Biología Acuática (2018)
33: 01 - 07

Forcipomyia (Synthyridomyia) murina (Winnertz, 1852) in South America. Synonymy and redescription (Diptera: Ceratopogonidae)

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Abstract. Both sexes of the hitherto Holarctic, Afrotropical and Oriental species *Forcipomyia (Synthyridomyia) murina* (Winnertz, 1852) are redescribed and the species is firstly recorded from Argentina (Salta, La Rioja, Santiago del Estero, Córdoba, Corrientes, Buenos Aires and Río Negro provinces). *Forcipomyia (S.) calchaqui* Spinelli & Marino, 1997 and *Forcipomyia (S.) soibelzoni* Marino & Spinelli, 2001 are recognized as its junior synonyms. A key for the identification of the four species of the subgenus that inhabit the Neotropical region is also presented, and *F. murina* is compared with the most similar Old World species.

Keywords: Forcipomyiinae, identification key, Neotropical, new record, synonymy.

Resumen. Se redescriben ambos sexos de la hasta ahora especie Holártica, Afrotropical y Oriental, *Forcipomyia (Synthyridomyia) murina* (Winnertz, 1852), y la especie se registra por primera vez en Argentina (provincias de Salta, La Rioja, Santiago del Estero, Córdoba, Corrientes, Buenos Aires y Río Negro). *Forcipomyia (S.) calchaqui* Spinelli & Marino, 1997 y *Forcipomyia (S.) soibelzoni* Marino & Spinelli, 2001 se reconocen como sinónimos menores. Se presenta una clave para la identificación de las cuatro especies del subgénero que habitan la región Neotropical, y se compara a *F. murina* con las especies más similares del Viejo Mundo.

Palabras Clave: Clave identificatoria, Forcipomyiinae, Neotropical, nueva cita, sinonimia.

INTRODUCTION

Biting midges of the genus *Forcipomyia* Meigen, 1818 inhabit all zoogeographical regions except Antarctica. They are very diverse and include 1154 extant and 32 extinct species (Borkent, 2016). Borkent & Spinelli (2007) listed 211 Neotropical species of *Forcipomyia*, but 19 species were subsequently described or recorded from this region. The genus has considerable economic impact because many species are important pollinators of some commercial trees such as cacao (*Theobroma cacao*) and rubber (*Hevea brasiliensis*) (Borkent & Spinelli, 2007).

Taxonomically, 36 subgenera are recognized within *Forcipomyia* (Borkent, 2016), and the current infrageneric classification is based mainly on adult morphology.

The subgenus *Synthyridomyia* Saunders, 1927 includes 27 extant and one extinct species worldwide (Borkent, 2016). Borkent & Spinelli (2007) recorded four species for the Neotropical region, and Spinelli *et al*. (2010) assigned *Forcipomyia calchaqui* Spinelli & Marino, 1997, a species originally described as *Forcipomyia* (*Thyridomyia*), to the subgenus *Synthyridomyia*, arising to five the number of Neotropical species of the subgenus. Of these, three species have been recorded from Argentina, *F. (S.) calchaqui* from Salta, La Rioja, Santiago del Estero,

Córdoba and Buenos Aires, *F. (S.) sanctaeclarae* Wirth, 1952 from Juan Fernández islands, central Chile and Río Negro, Chubut and Santa Cruz provinces in Argentina, and *F. (S.) soibelzoni* Marino & Spinelli, 2001 from the Argentinean province of Río Negro.

A recent study of the *Forcipomyia* from Argentina deposited in the collection of the Museo de La Plata, Argentina, revealed the presence of female specimens from several localities that were provisionally identified as *F. (S.) calchaqui*, being those from Buenos Aires and Salta provinces, including the type locality, associated with males. A close examination of the males and the comparison with the Old World species of the subgenus revealed that they actually belong to *Forcipomyia (S.) murina* (Winnertz, 1852), a species widely distributed in the Holarctic, Afrotropical and Oriental regions. This finding prompt us to record *F. (S.) murina* for the Neotropical region, to fully redescribe the species on the basis of the specimens from Argentina, and to propose *F. (S.) calchaqui* and *F. (S.) soibelzoni* as junior synonyms, after the examination of the type material of both species.

MATERIAL AND METHODS

Specimens were collected using CDC, Shannon or funnel light traps or Malaise traps in the great majority of the collecting localities, and sweeping along a narrow, meandrous stream in Alberti, Buenos Aires province. They were preserved in 70% ethanol and subsequently cleared, dissected and mounted on microscope slides in Canada balsam, and were examined and measured with a binocular compound microscope at 40-400X. Illustrations were made using an Olympus CH2 microscope with attached camera lucida. Photographs were taken with a Micrometrics SE Premium digital camera attached to a Nikon Eclipse E200 microscope.

Morphological terms follow those in the chapter on Ceratopogonidae in the recent Manual of Central American Diptera (Borkent *et al*., 2009). Special terms for the male genitalia are those provided by Alwin-Kownacka *et al*. (2016). Examined specimens are deposited in the Collection of the Museo de La Plata, Argentina (MLPA).

SYSTEMATICS

Key to *Forcipomyia (Synthyridomyia)* of the Neotropical region.

1. Males 2
-- Females 5
2. Posteromedian margin of sternite 9 straight or with shallow excavation; sensory pit of third palpal segment on prominent basal or mesal swelling.....3
-- Sternite 9 with very deep posteromedian excavation; sensory pit of third palpal segment on the slightly broader midportion .....*F. (S.) sanctaeclarae*
3. Aedeagus with a dorsal, long, heavily sclerotized median projection with pointed tip curved mesad, and two pairs of posteriorly directed lateral sclerites; submedian process of parameres rod-like with apex not expanded .....*F. (S.) murina*
-- Aedeagus without median projection, and with one pair of posteriorly directed lateral sclerites; submedian process of parameres rod-like with expanded apex 4
4. Aedeagus with distal piece of lateral sclerite heavily sclerotized, blackish, with blunt tip..... *F. (S.) floridensis*
-- Aedeagus with distal piece of lateral sclerite moderately sclerotized, brownish, with sharp, slender tip ..... *F. (S.) tenuiforceps*
5. Sensory pit of third palpal segment on prominent basal or mesal swelling; mandible with more than 20 teeth 6
-- Sensory pit of third palpal segment on the slightly broader midportion; mandible with approximately 12 minute teeth ..... *F. (S.) sanctaeclarae*
6. Spermatheca with prominent, oblique neck 7
-- Spermatheca with short, scarcely apparent neck ..... *F. (S.) tenuiforceps*
7. Sensory pit of third palpal segment on prominent basal swelling; flagellomeres 2–8 elongate, subcylindrical.....*F. (S.) murina*
-- Sensory pit of third palpal segment on prominent mesal swelling; flagellomeres 2–8 short, globose .....*F. (S.) floridensis*

Synthyridomyia Saunders

Synthyridomyia Saunders, 1957: 688 (as subgenus of *Forcipomyia*). Type species: *Lasiohelea acidicola* Tokunaga, by original designation.

Forcipomyia (*Synthyridomyia*) *murina* (Winnertz) (Figures 1-11)

Ceratopogon murinus Winnertz, 1852: 26 (male, female, Germany).

Apelma aurosparsum Kieffer, 1919: 65 (male, Hungary).

Forcipomyia sulfurea Kieffer, 1923: 664 (female, Algeria).

Forcipomyia hirtipalpis Kieffer, 1924: 392 (male, France).

Forcipomyia sate Kieffer, 1925: 245 (male, female, Egypt).

Forcipomyia longitarsis Tokunaga, 1940: 92 (male, Taiwan).

Forcipomyia moascari Macfie, 1943: 147 (male, female, Egypt).

Forcipomyia attonsa Goetghebuer, 1950: 1 (male, Belgium).

Forcipomyia murina: Dow and Wirth 1972: 197 (male, female, North America, Europe = *Forcipomyia moascari* Macfie, 1943, distribution); Remm, 1981: 31 (= *Apelma aurosparsum* Kieffer, 1919, *Forcipomyia moascari* Macfie, 1943); Szadziewski 1983: 379 (*Algeria* = *Forcipomyia sulfurea* Kieffer, 1923, *Forcipomyia hirtipalpis* Kieffer, 1924, *Forcipomyia sate* Kieffer, 1925); Szadziewski 1986: 21 (male, Belgium, = *Forcipomyia longitarsis* Tokunaga, 1940, *Forcipomyia attonsa* Goetghebuer, 1950, *Forcipomyia murina sibmurina* Remm, 1980); Boorman & van Harten 2002: 438 (male, female, Bahrain, Oman, Yemen); Szadziewski *et al*. 2011: 639 (male, UAE); Alwin & Szadziewski, 2013: 124 (photo male genitalia); Alwin-Kownacka *et al*., 2016: 371 (diagnosis, Israel, Yemen, distribution); Yu *et al*., 2005: 660 (male, Taiwan).

Forcipomyia murina sibmurina Remm, 1980: 115 (male, female, southern Siberia).

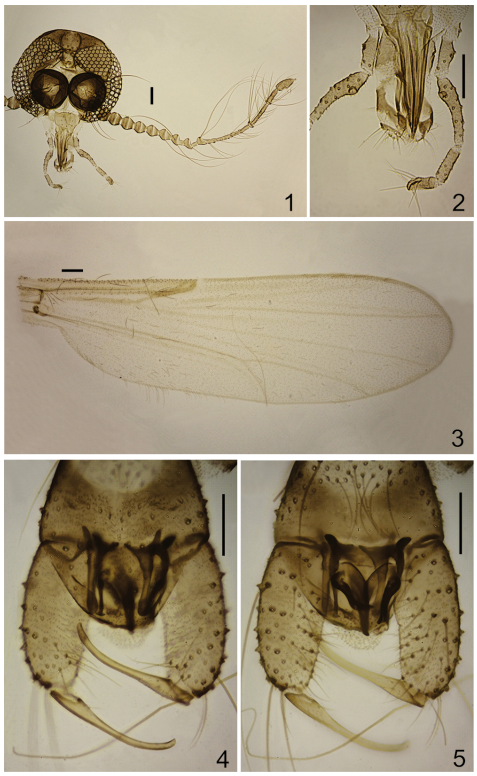
Forcipomyia calchaqui Spinelli & Marino, 1997: 188 (female, *Arge*ntina); Spinelli *et al.,* 2010: 130 (subgeneric position, Argentina records). NEW SYNONYM.

Forcipomyia soibelzoni Marino & Spinelli, 2001: 14 (female, Argentina); Muzón *et al.,* 2005: 62 (Argentina records). NEW SYNONYM.

DIAGNOSIS. Male. Only species of Neotropical *Forcipomyia* (*Synthyridomyia*) with posteromedian margin of sternite 9 straight, aedeagus with a dorsal heavily sclerotized median projection and two pairs of posteriorly directed lateral sclerites, and submedian process of parameres with not expanded apex. Female: only species of Neotropical *Forcipomyia* (*Synthyridomyia*) with sensory pit of third palpal segment on prominent basal swelling, and spermatheca with prominent, oblique neck.

Male. (Figures 1−5, 10−11). Head (Figure 1) brown. Eyes without interommatidial spicules. Antenna (Figure 1) with well developed plume, extending to base of flagellomere 13, flagellomeres 2−6 spherical, 7–9 vasiform, 10 cylindrical, greatly elongate, 1.90–2.10 (2.00, n=3) x longer than 11, 12 similar to 11 but shorter, 13 conical, slightly longer than 12 with apical nipple, slightly constricted basally; antennal ratio 0.95–1.09 (1.00, n=3). Palpus (Figure 2) with third segment elongate, with rounded, subbasal pit; segments 4, 5 separate, 5 distinctly shorter than 4; palpal ratio 3.70–4.10 (3.95, n=3). Thorax brown; scutellum paler, with 12 large, 6 smaller setae. Legs light brown; prothoracic tarsal ratio 2.50–2.70 (2.63, n=3); mesothoracic tarsal ratio 2.20–2.40 (2.35, n=3), metathoracic tarsal ratio 2.06–2.12 (2.10, n=3); tarsal claws well developed, apices simple. Wing (Figure 3) membrane pale, covered with macrotrichia; base of M_2 not visible; 1st radial cell obliterated, 2nd radial cell well developed; cubital fork distal to level of apex of costa; wing length 1.04–1.20 (1.10, n=3) mm, breadth 0.32–0.38 (0.35, n=3) mm; costal ratio 0.38–0.40 (0.39, n=3). Halter whitish.

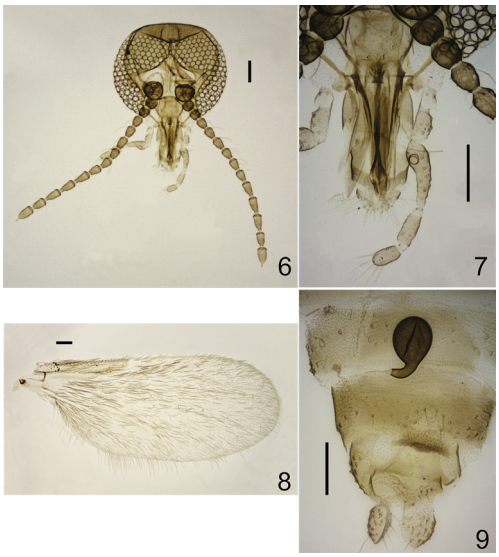
Abdomen pale brown. Genitalia (Figures 4−5, 10−11) brown: tergite 9 (Figure 4) short, extending to 1/2 length of gonocoxite, posterior margin rounded with long, slender, setose, mesally directed apicolateral processes. Sternite 9 (Figure 5) as long as broad, posteromedian margin straight. Gonocoxite cylindrical, twice longer than greatest breadth; gonostylus 0.9 length of gonocoxite, broad basally, distal 2/3 slender, tip blunt. Parameres (Figures 4, 10) with angular basimedian processes nearly meeting on midline, each with lateral process bearing a slender, anteriorly directed knob and articulated with gonocoxal apodeme, submedian process



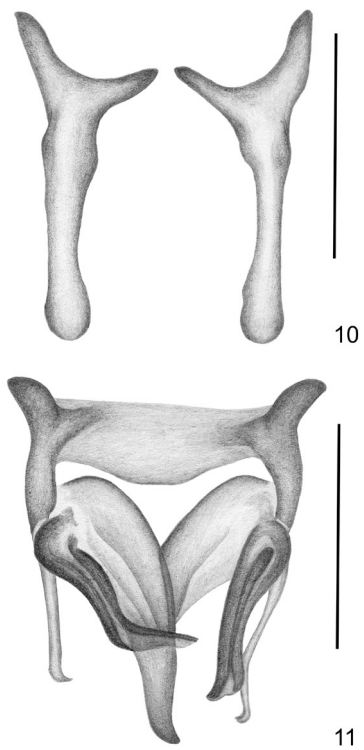
Figures 1–5. *Forcipomyia* (*Synthyridomyia*) *murina* (Winnertz). Male. 1: Head. 2: Palpus. 3: Wing. 4: Genitalia, dorsal view. 5: Genitalia, ventral view. Scale bars: 0.05 mm.

stout, rod-like, fused with lateral process, apex not expanded. Aedeagus (Figures. 5, 11) complicated; basal arch reduced to a stout transverse basal bridge convex posteriorly, bearing on each end, a short, stout, posteriorly directed lateral arms, the mesal distal margins of which are expanded mesally in a broad posteroventrally curved plate with pointed tip curved mesad; from the caudal margin of each lateral arm articulates a slender, posteriorly directed sclerite, from which arises a stout, sinuous, heavily sclerotized, posteromesally directed sclerite with pointed tip.

Female (Figures 6–9). Head (Fig. 6) brown. Eyes abutting medially for length of two ommatidia, without interommatidial spicules. Antenna (Figure 6) with flagellomeres 2–8 elongate, subcylindrical or subconical, 9–12 slightly more elongate, 13 subcylindrical with apical nipple, constricted basally; antennal ratio 0.75–1.02 (0.89, n=11). Palpus (Figure 7) pale brown, third segment elongate, with prominent basal



Figures 6–9. *Forcipomyia* (*Synthyridomyia*) *murina* (Winnertz). Female. 6: Head. 7: Palpus. 8: Wing. 9: Genital sclerotization and spermatheca. Scale bars: 0.05 mm.



Figures 10–11. *Forcipomyia* (*Synthyridomyia*) *murina* (Winnertz). Male. 10: Parameres. 11: Aedeagus. Scale bars: 0.05 mm.

swelling bearing rounded pit; segments 4, 5 separate, 5 shorter than 4; palpal ratio 2.50–3.60 (2.92, n=12). Mandible with 22–27 (26, n=12) minute teeth.

Thorax brown; scutellum paler, with 12 large, 6 smaller setae. Legs light brown; prothoracic tarsal ratio 2.10–2.67 (2.44, n=11); mesothoracic tarsal ratio 2.11–2.45 (2.36, n=11), metathoracic tarsal ratio 2.00–2.50 (2.27, n=11); tarsal claws well developed, curved. Wing (Figure 8) membrane pale, covered with macrotrichia; base of M_2 not visible; 1st radial cell obliterated, 2nd radial cell well developed; cubital fork distal to level of apex of costa; wing length 0.74–1.06 (0.89, n=12) mm, breadth 0.32–0.45 (0.38, n=12) mm; costal ratio 0.34–0.40 (0.37, n=12). Halter whitish.

Abdomen (Figure 9) pale brown. Sternite 8 with transversal, dark brown ribbon. Genital plate of sternite 9 lightly sclerotized, subquadrangular with rounded lumen. Spermatheca globose with prominent oblique neck, the globose portion measuring 40–50 (44, n=12) µm of diameter, neck 14–30 (22, n=12) µm long.

Types. *Ceratopogon murinus*: Two syntypes from Germany are in the British Museum, and other Winnertz material presumably is in the Vienna Museum, Bonn Museum and Senckenberg Museum (Dow & Wirth, 1972).

Forcipomyia calchaqui: Holotype female, Argentina, Salta, Cafayate, 26°3'54.14" S, 65°58'21.99" W, 17–VIII–1980, G. Spinelli, at light (MLPA, examined).

Forcipomyia soibelzoni: Holotype female, Argentina, Río Negro, meseta de Somuncurá, Chipauquil, vertiente arroyo Valcheta, 40°58'25" S, 66°39'14.7" W, 630 m, 28–XI–1995, G. Spinelli, Shannon trap (MLPA, examined).

Other specimens examined. Argentina, Salta, Cachi, 25°7'5.72" S, 66°9'47.78" W, 18–I–2000, G. Spinelli, 1 female, at light; Salta, Cafayate, motel ACA, 26°3'54.14"S, 65°58'21.99" W, 27–III–2005, G. Spinelli, 2 females, at light; same data except 28–III–2005, G. Spinelli, 1 male, 4 females; La Rioja, río Miranda at national route 40, 29º20'50.4" S, 67º42'12.8" W, 1590 m, 17/18–XI–2007, G. Spinelli, 1 female, CDC light trap; La Rioja, Chilecito, 29°10'27.22" S, 67°28'45.61" W, 29-IX-1989, G. Spinelli, at light; Santiago del Estero, Añatuya, 28°27'38.08" S, 62°50'3.71" W, XII–1998, D. Carpintero, 2 females, at light; Córdoba, paraje Las Jarillas, río San Antonio, 31°32'02.8" S, 64°33'01.7" W, 820 m, 25–XI–2007, G. Spinelli, 1 female, Malaise trap; Córdoba, río Suquía at arroyo Huerta Grande, 31º05'00.6" S, 64º30'05.2" W, 934 m, 21–X–2008, P. Marino, 1 female, sweeping; Corrientes, Colonia Pellegrini, 28°32'17.58" S, 57°10'56.86" W, 21/27–XI–2002, M. Coscarón, 1 male, Malaise trap; Buenos Aires, Alberti, 35°1'28.63" S, 60°15'36.92" W, 15–I–1999, G. Spinelli, 1 female, sweeping; same data except 25–XII–1999, 1 male.

Distribution. Widely spread in the Holarctic and Afrotropical regions, reported also from the Oriental region (Taiwan). Records in the Neotropical region are those from Argentina, in Salta, La Rioja, Santiago del Estero, Córdoba, Corrientes, Buenos Aires and Río Negro provinces.

Taxonomic discussion. Although the specimens from Argentina that were previously identified as *F. calchaqui*, show some slight meristic differences with respect to the available descriptions of *F. murina* from the Holarctic region, such as shorter costal ratio and longer fifth palpal segment, the great resemblance of the male genitalia leaves little doubt about that the Holarctic and Neotropical specimens represent a single species, supporting thus the proposed synonymy. Besides, a close examination of the female holotype of *F. soibelzoni* revealed that it is identical to the female holotype of *F. calchaqui*, and therefore it has to be considered also a junior synonym of *F. murina.*

All diagnostic characters distinguishing males and females of *F. murina* from the other Neotropical species of the subgenus *Synthyridomyia* may be found in the key provided above.

Three Oriental species of the subgenus, *F. (S.) longitarsis* Tokunaga, 1940, *F. (S.) contigoa* Liu & Yu, in Yu *et al.*, 2005 and *F. (S.) xsiangshanensis* Yu, Liu & Chen, in Liu *et al.*, 2009 are very similar to *F. murina*. In *F. longitarsis* the aedeagal basal bridge is distinctly narrower with its distal margin straight, the lateral arms are directed mesally, and the slender sclerite that articulates from the caudal margin of the lateral arm is directed mesally. In *F. contiguous* the aedeagal basal

bridge is also distinctly narrower with its distal margin straight, the distomesal portion of the aedeagus is represented by a cylindrical process with blunt tip and the basimedian processes of parameres are straight, not angular. Finally, the aedeagal posteroventrally curved plate has a truncate tip in *F. xsiangshanensis.*

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Recibido: 19 de febrero de 2018 - Aceptado: 04 de abril de 2018