at the

anterior margin of vein R₁ where it meets the costa. Division 2 begins at the anterior margin of vein R₁ and ends at the anterior margin of R₂₊₃. Division 3 begins at the anterior margin of R₂₊₃ and ends at the base of the last costal seta (Fig. 1).

SYSTEMATICS

Megaselia arizonensis (Malloch)

Aphiochaeta arizonensis Malloch, 1912, p. 478. - Brues, 1915, p. 112.

Megaselia (*Aphiochaeta*) *arizonensis*: Borgmeier, 1964, p. 265 (key), 336, figs. 93, 100.

HOLOTYPE. ♂, USA: "Arizona: Williams, 30, 6, H.S. Barber Collector, Type No. 14870" (Smithsonian Institution; examined, remounted in Canada balsam on a glass slide). According to Borgmeier (1964), the collection date for the specimen is 30 June 1901.

NEWLY EXAMINED SPECIMENS. USA: California: Los Angeles County: Burbank, 34.17°N, 118.308°W, 2♂, 1–8 Feb 2014, BioSCAN site 21, C. Cianci, Malaise trap 15664; Carthay, 34.059°N, 118.369°W, 2♂, 28 Jan–4 Feb 2014, BioSCAN site 19, T. Dahl, Malaise trap 15593; Elysian Park, 34.078°N, 118.234°W, 2♂, 1–8 Feb 2014, BioSCAN site 14, E.&V. Harding, Malaise trap 15640; Exposition Park, 34.018°N, 118.289°W, 1♂, 14–21 Feb 2014, BioSCAN site 1, L. Gonzalez and D. Pentcheff, Malaise trap 15623; Glendale, 34.149°N, 118.218°W, 5♂, 1–8 Feb 2014, BioSCAN site 13, K. Hoffman, Malaise trap 15676; Los Feliz, 34.116°N, 118.279°W, 4♂, 1–8 Feb 2014, BioSCAN site 6, J. and A. Koch, Malaise trap 15572; mid-Wilshire, 34.058°N, 118.328°W, 1♂, 1–8 Feb 2014, BioSCAN site 26, P. Lombard, Malaise trap 15606; Silver Lake, 34.102°N, 118.257°W, 1♂, 1–8 Feb 2014, BioSCAN site 7, J. Hogg, Malaise trap 15645.

RECOGNITION. In his redescription of this species, Borgmeier (1964) noted that it had a ventral pair of setose projections on abdominal segment 6 (Fig. 4; also illustrated by Borgmeier, 1964, fig. 99). We were puzzled when many of our recently collected specimens bearing this character keyed to *Megaselia cirriventris* Schmitz, 1929, a species known only from Greenland and Europe, and whose male genitalia (figured in Schmitz, 1958: 476, fig. 261; redrawn herein as Fig. 2, lower) differed from those of our specimens. The division separating the paths of these two species in Borgmeier's (1964) key is couplet 15 on page 265, which contrasts "first costal division about twice as long as 2+3" (leading towards *M. cirriventris*) with "first costal division shorter than double 2+3" (leading towards *M. arizonensis*). In his redescription of *M. arizonensis*, Borgmeier wrote of the costal divisions "15: 5: 4," making division 1 (15 units) shorter than

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Table 1 Measurements of some specimens of *Megaselia arizonensis*. Bold text indicates specimens with $C1 < 2(C2+C3)$. Abbreviations: C1, costal division 1; C2+3, costal divisions 2+3; HT, holotype.

LACM ENT #	Specimen Locality	C1	C2+3	Ratio
322134	Williams, AZ (HT)	3.9	1.9	C1>2(C2+C3)
322135	Big Pines, CA	4.1	1.7	C1>2(C2+C3)
322136	Burbank, CA	3.8	2	C1<2(C2+C3)
322137	Burbank, CA	4.4	2.2	C1=2(C2+C3)
322139	Carthay, CA	4.1	2.3	C1<2(C2+C3)
322140	Carthay, CA	3.8	1.9	C1=2(C2+C3)
322146	Elysian Park, CA	5.2	2.5	C1>2(C2+C3)
322147	Elysian Park, CA	3.4	1.7	C1=2(C2+C3)
322138	Elysian Park, CA	3.9	2.1	C1<2(C2+C3)
322148	Exposition Park, CA	3.8	2	C1<2(C2+C3)
322141	Glendale, CA	4	2.1	C1<2(C2+C3)
322142	Glendale, CA	4.1	2.3	C1<2(C2+C3)
322143	Glendale, CA	4.1	2.3	C1<2(C2+C3)
322145	Glendale, CA	4.4	2.3	C1<2(C2+C3)
322149	Los Feliz, CA	4.1	2.2	C1<2(C2+C3)
322151	Los Feliz, CA	3.5	2.2	C1<2(C2+C3)
322152	Los Feliz, CA	4.1	2.1	C1<2(C2+C3)
322150	Los Feliz, CA	3.9	1.9	C1>2(C2+C3)
322153	Mid-Wilshire, CA	3.9	2.1	C1<2(C2+C3)
322154	Montecito Heights, CA	3.5	1.9	C1<2(C2+C3)
322155	Montecito Heights, CA	4.1	1.9	C1>2(C2+C3)
322156	Montecito Heights, CA	3.7	1.9	C1<2(C2+C3)
322157	Montecito Heights, CA	3.6	1.8	C1=2(C2+C3)
322158	Montecito Heights, CA	3.3	1.8	C1<2(C2+C3)
322159	Silverlake, CA	3.7	1.8	C1>2(C2+C3)
322160	Evansville, IN	3.1	1.5	C1>2(C2+C3)
322161	East Lansing, MI	4.5	2.6	C1<2(C2+C3)
322162	Bear Mountain, NY	3.8	2	C1<2(C2+C3)
322163	Lake Chelan, WA	3.1	2	C1<2(C2+C3)

double 2+3 ($5 + 4 = 9 \times 2 = 18$). The figured specimen was one from Lake Chelan, Washington state. We examined the holotype of this species, however, and measured division 1 as 4.7 units and divisions 2+3 as 2.2 units (Table 1). Since 4.7 units is longer than double 2.2 units (4.4 units), the holotype specimen itself would not key to the correct species! We also measured an assortment of specimens from elsewhere in this species' range, some of which had division 1 longer than twice 2+3, others in which division 1 was subequal to double 2+3, and still others with division 1 shorter than 2+3. Only some of these would pass couplet 15.

In order to minimize the possibility of future misidentifications in this group, we examined and illustrated the male genitalia of our specimens (Fig. 2, upper) and compared them with the genitalia of the holotype. All have the same structure, confirming that our specimens are indeed *Megaselia arizonensis*. It is a common dark brown phorid (Fig. 3), frequently collected in our urban survey, and it is distributed widely in the USA (a full list of state records is given by Borgmeier, 1964).

For future users of Borgmeier's key, we offer the following modifications for page 265:

- 16. Venter of segment 6 with pair of projections bearing small sclerites and tuft of bristlelike setae, one on each side of midline (Figs. 2, 4) 16A
- Venter of segment 6 lacking sclerites and tufts of setae . . . 17
- 16A. Left side of epandrium with narrow ventral process (Fig. 2, upper) *M. arizonensis* (Malloch) (in part)
- Left side of epandrium broadly rounded posteroventrally (Fig. 2, lower) *M. cirriventris* Schmitz

In the longer term, Borgmeier's keys will have to all be rewritten, using characters that vary less among specimens than does wing venation.

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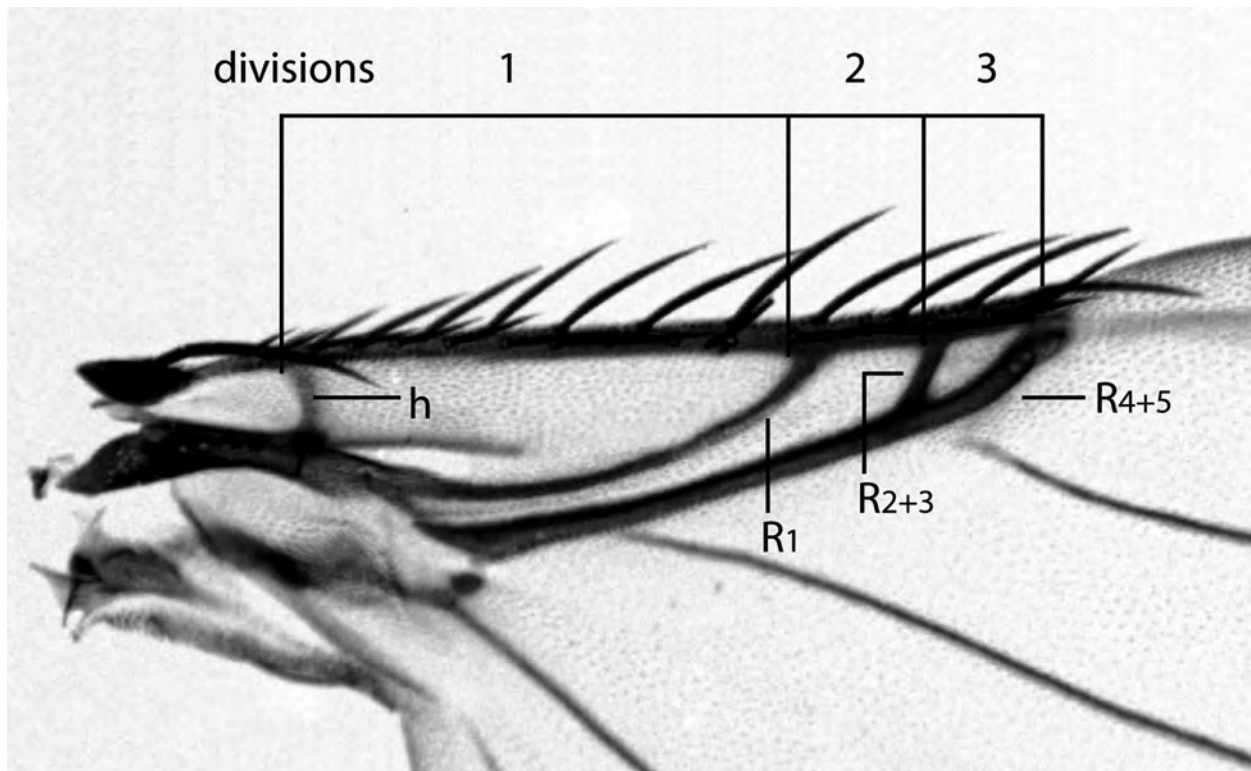
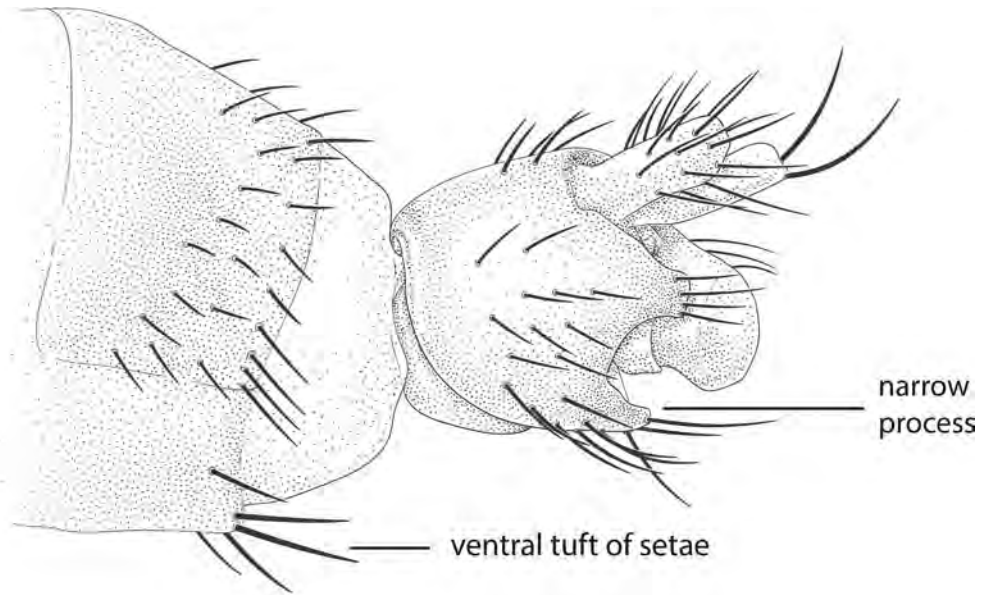
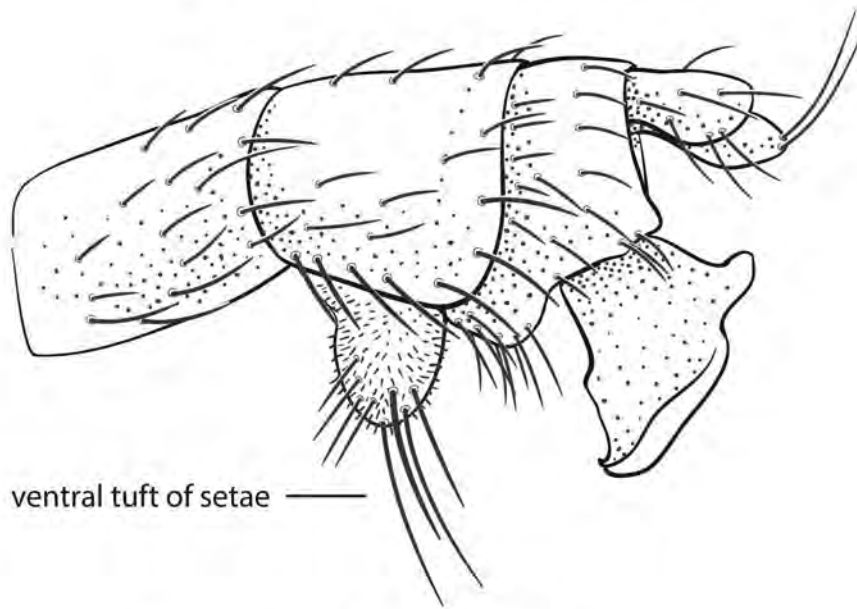


Figure 1 Photograph of a *Megaselia* species right wing showing our measuring conventions. Abbreviation: h, humeral crossvein.



Megaselia arizonensis



Megaselia cirriventris

Figure 2 Male genitalia, left lateral (anterior to the left).



Figure 3 *Megaselia arizonensis*, left lateral (specimen from Los Angeles, CA).

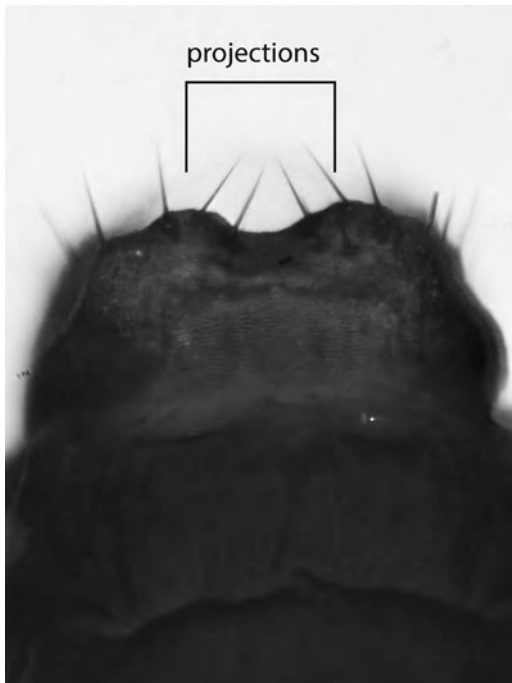


Figure 4 *Megaselia arizonensis*, male abdomen, ventral (posterior above).