Opportunity in our Ignorance: Urban Biodiversity Study Reveals 30 New Species and One New Nearctic Record for Megaselia (Diptera: Phoridae) in Los Angeles (California, USA)

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Abstract

An urban biodiversity study sampling primarily from private backyards in Los Angeles, California (USA), reveals the presence of fifty-six species of Megaselia within the first few months of sampling. Thirty of these are described as new to science: M. armstrongorum, M. bradyi, M. brejchaorum, M. carthayensis, M. ciancii, M. creasoni, M. defibaughorum, M. donahuei, M. francocae, M. fujikai, M. hardingorum, M. heini, M. hentschkeae, M. hoffmanorum, M. hoggorum, M. hoguei, M. isaacmajorum, M. kelleri, M. lombardorum, M. marquezi, M. mikejohnsoni, M. oxboroughae, M. pisanoi, M. remwickorum, M. rodriguezorum, M. sacatelensis, M. seaverorum, M. sidneyae, M. steptoeae, and M. wiegmanae. M. largifrontalis is newly reported from the Nearctic Region. The implications these findings have for future taxonomic work in Megaselia, particularly in urban areas, are discussed.

Key words: Diptera, Phoridae, urban biodiversity

Introduction

Urban areas are usually not considered to be richly biodiverse environments. They consist of highly degraded remnants of original habitats alongside of greatly modified areas planted with non-native species that are watered, fertilized and manipulated to fulfill new purposes. These environments are often neglected by researchers (who leave their homes in search of greener, richer environs to study), leaving the biodiversity of most cities un- or under-studied. In recent years this has been changing; studies of urban ecosystems in Baltimore and Phoenix in the United States (Grimm et al. 2000), as well as large projects in the United Kingdom (e.g., Loram et al. 2007), Switzerland (Sattler et al. 2010), and elsewhere (e.g., Bolger et al. 2000; Alberti et al. 2003; Crooks et al. 2004) have helped to raise the profile of urban ecology (e.g., Shochat et al. 2006). In Los Angeles, ignorance of the urban environment has turned into an exciting research opportunity. The BioSCAN Project (Brown et al. 2014, Hartop 2014) has uncovered thirty fly species in a single genus that are new to science, and an additional species until now unknown from the Nearctic Region. These discoveries came after just three months of project sampling, which yielded over 10,000 specimens for examination. This is our first glimpse into the unknown richness of urban biodiversity in Los Angeles, and points to the tremendous deficiency of taxonomic knowledge about the fauna immediately surrounding the homes and workspaces of researchers. Apparently, we need not travel far to have plentiful opportunities for studying biodiversity.

Our main study group is the fly family Phoridae (Diptera), which is an extremely diverse family (Disney & Durska 2008) and are abundant in Malaise trap samples (Disney et al. 1982). In particular, we have focused on the large and species-rich genus Megaselia Rondani, from which we already have collected tens of thousands of specimens for examination. Although studies on urban Megaselia are few, some pre-existing information does exist from England. A limited survey of a large garden in London (UK) recorded 56 species of Megaselia and noted the recording (then) of 53 species from a suburban garden in Cambridge (UK) (Disney 2001); more have been added since, and the current total for it, and other gardens in Cambridge, is 57 species. We are turning up
similar results in Los Angeles (California, USA), where we have already documented 56 species in this genus from urban backyards. We expect that number to grow as the study continues. One of the first species found during preliminary trials for the project was a new record for the Nearctic Region, which hinted at the discoveries that lay ahead (Disney & Brown 2009).

This project has forced us to delve into both type material and non-type historic collections of North American phorid flies. Errors and misidentifications are common, due in part to the identification of material in a dried state. Many details of *Megaselia* are only readily observable after specimens have been slide mounted. For example, four species were reported in the type series of a “species” mounted on pins when remounted on slides (Disney 1983). Descriptions of species from the females only, and males “identified” as that species based only on venational or superficial character sets is a problem that will likely take decades to sort out completely. Work on *Megaselia* must be made a priority despite these setbacks. The diversity of life histories for this largely cosmopolitan genus is tremendous and future study on the group is paramount for understanding their role in both our ecosystems and our lives.

**Materials and Methods**

Specimens were collected by Malaise traps set up at thirty sites in Los Angeles (CA: USA) (Table 1). Specimens were captured and preserved in 95% ethanol, dissected and slide mounted either by first clearing in clove oil and then mounting in Canada Balsam, or mounting directly in Berlese’s fluid (D. J. & D. Henshaw, Waltham Abbey, England) and then sealed with dammar varnish (a commercially available product used for preserving artwork). A subset of specimens were softened in lactic acid and their hypandria were dissected out and photographed. Specimens were examined using a Leica M205C stereo microscope and photographed on this microscope using a Nikon D600 digital SLR camera. Photograph stacking was done with Helicon Focus software. Specimens are deposited in the Natural History Museum of Los Angeles County, USA (LACM), the Cambridge University Museum of Zoology, UK (CUMZ), the Smithsonian Institution (USNM), and the Museum of Comparative Zoology Collection (MCZC). Methods for dissection and specific mounting protocol followed those recommended for this genus (Disney 2009).

**TABLE 1.** BioSCAN site locations.

<table>
<thead>
<tr>
<th>Name</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Name</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atwater Village</td>
<td>34.114</td>
<td>-118.251</td>
<td>Hollywood</td>
<td>34.095</td>
<td>-118.334</td>
</tr>
<tr>
<td>Burbank</td>
<td>34.170</td>
<td>-118.308</td>
<td>Jefferson Park</td>
<td>34.030</td>
<td>-118.327</td>
</tr>
<tr>
<td>Carthay</td>
<td>34.059</td>
<td>-118.369</td>
<td>Koreatown</td>
<td>34.072</td>
<td>-118.291</td>
</tr>
<tr>
<td>Eagle Rock</td>
<td>34.136</td>
<td>-118.194</td>
<td>Larchmont</td>
<td>34.077</td>
<td>-118.320</td>
</tr>
<tr>
<td>Eagle Rock</td>
<td>34.129</td>
<td>-118.215</td>
<td>Leimert Park</td>
<td>34.014</td>
<td>-118.321</td>
</tr>
<tr>
<td>Echo Park</td>
<td>34.074</td>
<td>-118.264</td>
<td>Los Feliz</td>
<td>34.118</td>
<td>-118.284</td>
</tr>
<tr>
<td>Elysian Park</td>
<td>34.078</td>
<td>-118.234</td>
<td>Los Feliz</td>
<td>34.116</td>
<td>-118.279</td>
</tr>
<tr>
<td>Elysian Valley</td>
<td>34.103</td>
<td>-118.243</td>
<td>Los Feliz</td>
<td>34.112</td>
<td>-118.293</td>
</tr>
<tr>
<td>Exposition Park</td>
<td>34.018</td>
<td>-118.288</td>
<td>Mid-City</td>
<td>34.047</td>
<td>-118.334</td>
</tr>
<tr>
<td>Gardena</td>
<td>33.876</td>
<td>-118.288</td>
<td>Mid-Wilshire</td>
<td>34.058</td>
<td>-118.328</td>
</tr>
<tr>
<td>Glassell Park</td>
<td>34.111</td>
<td>-118.230</td>
<td>Mount Washington</td>
<td>34.103</td>
<td>-118.216</td>
</tr>
<tr>
<td>Glendale</td>
<td>34.149</td>
<td>-118.218</td>
<td>Pico-Union</td>
<td>34.046</td>
<td>-118.275</td>
</tr>
<tr>
<td>Glendale</td>
<td>34.159</td>
<td>-118.247</td>
<td>Silverlake</td>
<td>34.093</td>
<td>-118.274</td>
</tr>
<tr>
<td>Highland Park</td>
<td>34.125</td>
<td>-118.189</td>
<td>Silverlake</td>
<td>34.102</td>
<td>-118.257</td>
</tr>
<tr>
<td>Highland Park</td>
<td>34.123</td>
<td>-118.193</td>
<td>University Park</td>
<td>34.034</td>
<td>-118.281</td>
</tr>
</tbody>
</table>
Following the authors’ previously established system, descriptions are presented as tables supplemented by habitus, wing and hypandrium photographs, genitalia drawings, and additional images of any salient features (Hartop & Brown 2014). Clarification of some of the characters from Hartop & Brown (2014) may prove useful: regarding labellum spinosity, the short, blunt spinose setulae on the labellum can be distinguished from other short setae that would not be determined as setulae by their characteristic bluntly rounded tips. The differentiated “curved” setae found on the basal part of the hind femur of some species differ from undifferentiated setae by being thick along most of their length and tapering abruptly to a fine point only near the curved tip of the seta. This compares to undifferentiated setae which taper uniformly along their length to a fine tip. Other differentiated setae on the basal half of the hind femur may instead be in characteristic arrangement or found in raised sockets. Future work on this description system is to include an online keying system for North American Megaselia.

Twenty nine of the new species herein described were named in honor of the hosts of BioSCAN sites. Each of the species was collected in the backyard of the site host for whom it is now named, although type material may come from other sites of occurrence, depending on availability. The thirtieth species is named in honor of the Seaver family of the Seaver Foundation.

Systematics

Taxon Discussion

In order to obtain a definitive diagnosis for any potentially new species of Megaselia, the entire body of world literature must be consulted. Although world literature was used here for a final diagnosis, the authors only make reference to species and literature outside the Nearctic fauna when a comparison is deemed necessary. Primary keys used for the Nearctic Megaselia are those of Borgmeier (1964, 1966) in his revisions of the North American fauna. These keys include two species of Pericyclocera, which are now considered Megaselia. Species formerly in Plastophora are covered by Colyer & Elberg (1969). The subgenus Kerophora is keyed by Brown (1988), with name changes by Disney (1994d, p. 280). Important revisions and additions are given by Robinson (1977, 1978, 1981). Further additions are covered by Robinson & Wisseman (1983), Disney (1981, 2004, 2008), Brown (1990), Barnes (1991), Hanson & Disney (2008), Disney, Copeland & Murrell (2009), Disney, Taylor, Slay & Kreica (2011), Stoeppler & Disney (2013).

As work on Nearctic Region Megaselia progresses, keys to the fauna will be created. Currently, with the fauna only known from scattered sampling across the region, a key would be premature and largely incomplete.

Taxon Treatments

Megaselia armstrongorum new species (Figs. 1, 33, 63, 93)

**Diagnosis.** Male. The costa of this species can be 0.42–0.44 wing length, allowing specimens to key to either group VII or group VIII in the keys of Borgmeier (1966). It keys to couplet 38 in the group VII key but differs from the two species there, M. rotundula Borgmeier and M. piccola Borgmeier by having 3 notopleural bristles. It runs to M. polyporicola Borgmeier in the group VIII key, from which it differs most noticeably in wing characteristics. M. polyporicola has dark veins, whereas M. armstrongorum has especially light veins, so much so that they are difficult to photograph well. Additionally, in M. polyporicola costal segment two (C2) is twice the length of costal segment three (C3), but in M. armstrongorum the sections are subequal.

**Description.** See Table 2.

**Distribution.** Los Angeles, California (USA).

**Etymology.** Named in honor of the Armstrong family, hosts of BioSCAN site 17.

**Biology.** Unknown.

**TABLE 2.** Species descriptions, *M. armstrongorum–M. ciancii*. Character remarks in parentheses, general remarks in last row.

<table>
<thead>
<tr>
<th>Head</th>
<th><em>M. armstrongorum</em></th>
<th><em>M. bradyi</em></th>
<th><em>M. brechbuehleri</em></th>
<th><em>M. carthayensis</em></th>
<th><em>M. ciancii</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fig 1</td>
<td>Fig 2</td>
<td>Fig 3</td>
<td>Fig 4</td>
<td>Fig 5</td>
<td></td>
</tr>
<tr>
<td>SA ratio</td>
<td>0.74–0.83</td>
<td>0.74–0.80</td>
<td>0.74–0.77</td>
<td>0.80–0.85</td>
<td>0.45–0.56</td>
</tr>
<tr>
<td>VIF position</td>
<td>normal</td>
<td>normal</td>
<td>normal</td>
<td>normal</td>
<td>normal</td>
</tr>
<tr>
<td>SFS vesicles</td>
<td>absent</td>
<td>absent</td>
<td>absent</td>
<td>absent</td>
<td>absent</td>
</tr>
<tr>
<td>Pespal setae length</td>
<td>long</td>
<td>long</td>
<td>long</td>
<td>long</td>
<td>long</td>
</tr>
<tr>
<td>Labellum spinosity</td>
<td>spinose</td>
<td>spinose</td>
<td>spinose (very dense)</td>
<td>not</td>
<td>not</td>
</tr>
</tbody>
</table>

Thorax

Aepisternum bare

Relative hair color same

### Paratype.


### Additional Material Examined.


### Megaselia bradyi new species (Figs. 2, 3, 4, 94)

**Diagnosis.** Male. In the group IV key of Borgmeier (1964), *M. bradyi* keys to couplet 17 but differs from both *M. difficilis* Malloch or *M. cribella* Borgmeier by having a characteristic basal fringe of 12+ robust, curved setae on the hind femur (F3), which those species lack.

**Description.** See Table 2.

**Distribution.** Los Angeles, California (USA).

**Etymology.** Named in honor of Brady Louie, the youngest host of BioSCAN site 20.

**Biology.** Unknown.


**Paratype.** ♂, USA: CALIFORNIA: Los Angeles, Los Feliz, 1–7.II.2014, Louie, Malaise trap (LACM 329757).
**Megaselia brejchaorum** new species (Figs. 3, 35, 65, 95)

**Diagnosis.** Male. In the group V key of Borgmeier (1964), *M. brejchaorum* keys to couplet 4 where it differs from both *M. pressicauda* Borgmeier and *M. divergens* Malloch in details of the genitalia (Fig. 65). The epandrium of *M. brejchaorum* lacks the foveolate impression of *M. pressicauda* and has long, robust bristles in contrast to the short hairs found on *M. divergens.*

**Description.** See Table 2.

**Distribution.** Los Angeles, California (USA).

**Etymology.** Named in honor of the Brejcha family, hosts of BioSCAN site 29.

**Biology.** Unknown.

**Holotype.** ♂, USA: CALIFORNIA: Los Angeles, Highland Park, 1–8.II.2014, Brejcha, Malaise trap (LACM 329758).


**Megaselia carthayensis** new species (Figs. 4, 36, 66, 96)

**Diagnosis:** Male. In the group VIII key of Borgmeier (1966), *M. carthayensis* keys to *M. polyporicola* Borgmeier. In contrast to the epandrium with longish hairs on both sides and dark wing veins of *M. polyporicola, M. carthayensis* has an epandrium with short hairs only (Fig. 66), and very light wing veins (Fig. 36).

**Description.** See Table 2.

**Distribution.** Los Angeles, California (USA).

**Etymology.** Named in honor of Carthay Elementary School, site of BioSCAN site 19.

**Biology.** Unknown.


**Paratypes.** 4 ♂, USA: CALIFORNIA: Los Angeles, Los Feliz, 31.V.2014–7.VI.2014, Koch, Malaise Trap (LACM 329762, LACM 329763, 2 CUMZ)


**Megaselia ciancii** new species (Figs. 5, 37, 67, 97)

**Diagnosis.** Male. In group VIII key of Borgmeier (1966), *M. ciancii* keys out to *M. pygmaeoides* [now considered to be *M. berndseni* (Schmitz 1919)] from which it differs immediately by the presence of 3 notopleural setae compared to the 2 found on *M. berndseni.*

**Description.** See Table 2.

**Distribution.** Los Angeles, California (USA).

**Etymology.** Named in honor of Chris Cianci, host of BioSCAN site 21.

**Biology.** Unknown.


**Megaselia creasoni** new species (Figs. 6, 38, 68, 98)

**Diagnosis.** Male. In the group VII key of Borgmeier (1966), *M. creasoni* fails the key at couplet 12 where it matches *M. minuta* Aldrich in costal index (CI) but differs in having very lightly colored legs (Fig. 6) compared to the dark mid and hing legs of *M. minuta*.

**Description.** See Table 3.

**Distribution.** Los Angeles, California (USA).

**Etymology.** Named in honor of Glen Creason, host of BioSCAN site 27.

**Biology.** Unknown.

**Holotype.** \( \delta \), USA: CALIFORNIA: Los Angeles, Elysian Park, 3–10.V.2014, Harding, Malaise trap (LACM 329766).

**Paratypes.** 4 \( \delta \), USA: CALIFORNIA: Los Angeles, Glassell Park, 3–10.V.2014, Creason, Malaise trap (LACM 329767, LACM 329768, 2 CUMZ)


**TABLE 3.** Species descriptions, *M. creasoni*–*M. fuiokai*. Character remarks in parentheses, general remarks in last row.

*TABLE 3.* Species descriptions, *M. creasoni*–*M. fuiokai*. Character remarks in parentheses, general remarks in last row.

**Megaselia defibaughorum** new species (Figs. 7, 39, 69, 99)

**Diagnosis.** Male. In the group VIII key of Borgmeier (1966), *M. defibaughorum* keys to couplet 9, where its CI of 0.36–0.38 makes it too long to be *M. pygmaeoides* [now considered to be *M. berndseni* (Schmitz 1919)], but not long enough to continue in the key. Taking the upper end of the CI range and continuing to couplet 10, *M.
defibaughorum keys to *M. bovista* Gimmersthal [now considered to be *M. agarici* (Lintner 1895)] from which it can immediately be distinguished by its lack of the clear posterior epandrial processes that make *M. agarici* so easily identifiable. *M. defibaughorum* superficially appears quite similar to *M. folliculorum* Disney (Disney, Taylor et al. 2011), but in addition to differences in the structure and setation of the epandrium (the epandrium of *M. defibaughorum* is more pronounced behind, under the anal tube and has longer and more plentiful setae), *M. defibaughorum* lacks the 1–1.5 rows of reduced, spinose rows of setae on the fore basitarsus (foretarsomere 1).

**Description.** See Table 3.

**Distribution.** Los Angeles, California (USA).

**Etymology.** Named in honor of the Defibaugh family, hosts of BioSCAN site 15.


*Megaselia donahuei* new species (Figs. 8, 40, 70, 100)

**Diagnosis.** Male. In the group VI key of Borgmeier (1966), *M. donahuei* keys to *M. orestes* Borgmeier, from which it differs by being a largely yellow species (Fig. 8) compared to the dark coloration throughout on *M. orestes*.

**Description.** See Table 3.

**Distribution.** Los Angeles, California (USA).

**Etymology.** Named in honor of Julian Donahue, host of BioSCAN site 31.


*Megaselia francoae* new species (Figs. 9, 41, 71, 101)

**Diagnosis.** Male. In the group VIII key of Borgmeier (1966), *M. francoae* keys to *M. polyporicola* Borgmeier from which it differs in a number of details. Most apparently, *M. francoae* has all dark legs (Fig. 9) compared to the light forelegs of *M. polyporicola*. The two species also have substantially different costal ratios: *M. polyporicola* 4.3:2.0:1, *M. francoae* 3.75:1.25:1, 3.49:1.26:1, 3.67:1.47:1.

**Description.** See Table 3.

**Distribution.** Los Angeles, California (USA).

**Etymology.** Named in honor of Candace Franco, host of BioSCAN site 30.


**Paratypes.** 2 ♂, USA: CALIFORNIA: Los Angeles, Koreatown, 5–12.IV.2014, Ralph, Malaise trap (LACM 329776, LACM 329777).
**Megaselia fujioikai** new species (Figs. 10, 42, 72, 102)

**Diagnosis.** Male. In the group VIII key of Borgmeier (1966), *M. fujioikai* keys to *M. seticerca* Borgmeier from which it differs in numerous ways. Most easily, *M. fujioikai* has a large, spheroid epandrium with medium hypoproct hairs (Fig. 72) in contrast to the medium sized epandrium with minute hypoproct hairs of *M. seticerca*. Additionally, *M. fujioikai* has 4 alular setae compared to the 3 on *M. seticerca* (Fig. 42).

**Description.** See Table 3.

**Distribution.** Los Angeles, California (USA).

**Etymology.** Named in honor of Ray Fujioka, host of BioSCAN site 8.

**Biology.** Unknown.

**Holotype.** ♂, USA: CALIFORNIA: Los Angeles, Elysian Park, 3–10.V.2014, Harding, Malaise trap (LACM 329778)


**Megaselia hardingorum** new species (Figs. 11, 43, 73, 103)

**Diagnosis.** Male. In the group VIII key of Borgmeier (1966), *M. hardingorum* keys to couplet 11 where it differs from both *M. globipyga* Borgmeier and *M. brevicostalis* Wood by having long costal setae (0.13–0.16 mm) and 5 alular setae.

**Description.** See Table 4.

**Distribution.** Los Angeles, California (USA).

**Etymology.** Named in honor of the Harding family, hosts of BioSCAN site 14.

**Biology.** Unknown.

**Holotype.** ♂, USA: CALIFORNIA: Los Angeles, Highland Park, 1–8.III.2014, Brejcha, Malaise trap (LACM 329781)


**Megaselia heini** new species (Figs. 12, 44, 74, 104)

**Diagnosis.** Male. Due to observed costal indices ranging from 0.41–0.44, *M. heini* could key in either the group VII or group VIII keys of Borgmeier (1966). In the group VII key, *M. heini* keys to *M. latipennis* Borgmeier from which it differs by having extremely strong hypoproct hairs (Fig. 74) compared to the “small” apical hairs of *M. latipennis*. In the group VIII key, *M. heini* keys to *M. polyporicola* Borgmeier. Comparison to the description was
inconclusive; upon examination of the type material it was found that the two species differ in details of the genitalia (Fig. 74). The terminal hairs on the hypoproct of *M. polyporicola*, although “long”, do not compare to the long, curved, strong setae found on *M. heini*. Additionally, *M. polyporicola* has more numerous, but finer, hairs on the epandrium than the *M. heini*, which has sparse, stout setation.

**Description.** See Table 4.

**Distribution.** Los Angeles, California (USA).

**Etymology.** Named in honor of Tony Hein, host of BioSCAN site 16.

**Biology.** Unknown.

**Holotype.** ♂, USA: CALIFORNIA: Los Angeles, Los Feliz, 4–11.IV.2014, Louie, Malaise trap (LACM 329784).


### Table 4

| Species descriptions, *M. hardingorum–M. hoggorum*. Character remarks in parentheses, general remarks in last row. |
|---|---|---|---|---|
| **M. hardingorum** | **M. heini** | **M. hentschkeae** | **M. hoffmannorum** | **M. hoggorum** |
| Head | Fig 11 | Fig 12 | Fig 13 | Fig 14 | Fig 15 |
| SA ratio | 0.72–0.78 | 0.89–0.97 | 0.76–0.83 | 0.75 | 0.83–0.94 |
| VIF position | normal | VFO adjacent | normal | normal | normal |
| SPVS vesicles | absent | absent | absent | absent | absent |
| Palpal setae length | long | long | long | long | long |
| Labellum spinosity | not | sparse | not | not | not |
| Thorax | | | | | |
| Aneuplodinum | bare | bare | h+: B (2 medium B) | hairs only | H+: B (1 long B) |
| Relative hair color | lighter | same | lighter | same | same |
| IF NP setae | 2 | 3 | 3 | 3 | 3 |
| NC setae | absent | absent | absent | absent | absent |
| Scutellar setae | 2+2 | 2+2 | 2+2 | 2+2 | 2+2 |
| Leg | | | | | |
| 1st palisade | 1–6 | 1–4 | 1–4 (unusual if on 5) | 1–5 | 1–4 |
| 2nd palisade | 0.67 | 0.67 | 0.67 | 0.67 | 0.5 |
| 3rd comb bifidate | absent | absent | absent | absent | absent |
| 3rd setulae | PD | PD | PD | PD | PD |
| 3rd basal setae | S+AV | S+AV | S+AV | S+AV | S+AV |
| Basal setae differentiation | absent | present | absent | present | present |
| Ving | Fig 43 | Fig 44 | Fig 45 | Fig 46 | Fig 47 |
| Wing Length (mm) | 1.50–1.88 | 1.22–1.75 | 1.10–1.31 | 2.09–2.15 | 1.05–1.30 |
| Subcosta | complete | incomplete | incomplete | incomplete | incomplete |
| R setae | short | absent | absent | absent | absent |
| Alar setae length (mm) | 0.40–0.43 | 0.41–0.44 | 0.35–0.38 | 0.46–0.47 | 0.35–0.38 |
| Costal index | 3.00–3.63 | 1.40–2.00 | 1.33–3.63 | 1.00–2.17 | 1.10–3.00 |
| Costal setae length (mm) | 0.10–0.16 | 0.05–0.07 | 0.07–0.09 | 0.14–0.17 | 0.05–0.06 |
| Number alar setae | 2 | 3 | 3 | 4 | 3 |
| Ving color | lightly infuscated/clear | lightly infuscated/clear | lightly infuscated/clear | lightly infuscated/clear | lightly infuscated/clear |
| Gender | Fig 73, 103 | Fig 74, 104 | Fig 75, 105, 106 | Fig 76, 107 | Fig 77, 108 |
| AT length | AT+E | AT+H | AT+E | AT+E | AT+E |
| E setation | hairs only | hairs only | hairs only but very strong | hairs only (strong, bristles) | hairs only |
| General Remarks | forbesbars was with four rows spines | forbesbars was with four rows spines | forbesbars was with four rows spines | forbesbars was with four rows spines | forbesbars was with four rows spines |

**Megaselia hentschkeae** new species (Figs. 13, 45, 75, 105, 106)

**Diagnosis.** Male. In the group III key of Borgmeier (1964), *M. hentschkeae* keys to *M. dilatata* Brues from which it differs by most often having 2 moderately strong anipisternal bristles (compared to *M. dilatata*’s one) and an
elongate genitalia with ventrally projecting anal tube (Fig. 75) compared to the large, deeply emarginate epandrium of *M. dilatata*.

**Description.** See Table 4.

**Distribution.** Los Angeles, California (USA).

**Etymology.** Named in honor of Peggy Hentschke, host of BioSCAN site 3.

**Biology.** Unknown.


*Megaselia hoffmanorum* new species (Figs. 14, 46, 76, 107)

**Diagnosis.** Male. In the group IV key of Borgmeier (1964), keys to *M. pulla* Brues from which it differs substantially in the structure of the genitalia (Fig. 76). Whereas *M. pulla* has an oblique ascending row of delicate bristles on the left side of the epandrium and 4 marginal bristles on the right, *M. hoffmanorum* has a nearly vertical arrangement of strong hairs on either side. Additionally, *M. hoffmanorum* lacks the moderate bristles described on the epandrium of *M. pulla*.

**Description.** See Table 4.

**Distribution.** Los Angeles, California (USA).

**Etymology.** Named in honor of the Hoffman Family, hosts of BioSCAN site 14.

**Biology.** Unknown.


*Megaselia hoggorum* new species (Figs. 15, 47, 77, 108)

**Diagnosis.** Male. In the group III key of Borgmeier (1964), *M. hoggorum* keys to *M. spiniclasper* Borgmeier which it differs from noticeably and immediately in the structure of the genitalia. *M. spiniclasper* has on the left side of the epandrium a single, long, curved projection bearing a terminal bristle. *M. hoggorum* bears two much more subtle, rounded ventral projections off corners of the epandrium (Fig. 77), which are similar to those of *M. dilatata* Brues (which comes out later in the key). Upon examination of type material, it was found that although the external structures of the genitalia of *M. hoggorum* and *M. dilatata* were similarly shaped, *M. hoggorum* lacked the prominent and largely protruding phallus complex visible on all specimens of *M. dilatata*. Additionally, *M. hoggorum* has much stronger epandrial setation.

**Description.** See Table 4.

**Distribution.** Los Angeles, California (USA).

**Etymology.** Named in honor of the Hogg family, hosts of BioSCAN site 7.

**Biology.** Unknown.


**Megaselia hoguei** new species (Figs. 16, 48, 78, 109)

**Diagnosis.** Male. In the group VIII key of Borgmeier (1966), *M. hoguei* keys to *M. polyporicola* Borgmeier, from which it differs greatly in overall appearance. *M. hoguei* is a much lighter colored species, with a lightly pigmented venter and legs and light brown halteres. *M. polyporicola* is a dark species, with black venter, halteres, and hind/mid legs being brown to black.

**Description.** See Table 5.

**Distribution.** Los Angeles, California (USA).

**Etymology.** Named in honor of Jim Hogue, host of BioSCAN site 24.

**Biology.** Unknown.


**Paratypes.** 4 ♂, USA: CALIFORNIA: Los Angeles, Glendale, 28.VI.2014–5.VII.2014 (LACM 329797, LACM 329798, 2 CUMZ)


**TABLE 5.** Species descriptions, *M. hoguei*–*M. marquezi*. Character remarks in parentheses, general remarks in last row.

<table>
<thead>
<tr>
<th></th>
<th><em>M. hoguei</em></th>
<th><em>M. isaacmajorum</em></th>
<th><em>M. kelleri</em></th>
<th><em>M. lombardorum</em></th>
<th><em>M. marquezi</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fig</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>19</td>
<td>20</td>
</tr>
<tr>
<td>SA ratio</td>
<td>0.69-0.74</td>
<td>0.88</td>
<td>0.53-0.60</td>
<td>0.82-0.91</td>
<td>0.45-0.56</td>
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<td>VHF position</td>
<td>normal</td>
<td>normal</td>
<td>VFO adjacent</td>
<td>normal</td>
<td>normal</td>
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<tr>
<td>SPS vesicles</td>
<td>absent</td>
<td>absent</td>
<td>absent</td>
<td>absent</td>
<td>absent</td>
</tr>
<tr>
<td>Palpal setae length</td>
<td>long</td>
<td>long</td>
<td>long</td>
<td>long</td>
<td>long</td>
</tr>
<tr>
<td>Labellum spinosity</td>
<td>not</td>
<td>not</td>
<td>not</td>
<td>not</td>
<td>not</td>
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<tr>
<td>Thorax</td>
<td>Anepisternum</td>
<td>bare</td>
<td>bare</td>
<td>bare</td>
<td>bare</td>
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<tr>
<td>Relative halter color</td>
<td>same</td>
<td>lighter</td>
<td>lighter</td>
<td>lighter</td>
<td>same</td>
</tr>
<tr>
<td>Tnl setae</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>NP eff</td>
<td>absent</td>
<td>absent</td>
<td>absent</td>
<td>absent</td>
<td>absent</td>
</tr>
<tr>
<td>Scutellar setae</td>
<td>2x2</td>
<td>2x2</td>
<td>2x2</td>
<td>2x2</td>
<td>2x2</td>
</tr>
<tr>
<td>Leg</td>
<td>Isi palpalisade</td>
<td>1-4</td>
<td>1-4</td>
<td>1-5</td>
<td>1-5</td>
</tr>
<tr>
<td></td>
<td>Is2 palpalisade</td>
<td>0.75</td>
<td>1.75</td>
<td>0.75</td>
<td>0.67</td>
</tr>
<tr>
<td></td>
<td>Is comb bifurcata</td>
<td>absent</td>
<td>absent</td>
<td>absent</td>
<td>absent</td>
</tr>
<tr>
<td></td>
<td>Is setulae</td>
<td>PD</td>
<td>PD</td>
<td>PD</td>
<td>PD</td>
</tr>
<tr>
<td></td>
<td>Is basal setae</td>
<td>B=AV</td>
<td>B=AV</td>
<td>B=AV</td>
<td>B=AV</td>
</tr>
<tr>
<td></td>
<td>Is basal setae differentiation</td>
<td>absent</td>
<td>absent</td>
<td>present (long, curved)*</td>
<td>absent (but strong)</td>
</tr>
<tr>
<td>Wing</td>
<td>Fig 48</td>
<td>Fig 49</td>
<td>Fig 50</td>
<td>Fig 51</td>
<td>Fig 52</td>
</tr>
<tr>
<td>Wing Length (mm)</td>
<td>1.31-1.65</td>
<td>2.09-2.39</td>
<td>1.53-1.59</td>
<td>1.03-1.20</td>
<td>1.23-1.41</td>
</tr>
<tr>
<td>Subcosta</td>
<td>incomplete</td>
<td>incomplete</td>
<td>incomplete</td>
<td>incomplete</td>
<td>incomplete</td>
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<tr>
<td>R2+3</td>
<td>present</td>
<td>present</td>
<td>present</td>
<td>present</td>
<td>present</td>
</tr>
<tr>
<td>Costal index</td>
<td>0.40-0.43</td>
<td>0.44-0.47</td>
<td>0.33-0.37*</td>
<td>0.44</td>
<td></td>
</tr>
<tr>
<td>Costal ratios</td>
<td>2.71-3.63: 1.76-2.73: 1</td>
<td>4.00-5.51: 1.33-1.89: 1</td>
<td>3.00-4.42: 2.25-2.38: 1</td>
<td>3.31-4.10: 1.00-1.25: 1</td>
<td>3.12-2.43: 1.65-2.31: 1</td>
</tr>
<tr>
<td>Costal setae length (mm)</td>
<td>0.05-0.07</td>
<td>0.19-0.24</td>
<td>0.08</td>
<td>0.05-0.07</td>
<td>0.06-0.08</td>
</tr>
<tr>
<td>Number alar setae</td>
<td>2-3</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>2-3 (moddy 2)</td>
</tr>
<tr>
<td>Alar setae length (mm)</td>
<td>0.08-0.11</td>
<td>0.16-0.19</td>
<td>0.11-0.12</td>
<td>0.08-0.11</td>
<td>0.09-0.11</td>
</tr>
<tr>
<td>Wing color</td>
<td>lightly infuscated/dark</td>
<td>lightly infuscated/dark</td>
<td>lightly infuscated/dark</td>
<td>lightly infuscated/dark</td>
<td>lightly infuscated/dark</td>
</tr>
<tr>
<td>Geleipela</td>
<td>Fig 78, 100</td>
<td>Fig 79, 110</td>
<td>Fig 80, 111</td>
<td>Fig 81, 112</td>
<td>Fig 82, 113</td>
</tr>
<tr>
<td>AT length</td>
<td>AT=E</td>
<td>AT=E</td>
<td>AT=E</td>
<td>AT=E</td>
<td>AT=E</td>
</tr>
<tr>
<td>Estillation</td>
<td>hairs only</td>
<td>hairs (strong)</td>
<td>hairs only</td>
<td>hairs only</td>
<td>hairs only</td>
</tr>
<tr>
<td>Relative posterior setation</td>
<td>E=T6=E=C+H</td>
<td>T6=E=C+H</td>
<td>E=C+H=T6</td>
<td>T6=E=C+H</td>
<td>H+C=E=T6</td>
</tr>
<tr>
<td>General Remarks</td>
<td>*F3 fringe &gt; 1/2 femur</td>
<td>*CI usually on upper end of range. 0.38-0.37</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Megaselia isaacmajorum** new species (Figs. 17, 49, 79, 110)

**Diagnosis.** Male. In the group IV key of Borgmeier (1964), *M. isaacmajorum* keys to couplet 15 where it can be easily eliminated from continuing in the key by its dark palpi, but lacks the single conspicuous bristle found on each side of the epandrium of *M. alaskensis* Malloch (Fig. 79).

**Description.** See Table 5.

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HARTOP ET AL.
**Distribution.** Los Angeles, California (USA).

**Etymology.** Named in honor of the sons of the Koch family: Isaac, Miguel, Aaron and Jacob, hosts of BioSCAN site 6.

**Biology.** Unknown.


*Megaselia kelleri* new species (Figs. 18, 50, 80, 111)

**Diagnosis.** Male. In the group VII key of Borgmeier (1966), *M. kelleri* keys to *M. rotundula* Borgmeier, from which it differs by the lack of a hair at the base of the R vein (*M. rotundula* has a long, conspicuous hair) and having 3 notopleural setae (2 on *M. rotundula*).

**Description.** See Table 5.

**Distribution.** Los Angeles, California (USA).

**Etymology.** Named in honor of Eric Keller, host of BioSCAN site 28.

**Biology.** Unknown.


*Megaselia largifrontalis* Schmitz

*Megaselia largifrontalis* Schmitz 1939: 189, Fig. 4, Textfig. 15; Disney 1999 Figs. 121–122

**Type series.** Described by Schmitz (1939), likely in the Zoological Research Museum in Bonn, Germany (not examined).

**Distribution.** We now report this species from Los Angeles, California (USA). Its confirmed distribution is: British Isles, mainland Europe, St. Helena, Yemen, California (USA).


*Megaselia lombardorum* new species (Figs. 19, 51, 81, 112)

**Diagnosis.** Male. In the group VIII key of Borgmeier (1966), keys to *M. pygmaeoides* [now considered to be *M. berndseni* (Schmitz 1919)] which has a shorter costa (CI 0.30–0.33 compared to *M. lombardorum* at 0.33–0.37, usually being at the upper end of that range) than this new species and more than twice as many spinuli on the labellum.
Description. See Table 5.

Distribution. Los Angeles, California (USA).


Biology. Unknown.

Holotype. △, USA: CALIFORNIA: Los Angeles, Eagle Rock, 3–10.V.2014, Keller, Malaise trap (LACM 329805)

Paratypes. 4 △, USA: CALIFORNIA: Los Angeles, Eagle Rock, 3–10.V.2014, Keller, Malaise trap (LACM 329806, LACM 329807, CUMZ)


*Megaelia marquezi* new species (Figs. 20, 52, 82, 113)

Diagnosis. Male. In the group VII key of Borgmeier (1966), *M. marquezi* keys to *M. rotundula* Borgmeier, from which it differs by having 3 notopleural setae rather than the 2 found on *M. rotundula*, and by the lack of a hair at the base of R (*M. rotundula* has a long, conspicuous hair).

Description. See Table 5.

Distribution. Los Angeles, California (USA).

Etymology. Named in honor of Humberto Marquez, caretaker of the Cesar Chavez Community Garden, site of BioSCAN site 25.

Biology. Unknown.


*Megaelia mikejohnsoni* new species (Figs. 21, 53, 83, 114)

Diagnosis. Male. In the group VIII key of Borgmeier (1966), *M. mikejohnsoni* keys to *M. globipyga* Borgmeier but lacks the globose genitalia of that species.

Description. See Table 6.

Distribution. Los Angeles, California (USA).

Etymology. Named in honor of Mike Johnson, relation to the Johnson family, hosts of BioSCAN site 22.

Biology. Unknown.


FIGURE 32. Detail of basal hind femur. Megaselia sidneyae.
**Megaselia oxboroughae** new species (Figs. 22, 54, 84, 115)

**Diagnosis.** Male. In the group VIII key of Borgmeier (1966), *M. oxboroughae* keys to *M. polyporicola* Borgmeier which it differs from by having incredibly short, truncate genitalia (Fig. 84) and much shorter wings (0.88–1.05 mm compared to 1.59 mm).

**Description.** See Table 6.

**Distribution.** Los Angeles, California (USA).

**Etymology.** Named in honor of Sharon Oxborough, host of BioSCAN site 12.

**Biology.** Unknown.


**TABLE 6.** Species descriptions, *M. mikejohnsoni*–*M. rodriguezorum*. Character remarks in parentheses, general remarks in last row.

<table>
<thead>
<tr>
<th>Head</th>
<th>M. mikejohnsoni</th>
<th>M. oxboroughae</th>
<th>M. pisanoi</th>
<th>M. remnickorum</th>
<th>M. rodriguezorum</th>
</tr>
</thead>
<tbody>
<tr>
<td>SA ratio</td>
<td>0.54-0.61</td>
<td>0.86-1.00</td>
<td>0.94-1.00</td>
<td>0.88-0.90</td>
<td>broken in type series: +/- 0.5</td>
</tr>
<tr>
<td>VIF</td>
<td>normal</td>
<td>normal</td>
<td>normal</td>
<td>normal</td>
<td>normal</td>
</tr>
<tr>
<td>SFS vesicles</td>
<td>absent</td>
<td>present</td>
<td>absent</td>
<td>absent</td>
<td>absent</td>
</tr>
<tr>
<td>Palpel setose length</td>
<td>long</td>
<td>long</td>
<td>long</td>
<td>long</td>
<td>long</td>
</tr>
<tr>
<td>Labellum spinosity</td>
<td>spineose</td>
<td>not</td>
<td>not</td>
<td>not</td>
<td>not</td>
</tr>
<tr>
<td>Thorax</td>
<td>Aneisternum</td>
<td>bare</td>
<td>bare</td>
<td>H + B (1 medium B, &lt;10 H)</td>
<td>hairs only (+/-3)</td>
</tr>
<tr>
<td>Relative halter color</td>
<td>lighter</td>
<td>same</td>
<td>same</td>
<td>same</td>
<td>lighter</td>
</tr>
<tr>
<td># NP setae</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>NP deft</td>
<td>absent</td>
<td>absent</td>
<td>absent</td>
<td>absent</td>
<td>absent</td>
</tr>
<tr>
<td>Scutellar setae</td>
<td>2+2</td>
<td>2+2</td>
<td>2+2</td>
<td>2+2</td>
<td>2+2</td>
</tr>
<tr>
<td>Leg</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>t1 tarsal id</td>
<td>1-4</td>
<td>indistinct</td>
<td>1-4</td>
<td>1-4</td>
<td>1-4</td>
</tr>
<tr>
<td>t2 tarsal id</td>
<td>0.75</td>
<td>0.75</td>
<td>0.75</td>
<td>0.75</td>
<td>0.75</td>
</tr>
<tr>
<td>t3 comb bifurcate</td>
<td>absent</td>
<td>absent</td>
<td>absent</td>
<td>absent</td>
<td>absent</td>
</tr>
<tr>
<td>t4 setae</td>
<td>PO</td>
<td>PO</td>
<td>PO</td>
<td>PO</td>
<td>PO</td>
</tr>
<tr>
<td>t5 setae</td>
<td>2-3</td>
<td>3-4</td>
<td>3-4</td>
<td>3-4</td>
<td>3-4</td>
</tr>
<tr>
<td>Wing Length (mm)</td>
<td>1.43-1.56</td>
<td>1.65-1.76</td>
<td>1.16-1.19</td>
<td>1.16-1.56</td>
<td>1.69-1.96</td>
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<tr>
<td>Subcosta</td>
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<tr>
<td>R seta</td>
<td>short</td>
<td>short</td>
<td>short</td>
<td>short</td>
<td>short</td>
</tr>
<tr>
<td>R2+3</td>
<td>present</td>
<td>present</td>
<td>present</td>
<td>present</td>
<td>present</td>
</tr>
<tr>
<td>Costal index</td>
<td>0.4-0.43</td>
<td>0.38-0.43</td>
<td>0.36-0.37</td>
<td>0.36-0.40</td>
<td>0.38-0.39</td>
</tr>
<tr>
<td>Costal ratio</td>
<td>3.00-3.80: 1</td>
<td>2.67-3.50: 0.92-1.60: 1</td>
<td>3.83-4.70: 1.04-1.70: 1</td>
<td>4.09-5.60: 1.33-1.75: 1</td>
<td>3.50-5.50: 1.00-1.67: 1</td>
</tr>
<tr>
<td>Costal setae length (mm)</td>
<td>0.08-0.09</td>
<td>0.04-0.06</td>
<td>0.06-0.07</td>
<td>0.11-0.12</td>
<td>0.09-0.12</td>
</tr>
<tr>
<td>Number alar seta</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Alar setae length (mm)</td>
<td>0.11-0.13</td>
<td>0.07-0.09</td>
<td>0.1</td>
<td>0.10-0.14</td>
<td>0.11-0.14</td>
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<tr>
<td>Wing color</td>
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<td>light brown</td>
<td>light brown</td>
<td>light brown</td>
<td>light brown</td>
</tr>
<tr>
<td>Genitalia</td>
<td>A+ = A</td>
<td>A+ = E</td>
<td>A+ = E</td>
<td>A+ = E</td>
<td>A+ = E</td>
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<tr>
<td>E setation</td>
<td>hairs only</td>
<td>hairs only</td>
<td>hairs only</td>
<td>hairs only</td>
<td>hairs = bristles</td>
</tr>
<tr>
<td>Relative posterior setation</td>
<td>E + T6 + H</td>
<td>E + T6 + H</td>
<td>E + T6 + H</td>
<td>E + T6 + H</td>
<td>E + T6 + H</td>
</tr>
<tr>
<td>General Remarks</td>
<td>midventral dislocated near base</td>
<td>membranous projection on epandrium posteriorly</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Megaselia pisanoi** new species (Figs. 23, 31, 55, 85, 116)

**Diagnosis.** Male. In the group III key of Borgmeier (1964), *M. pisanoi* keys to *M. goniata* Borgmeier. These two species are remarkably similar but differ in a number of details. *M. pisanoi* has all legs brown, forelegs only slightly lighter (Fig. 23), while *M. goniata* has legs yellowish, hind legs darker. The hind femur fringe of *M.*
pisanoi has 10+ setae, while M. goniata has 7. The ratio of costal segments for M. goniata is such that C1 is 3.6x C3, but M. pisanoi has C1 typically 4.5x C3 or longer. The palpal setae for M. goniata are said to be 3 apically with one shorter laterally; M. pisanoi has at least 6 palpal setae. Lastly, the small size of M. goniata (1mm) is mentioned by Borgmeier; the slide mounted holotype of M. pisanoi measures over 1mm just from the front of the thorax to the end of T6 (not including the head which was dissected and mounted separately). Unfortunately, the holotype of M. goniata is almost completely destroyed and a complete comparison to type material was not possible. The midfemur of the holotype of M. goniata was examined, and does not appear as denticulate as M. pisanoi; the widest part of the expansion on M. goniata is 0.11mm, while M. pisanoi is 0.16mm. M. goniata does appear to have a brushlike process on the left lobe of the hypandrium as seen in M. pisanoi (Fig. 116); further specimens are needed to confirm the status of these apparent sibling species.

**Description.** See Table 6.

**Distribution.** Los Angeles, California (USA).

**Etymology.** Named in honor of Mark Pisano, host of BioSCAN site 4.

**Biology.** Unknown.

**Holotype.** ♂, USA: CALIFORNIA: Los Angeles, Mount Washington, 3–10.V.2014, Donahue, Malaise trap (LACM 329817)


*Megaselia renwickorum* new species (Figs. 24, 56, 86, 117)

**Diagnosis.** Male. In the group V key of Borgmeier (1964) *M. renwickorum* keys to couplet 6, where the distinctive shape of the left side of the epandrium (Fig. 86) and 10+ hairs on the ventrally directed cerci immediate distinguish it from both *M. monochaeta* Borgmeier and *M. subnudifemur* Borgmeier.

**Description.** See Table 6.

**Distribution.** Los Angeles, California (USA).

**Etymology.** Named in honor of the Renwick family, hosts of BioSCAN site 5.

**Biology.** Unknown.


*Megaselia rodriguezorum* new species (Figs. 25, 57, 87, 118)

**Diagnosis.** Male. In the group VIII key of Borgmeier (1966) *M. rodriguezorum* keys to to *M. dakotensis* Borgmeier [now considered to be *M. halterata* (Wood)] from which it differs by lacking the light coloration and dense setation of *M. halterata*’s venter and the spinelike left process of the hypandrium (Fig 25, 87).

**Description.** See Table 6.

**Distribution.** Los Angeles, California (USA).

**Etymology.** Named in honor of the Rodriguez family, hosts of BioSCAN site 9.

**Biology.** Unknown.
FIGURES 43–52. Right wing, dorsal. 43. Megaselia hardingorum. 44. Megaselia heini. 45. Megaselia hentschkea. 46. Megaselia hoffmanorum. 47. Megaselia hoggorum. 48. Megaselia hoguei. 49. Megaselia isaacmajorum. 50. Megaselia kelleri. 51. Megaselia lombardorum. 52. Megaselia marquezi


TABLE 7. Species descriptions, M. sacatelensis—M. wiegmanae. Character remarks in parentheses, general remarks in last row.

<table>
<thead>
<tr>
<th>Head</th>
<th>M. sacatelensis</th>
<th>M. saeremon</th>
<th>M. diphyae</th>
<th>M. stephanoe</th>
<th>M. wiegmanae</th>
</tr>
</thead>
<tbody>
<tr>
<td>S/A ratio</td>
<td>0.46-0.55</td>
<td>unknown, not equal</td>
<td>0.81-0.82</td>
<td>0.75-0.90</td>
<td>0.84-0.85</td>
</tr>
<tr>
<td>VIF position</td>
<td>normal</td>
<td>normal</td>
<td>normal</td>
<td>normal</td>
<td>normal</td>
</tr>
<tr>
<td>SPS vesicles</td>
<td>present</td>
<td>absent</td>
<td>absent</td>
<td>absent</td>
<td>absent</td>
</tr>
<tr>
<td>Palpal setae length</td>
<td>long</td>
<td>long</td>
<td>long</td>
<td>long</td>
<td>long</td>
</tr>
<tr>
<td>Labellar spinosity</td>
<td>not</td>
<td>not</td>
<td>not</td>
<td>not</td>
<td>not</td>
</tr>
</tbody>
</table>

Thorax

Anepestidium bare hairs (12+) hairs (15+) H+B (variable, moderate B) bare

Relative halter color same same same same lighter

# NP setae 2 3 3 3 2

NP deft absent absent absent present

Scutellar setae 2x2 2x2 2x2 2x2

Leg

t1 palisade 1-4 1-4 1-4 1-4 1-4

t2 palisade 0.88 0.6 0.67 0.67 0.67

g comb bifurcate absent absent absent absent absent

g setulae PD PD PD PD

f1 basal setae B+AV B+AV B+AV B+AV

f2 basal setae differentiation absent (+10 long) absent absent absent present (10+ long, curved) absent

Wing

Wing Length (mm) 1.64-1.66 1.41 1.13-1.37 1.06-1.28 1.04-1.23

Costal index 0.42-0.43 0.4 0.33-0.36 0.37-0.41 0.42-0.44

Costal ratio 2.85-3.90 2.00-2.60: 1 3.11: 1.06: 1 3.76: 1.10: 1 3.53-4.60: 1.00-1.28: 1 2.63-3.08: 1.57-1.77: 1

Number alar setae 3 3 2 (basal 1/3) 2 2

General Remarks

Forefemur + t1 seg2 with spindles F2 with basal sculpturing (Fig. 22)

Megaselia sacatelensis new species (Figs. 26, 58, 88, 119)

Diagnosis. Male. In the group VIII key of Borgmeier (1966), M. sacatelensis keys to M. longipennis Malloch which was described from females only (1912). Borgmeier examined many specimens of both sexes that he designated as M. longipennis. Closer examination reveals that it is almost certain this material contains multiple species. M. sacatelensis has a characteristic coloration (Fig. 26), which does exhibit variation but is recognizable in pattern in over 100 specimens observed, unlike the generally varied coloration Borgmeier noted for M. longipennis. Additionally, the halteres on M. sacatelensis are dusky yellow, almost a light brown, in contrast to the “pale yellow” halteres described by Borgmeier (1966). Lastly, M. sacatelensis has a characteristic hypandrium with two darkened and elongate processes (Fig. 119) that fold over each other when the genitalia are withdrawn (Fig 88). Again, slide mounting of specimens is absolutely essential with Megaselia to eliminate errors and redundancy.

Description. See Table 7.

Distribution. Los Angeles, California (USA).
**Etymology.** Named in honor of Sacatela Creek that historically ran by the Los Angeles Ecovillage, home of BioSCAN site 11.

**Biology.** Unknown.


**Megaselia seaverorum** new species (Figs. 27, 59, 89, 120)

**Diagnosis.** Male. In the group V key of Borgmeier (1964), *M. seaverorum* keys to *M. subnudifemur* Borgmeier. *M. seaverorum* can be distinguished from this species (and a majority of other species in the genus) by the unique, wedge shaped structure of its cerci, which each have 10+ setae (Fig. 89).

**Description.** See Table 7.

**Distribution.** Los Angeles, California (USA).

**Etymology.** Named in honor of the Seaver family, whose gracious donations from the Seaver Foundation make BioSCAN possible.

**Biology.** Unknown.

**Holotype.** ♂, USA: CALIFORNIA: Los Angeles, Glendale, 1–8.II.2014, Hoffman, Malaise trap (LACM 329829).


**Megaselia sidneyae** new species (Figs. 28, 32, 60, 90, 121, 122)

**Diagnosis.** Male. In the group V key of Borgmeier (1964), *M. sidneyae* keys to *M. divergens* Malloch, which in the description (1912) lacks the characteristic femoral sculpturing (Fig. 32) and curved, spindly left process of the hypandrium (Figs. 90, 121, 122). *M. divergens* is also a smaller species (1 mm compared to *M. sidneyae* at >1 mm measuring only the thorax through tergite 6). Examination of type material was inconclusive; the male and female from Plummers Island, Maryland designated in the original description are both female, and the male from Washington, District of Columbia from 30 September 1912 is not to be found. This leads us to believe that it is possible this species was mistakenly identified from females only, as the “male” from Maryland is clearly female with withdrawn genitalia. Of the material mentioned by Malloch from Williams, Arizona, only three of the four specimens were found. Two are females, and the third needs to be slide mounted but is almost certainly a different species based on the long, heavy setation visible on the tergites (*M. sidneyae* has short setation throughout, and *M. divergens* is noted by Borgmeier as having bare tergites). Of the males in the non-type collection material of *M. divergens* (that can be positively identified as mounted), there are some that clearly belong to *M. sidneyae* and are listed in additional material examined. These were obviously designated as this species post-description according to mostly venational characteristics. At this time, with no way to assuredly match males and females, we here describe *M. sidneyae* as a new species, distinct from *M. divergens* as above, easily recognized by the basal femoral sculpturing and curved, spindly left hypandrial process.

**Description.** See Table 7.

**Distribution.** Los Angeles, California (USA).

**Etymology.** Named in honor of Sidney Higgins, host of BioSCAN site 23.

**Biology.** Unknown.


FIGURES 69–74. Male genitalia, left lateral. 69. Megaselia defibaughorum. 70. Megaselia donahuei. 71. Megaselia francoae. 72. Megaselia fujikai. 73. Megaselia hardingorum. 74. Megaselia heini.
FIGURES 75–80. Male genitalia, left lateral. 75. Megaselia hentschkeae. 76. Megaselia hoffmanorum. 77. Megaselia hoggorum. 78. Megaselia hoguei. 79. Megaselia isaacmajorum. 80. Megaselia kelleri

FIGURES 81–86. Male genitalia, left lateral. 81. Megaselia lombardorum. 82. Megaselia marquezi. 83. Megaselia mikejohnsoni. 84. Megaselia oxboroughae. 85. Megaselia pisanoi. 86. Megaselia renwickorum.
**Megaselia steptoeae** new species (Figs. 29, 61, 91, 123)

**Diagnosis.** Male. In the group III key of Borgmeier (1964), *M. steptoeae* keys to couplet 13 where it can readily be distinguished from both *M. scopalis* Brues and *M. renata* Borgmeier. *M. steptoeae* lacks the forceps-like epandrial process and strong anipisternal bristle of *M. scopalis*. *M. steptoeae* is differentiated easily from *M. renata* by the structure of the genitalia. In *M. renata*, the epandrium has a triangular notch near the rear margin and numerous stout bristles near the lower margin of the epandrium; *M. steptoeae* lacks such a notch and has few bristles arranged in a more-or-less vertical row on the epandrium (Fig. 91).

**Description.** See Table 7.

**Distribution.** Los Angeles, California (USA).

**Etymology.** Named in honor of LaChristian Steptoe, host of BioSCAN site 10.

**Biology.** Unknown.

**Holotype.** ♀, USA: CALIFORNIA: Los Angeles, Los Feliz, 4–11.IV.2014, Louie, Malaise trap (LACM 329834).

**Paratypes.** 4 ♀, USA: CALIFORNIA: Los Angeles, Koreatown, 5–12.IV.2014, Ralph, Malaise trap (LACM 329835, LACM 329836, 2 CUMZ)


**Megaselia wiegmanae** new species (Figs. 30, 62, 92, 124)

**Diagnosis.** Male. In the group VIII key of Borgmeier (1966), *M. wiegmanae* fails the key at couplet 11 where it lacks either the enlarged genitalia of *M. globipyga* Borgmeier or the large hypandrium of *M. brevicostalis* Wood. *M. wiegmanae*, like *M. brevicostalis*, is part of the *M. curtineura* complex of *Megaselia*, and the two species are similar. In addition to the aforementioned large hypandrium of *M. brevicostalis*, *M. wiegmanae* has a slightly longer costal index (0.42–0.44 compared to 0.40–0.43), and only 2 alular setae (3 in *M. brevicostalis*) (Fig. 92).

**Description.** See Table 7.

**Distribution.** Los Angeles, California (USA).

**Etymology.** Named in honor of K.T. Wiegman, host of BioSCAN site 18.

**Biology.** Unknown.


**Discussion**

The authors again stress the importance of species-level taxonomy in urban environments (as elsewhere). In our rapidly changing world, the fauna of cities remains poorly known. It may be true that Los Angeles has higher diversity than many cities with its diverse geography and warm-temperate climate. Additionally, the two large container ports of the area mean importations are likely often and numerous, and the abundance of non-native flora makes Los Angeles an excellent settling place for insect invaders from around the world. No matter what factors may be at play, however, dozens of new species in a single genus described from one of the world’s largest cities is remarkable. These findings hint at the tremendous amount of work taxonomists have before them in urban environments.
We report on the results of a single collecting method, Malaise traps. These flight interception traps will obtain a large proportion of the species present in a given area, however, some species will require other collecting methods to demonstrate their presence (e.g. Disney et al. 1982).
The importance of adequately prepared type material and visual documentation of species has become especially apparent during the preparation of this manuscript. It is the hope of the authors that with continued work using the streamlined, heavily visual and table-based description of Hartop and Brown (2014), many of the discrepancies of the Nearctic fauna of *Megaselia* will be resolved, and many more new species will be described in the decades to come.

Acknowledgments

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