

## NOTA CIENTÍFICA

---

**Redescription of the pupa of *Parabzezzia balseiroi*  
(Diptera: Ceratopogonidae)**

---

**SPINELLI, Gustavo R., María M. RONDEROS & Pablo I. MARINO**División Entomología, Museo de La Plata, CCT CONICET- La Plata, Paseo del Bosque s/n,  
1900 La Plata, Argentina; e-mail: spinelli@fcnym.unlp.edu.ar**Redescripción de la pupa de *Parabzezzia balseiroi* (Diptera:  
Ceratopogonidae)**

■ **RESUMEN.** Se describe e ilustra la pupa de *Parabzezzia balseiroi* Spinelli & Grogan, utilizando microscopio binocular, cámara clara y fotografía digital. Las pupas fueron capturadas en el margen de un arroyo en la reserva Parque Provincial E. Tornquist, Sierra de la Ventana, provincia de Buenos Aires, Argentina. Asimismo, se observaron, midieron y fotografiaron las pupas de la serie tipo depositadas en el Museo de La Plata. Se compara *Parabzezzia balseiroi* con *P. alexanderi* Wirth, la cual ha sido también estudiada y fotografiada en este trabajo, sobre la base de ejemplares neárticos.

**PALABRAS CLAVE.** *Parabzezzia balseiroi*. Pupa. Sierra de la Ventana, Argentina. *Parabzezzia alexanderi*.

■ **ABSTRACT.** The pupa of *Parabzezzia balseiroi* Spinelli & Grogan was described and illustrated using binocular microscope, camera lucida and digital photographs. Pupae were captured along a stream margin in the Parque Provincial E. Tornquist Reserve, Sierra de la Ventana, Buenos Aires province, Argentina. Also, additional pupae were observed, measured and photographed on the basis of the type series deposited in the Museo de La Plata. *Parabzezzia balseiroi* is compared with *P. alexanderi* Wirth, which was also herein studied and photographed from Nearctic specimens.

**KEY WORDS.** *Parabzezzia balseiroi*. Pupa. Sierra de la Ventana, Argentina. *Parabzezzia alexanderi*.

The worldwide genus *Parabzezzia* Malloch is a small group of poorly known biting midges, commonly breeding along the edge of more permanent bodies of water (Grogan & Wirth, 1977). Borkent & Spinelli (2007), in their catalog of the Neotropical ceratopogonids, recorded 24 species from this region which were reviewed by Spinelli & Grogan (1987). By virtue of the presence of a conspicuous basal swelling of the costal vein, Spinelli & Grogan (1987) recognized the *alexanderi* group, composed by five species:

*P. alexanderi* Wirth, *P. balseiroi* Spinelli & Grogan, *P. blantoni* Wirth, *P. costalis* Wirth and *P. spangleri* Wirth. Of these, they described the pupae of *P. alexanderi* from eastern North America, Mexico, Belize, El Salvador and northeastern Argentina, and *P. balseiroi* from Mendoza, Corrientes and Entre Ríos provinces in Argentina. Although these are relatively modern descriptions, they are very incomplete.

The purpose of this paper is to fully describe the pupa of *P. balseiroi* from material

collected during a recent entomological survey in Sierra de la Ventana, Buenos Aires province, Argentina. In addition, the pupal exuviae of *P. alexanderi* is herein studied, photographed and compared with *P. balseiroi*. Due to the possibility of a synonymy of these species based on the adult similarity, the detailed study of their pupae is strongly needed to clarify the identification problem. The improvement in the knowledge of the pupae of ceratopogonids in the last years has allowed to determine the differences which, although minimum, make possible the distinction of the two species in this study.

Female pupae of *P. balseiroi* were collected with pipette from a white tray with muddy water from the edge of a stream margin in the Reserva Natural Parque Provincial Ernesto Tornquist in Sierra de la Ventana, Buenos Aires province, Argentina. They were carried back to the laboratory and conditioned in vials, individually, with a drop of water. Observations were done daily, until adult emergence. For microscopic observation, pupal exuviae were slide-mounted in Canada balsam following the technique described by Borkent & Spinelli (2007). They were mounted ventrally to examine cuticular processes of the cephalothorax, respiratory organs, and abdominal segments. All the illustrations were made with camera lucida. Photographs were taken with a Pentax Optio Power Shot S60 digital camera through a Leitz SM-Lux (10× or 40×). All the images were assembled in Photoshop CS4.

Male pupal exuviae of *P. balseiroi* were described from the type-series, represented by specimens slide mounted in Canada balsam following Wirth & Marston (1968).

Male and female pupal exuviae of *P. alexanderi*, also slide mounted in the manner of Wirth & Marston (1968), were studied and photographed from Nearctic specimens housed in the Florida State collection of Arthropods, Gainesville, Florida, USA (FSCA). For terminology see Borkent & Craig (2001). Studied specimens of *P. balseiroi* are deposited in the collection of the Museo de La Plata, Argentina (MLPA).

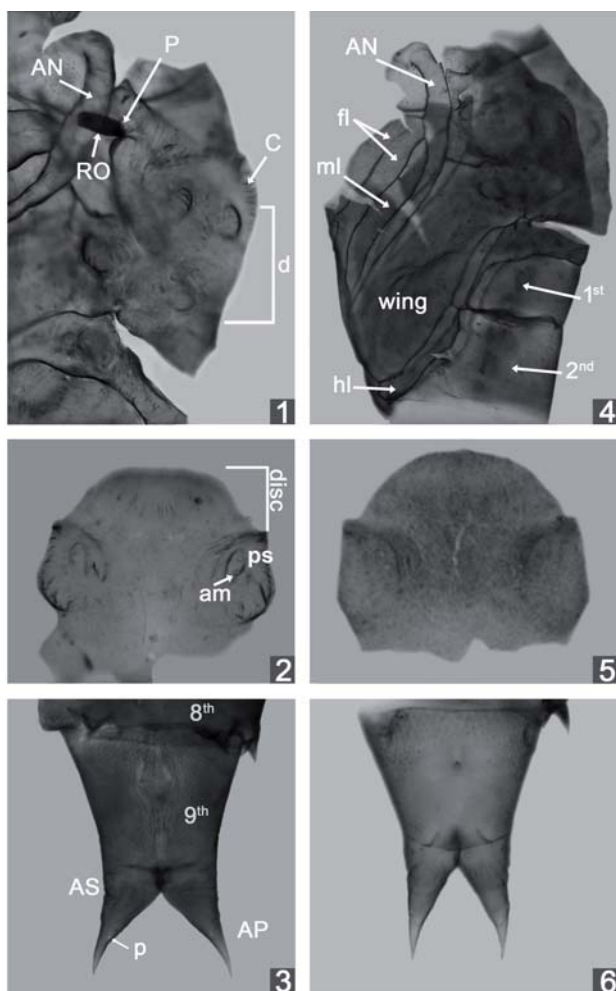
*Parabrezza balseiroi* Spinelli & Grogan,  
1987

(Figs. 1-3, 7-9, 14-18)

*Parabrezza balseiroi* Spinelli & Grogan,  
1987: 13 (female, male, pupa; Argentina); Spinelli & Wirth, 1993: 49 (in list of Argentinean species); Borkent & Wirth, 1997: 104 (in World catalog); Spinelli, 1998: 326 (in list of Argentinean species); Borkent & Spinelli, 2000: 51 (in catalog species south of USA); Spinelli, 2000: 70 (distribution); Borkent & Spinelli, 2007: 84 (in Neotropical catalog); Borkent, 2011: 127 (online catalog).

**Diagnosis adult.** Only Neotropical species of the *Parabrezza alexanderi* group with basal costal swelling non detached, costal section III separate from vein  $M_1$ , legs mostly yellowish, r-m crossvein at an oblique angle, and female claws on fore and mid legs equal.

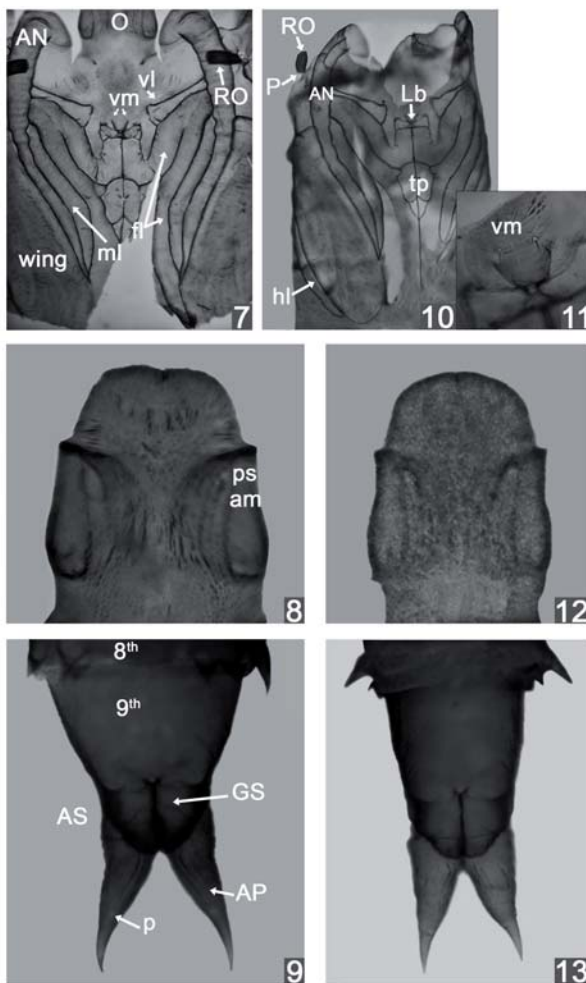
**Redescription of female pupa** (Figs. 1-3, 14-18). Length (including apicolateral processes) 2.85-3.60 (3.22, n = 10) mm. Exuviae pale brown, body surface smooth. Operculum (Fig. 2) with anterior margin quadrangular, posterior margin truncated, disk with longitudinal wrinkles on anterior portion, lateral margin with broad raised areas with well developed anteromarginal tubercle (am) bearing minute seta, pore at tubercle base, OL 0.056-0.080 (0.066, n = 9) mm, OW 0.200-0.296 (0.257, n = 10) mm, OW/OL 3.3-4.1 (3.6, n = 9). Labrum, mandibular, maxillary, labial sheaths well developed, palpal sheath medium-sized (Fig. 16). Cephalothorax surface smooth, with medium-sized medial crest extending between bases of respiratory organs (Fig. 1). Cephalothorax length 1.10-1.32 (1.18, n = 10) mm, width 0.78-0.82 (0.80, n = 7) mm. Two anterodorsal setae (ad), one minute seta, one pore (Fig. 14); one short, stout dorsolateral seta (dl) (Fig. 14); two minute, stout dorsomedial setae (dm) (Fig. 14). Dorsal sensillae (d) and thoracic tubercles (Figs. 1, 15): i-ii peg, iii pore on tubercle I, iv



**Figs. 1-6.** Female pupa: 1-3, *Parabrezzaia balseiroi*, 4-6, *Parabrezzaia alexanderi*; 1, 4, cephalothorax, lateral view; 2, 5, operculum; 3, 6, anal segment. Anteromarginal setae (am); antenna (AN); anal segment (AS); apicolateral processes (AP); crest (c); dorsal sensillae (d); foreleg (fl); hindleg (hl); midleg (ml); pedicel (P); pore (p); pore at tubercle base (ps); respiratory organ (RO).

pore on tubercle II, tubercles III, IV without sensillae. Respiratory organ (Fig. 1) 2.5 longer than broad, dark brown, short, with 10-12 apical opening pores in two rows, RO length 0.084-0.116 (0.100,  $n = 10$ ) mm, RO width 0.038-0.046 (0.041,  $n = 10$ ) mm, base slightly tapered; pedicel slightly pale, smooth, short, pedicel length 0.012-0.022 (0.018,  $n = 10$ ), P/RO 0.12-0.22 (0.18,  $n = 10$ ). One ventromedian, short, strong seta (vm); one ventrolateral (vl) pore (Fig. 16). Abdominal segments integument smooth, tubercles poorly developed. First abdominal segment as in Fig. 17; anterior edge with

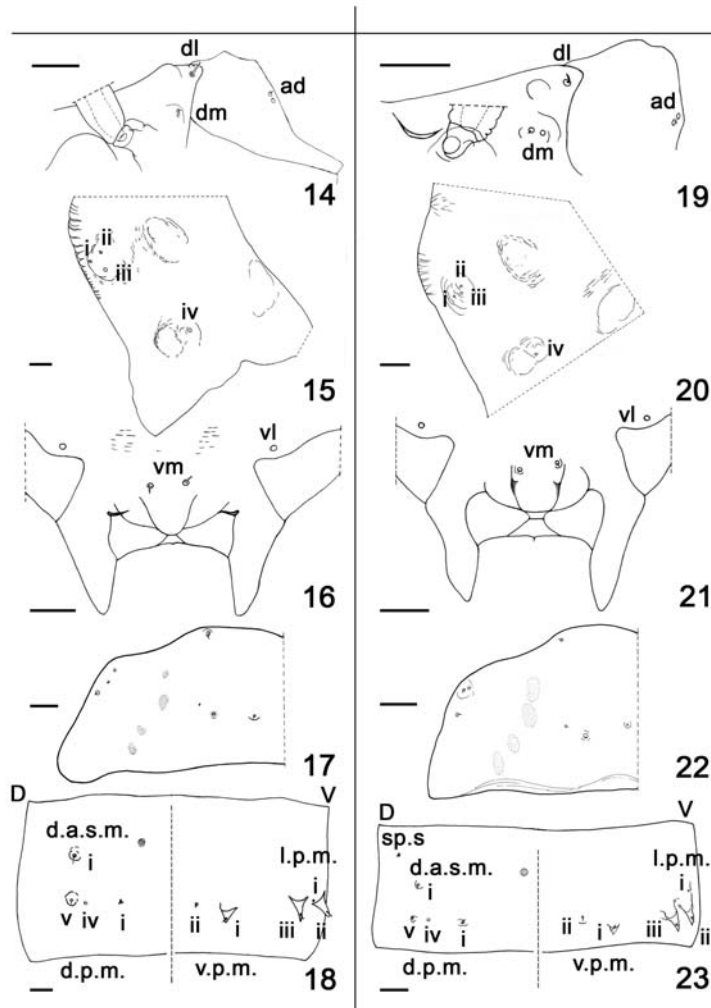
two minute setae on small tubercle; lateral portion with two minute setae, one pore; mesal portion with one pore, two minute setae. Fourth abdominal segment with sensillar pattern (Fig. 18) as follows: one dorsal anterosubmarginal (d.a.s.m.), medium-sized, stout seta; 3 dorsal posteromarginal (d.p.m.) setae: i stout, black, minute seta, ii-iii absent, iv pore, v short seta, base rounded; lateral anterosubmarginal (l.a.s.m.) absent; 3 lateral posteromarginal (l.p.m.): i pore, ii-iii short seta, all on triangular, strong tubercles; ventral anterosubmarginal (v.a.s.m.) absent; 2 ventral posteromarginal (v.p.m.) setae: i,



**Figs. 7-13.** Male pupa: 7-9, *Parabezzia balseiroi*, 10-13, *Parabezzia alexanderi*; 7, 10, cephalothorax, ventral view; 8, 12, operculum; 9, 13, anal segment; 11, ventromedian setae. Anteromarginal setae (am); antenna (AN); anal segment (AS); apicolateral processes (AP); fore leg (fl); genital sac (GS); hind leg (hl); labium (Lb); mid leg (ml); operculum (O); pedicel (P); pore (p); pore at tubercle base (ps); respiratory organ (RO); thoracic plate (tp); ventrolateral setae (vl); ventromedian setae (vm).

short, stout seta on raised, triangular base; ii, minute, hyaline seta. Female anal segment (Fig. 3) with dorsal surface smooth, only few spicules on anterior edge, ventral surface with spinules, apicolateral processes triangular with ventral pore at mid portion, medium-sized, base wide, slightly divergent, extreme tip slightly clear; anal segment length (with apicolateral processes) 0.344-0.400 (0.37, n = 10) mm, width 0.176-0.264 (0.20, n = 10) mm, apicolateral processes length 0.136-0.170 (0.153, n = 10) mm.

**Male** (from type-series) (Figs. 7-9). Similar to female with sexual differences. Length (including apicolateral processes) 2.70-3.08 (2.93, n = 5) mm. Operculum (Fig. 8) longer than female, anteromarginal tubercle longer than female, with setae on anterior edge; OL 0.074-0.084 (0.078, n = 5) mm, OW 0.190-0.216 (0.197, n = 5) mm, OW/OL 2.26-2.84 (2.54, n = 5). Respiratory organ (Fig. 7) length 0.084-0.112 (0.096, n = 5) mm, pedicel length 0.014-0.020 (0.016, n = 5) mm, P/RO 0.145-0.187 (0.166, n = 5). Anal



**Figs. 14-23.** Female pupa: 14-18, *Parabrezza balseiroi*, 19-23, *Parabrezza alexanderi*; 14, 19, tubercles of cephalothorax; 15, 20, dorsal setae; 16, 21, ventromedian and ventrolateral setae; 17, 22, 1<sup>st</sup> abdominal segment; 18, 23, 4<sup>th</sup> abdominal segment. Scale bars 0.05 mm. Anterodorsal setae (ad); dorsolateral seta (dl); dorsomedial setae (dm); spiracular scar (sp.s); ventrolateral setae (vl); ventromedian setae (vm). Fourth abdominal segment setae: dorsal posteromarginal setae (d.p.m.); dorsal anteromarginal setae (d.a.s.m.); lateral posteromarginal setae (l.p.m.); ventral posteromarginal setae (v.p.m.).

segment (Fig. 9) length 0.344-0.376 (0.36,  $n = 5$ ) mm, width 0.224-0.24 (0.23,  $n = 5$ ) mm, apicolateral processes length 0.116-0.156 (0.14,  $n = 5$ ) mm.

**Distribution.** Argentina (Mendoza, Corrientes, Entre Ríos, Buenos Aires provinces).

**Bionomics.** The development of the pupa of *P. balseiroi* was completed in 4 days when placed individually in cotton-stopper

vials. The emergency of adults reared in laboratory was produced at T 22°-26° C (24° C) and H 42-45 % (43 %).

**Examined types of *P. balseiroi*.** Holotype female with pupal exuviae, allotype male with pupal exuviae, Argentina, Entre Ríos, Santa Ana, 23-IX-1984, E. Balseiro-G. Spinelli, collected as pupae, reared in laboratory. Paratypes, 6 females, 12 males, as follows: same data as holotype, 3 males; same data except 9-XI-1984, 9 males, 6

females. All specimens were collected as pupa along a pond margin associated with filamentous algae, and reared in laboratory (MLPA).

### Other examined specimens

*Parabrezza balseiroi*: Argentina, Buenos Aires, Sierra de la Ventana, Reserva Parque Provincial E. Tornquist, arroyo de la Clausura, 38° 02' 46.1" S, 61° 59' 10.1" W, 19-XII-2006, F. Díaz, 2 females with pupal exuviae; same data except 23-III-2007, P. Marino-C. Cazorla, 1 female. All specimens were collected as pupae along a stream margin and reared in laboratory (MLPA).

*Parabrezza alexanderi* (Figs. 4-6, 10-13, 19-23): USA, Maryland, Prince Georges Co., College Park, Lakeland Pond, 30-V-1975, W.L. Grogan, 1 male with pupal exuviae; same data except 10-IX-1975, 1 female. Specimens collected as pupa along a pond margin and reared in laboratory.

**Remarks.** As it was pointed out by Spinelli & Grogan (1987), adults of *P. balseiroi* and *P. alexanderi* are nearly identical except for the length of tarsal claws which are equal on fore and mid legs in *P. balseiroi*, and unequal in *P. alexanderi*. The strong similarity of the adults of both species is correlated with the slight differences showed by their pupae. The following are the differences observed in the pupa of *P. alexanderi* when it was compared with *P. balseiroi*:

\* The lateral margins of the operculum are not as raised as in *P. balseiroi*, and the anteromarginal tubercle is less developed (Figs. 5, 12).

\* The respiratory organ bears 14-16 apical opening pores (Fig. 10).

\* The dorsomedial setae are represented by one seta and one pore (Fig. 19).

\* The dorsolateral seta is stouter and shorter, peg-like (Fig. 19).

\* The ventromedian seta is minute, and the male shows an additional pore (Figs. 11, 21).

\* The first abdominal segment has a single seta on its anterior margin (Fig. 22).

\* The apicolateral processes have a narrow base, are subparallel, and bear two pores at their mid portion (Figs. 6, 13).

### ACKNOWLEDGEMENTS

Our gratitude to Dr. William L. Grogan, who kindly sent to us specimens of *P. alexanderi* from the Florida Collection of Arthropods, Florida, USA. We also acknowledge Florentina Díaz and Nélida Caligaris for technical assistance and Mónica A. Caviglia for the English proofreading.

### LITERATURE CITED

- BORKENT, A. 2011. World species of Biting Midges (Diptera: Ceratopogonidae). Available from: <http://www.inhs.illinois.edu/research/FLYTREE/CeratopogonidaeCatalog.pdf>. (Last updated: February 10, 2011).
- BORKENT, A. & CRAIG, D. A. 2001. Submerged *Stilobezzia rabelloi* Lane (Diptera: Ceratopogonidae) pupae obtain oxygen from the aquatic fern *Salvinia minima* Baker. *Proceedings of the Entomological Society of Washington* 103: 655-665.
- BORKENT, A. & SPINELLI, G. R. 2000. Catalog of the New World biting midges south of the United States of America (Diptera: Ceratopogonidae). *Contributions on Entomology, International* 4 (1): 1-107.
- BORKENT, A. & SPINELLI, G. R. 2007. Neotropical Ceratopogonidae (Diptera: Insecta). In: Adis, J., J. R. Arias, G. Rueda-Delgado & K. M. Wantzen (Eds.). *Aquatic Biodiversity in Latin America (ABLA)*. Vol. 4. Pensoft, Sofia-Moscow, 198 pp.
- BORKENT, A. & WIRTH, W. W. 1997. World Species of Biting Midges (Diptera: Ceratopogonidae). *Bulletin of the American Museum of Natural History* 233: 1-257.
- GROGAN, W. L. & WIRTH, W. W. 1977. A revision of the Nearctic species of *Parabrezza* Malloch (Diptera: Ceratopogonidae). *Journal of the Kansas Entomological Society* 50 (1): 49-83.
- SPINELLI, G. R. 1998. Ceratopogonidae. In: Coscarón, S. & J. J. Morrone (Eds.), *Biodiversidad de los artrópodos argentinos. Una aproximación biotaxonomía*, Ediciones Sur, La Plata, pp. 314-326.
- SPINELLI, G. R. 2000. New records of biting midges from southern South America (Diptera: Ceratopogonidae). *Neotrópica* 46: 69-70.
- SPINELLI, G. R. & GROGAN, W. L. 1987. A revision of the Neotropical species of *Parabrezza* (Diptera: Ceratopogonidae). *Biología Acuática* 11: 1-45.
- SPINELLI, G. R. & WIRTH, W. W. 1993. *Los Ceratopogonidae de la Argentina (Insecta: Diptera)*. Fauna de agua dulce de la República Argentina. Volumen 38. Diptera Fascículo 3. Ceratopogonidae, 124 pp.
- WIRTH, W. W. & MARSTON, N. 1968. A method for mounting small insects on microscope slides in Canada balsam. *Annals of the Entomological Society of America* 61: 783-784.