

Male description of the phytotelma-dwelling species *Polypedilum parthenogeneticum* (Chironomidae: Chironominae)

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Abstract

The male of the phytotelma-dwelling species *Polypedilum parthenogeneticum* is described from *Eryngium* L. (Apiaceae) (Corrientes province, Argentina) and is included within the subgenus *Polypedilum*. The pupal diagnosis is emended, its geographic distribution is updated, and their taxonomic relationships with other Neotropical species of *Polypedilum* are discussed.

Introduction

The genus *Polypedilum* Kieffer, 1913 occurs in all zoogeographical regions except Antarctica (Vårdal et al. 2002). The larvae of this genus are found in sediments of standing and flowing waters, with a few species mining wood or grazing on epilithic surfaces (Cranston et al. 1989; Vårdal et al. 2002). This genus is quite diverse, with more than 500 species worldwide and about 70 belong to the Neotropical region. The taxonomic classifications and the subgeneric delimitation of *Polypedilum* have been problematic and were treated in several studies (Sæther et al. 2010; Cranston et al. 2016; Yamamoto and Yamamoto 2016; Shimabukuro et al. 2019),

The species *Polypedilum parthenogeneticum* was described by Donato & Paggi (2008) based on reared material collected from the leaf axils of *Eryngium* L. (Apiaceae). All the specimens obtained were females and the parthenogenesis was confirmed in the laboratory, being the eclosion one day after the oviposition. New specimens of *P. parthenogeneticum* collected from the leaf axils of *Eryngium* sp. were reared in the laboratory and a male was obtained for the first time. Therefore, the aims of this study are to describe the male of *P. parthenogeneticum* and to provide new information on its geographic distribution, as well as to emend the pupal diagnosis of this species.

Material and methods

Microscope slides were prepared by clearing the specimen with 10% KOH; neutralization with glacial acetic acid; followed by a dehydration series of 80%, 96% and 100% ethanol and mounting in Canada Balsam. Morphological terminology and measurement standards follow Sæther (1980) and Bidawid-Kafka & Fittkau (1995); the values are rounded off to the nearest 5 µm unless otherwise stated; measurements are given in µm (except when otherwise stated) as ranges. The specimens studied are deposited in the collection of the Instituto de Limnología "Dr. Raul A. Ringuelet", Argentina (ILPLA).

Taxonomy

The subgenus *Polypedilum* defined by Sæther et al. (2010) is characterized for the lack of frontal tubercles; wing membrane without macrotrichia; R_{2+3} usually well separated from R_1 ; superior volsella with a long projection, usually with lateral midbasal to subapical strong setae; and the anal point is never trifold or with lateral shoulders. As Cranston et al. 2016 considered *Tripedilum* as junior synonym of *Polypedilum* s. str., the absence of frontal tubercles and the presence of outer setae in the digitiform projection of superior volsella become inconsistent to define *Polypedilum* s. str. because those characters are diagnostic for *Tripedilum* as it was stated by Sæther et al. (2010) (see also Yamamoto and Yamamoto (2016) for further discussion). We consider the inclusion of *P. parthenogeneticum* in the subgenus *Polypedilum* by a combination of characters such as bare wing membrane, long digitiform projection of superior volsella and anal point not trifold, following Shimabukuro et al. (2019). The inclusion is also supported since the larval and pupal stages of *P. parthenogeneticum* belong to *Polypedilum* s. str. Taxonomic relationships of those stages together with the female are discussed in Donato and Paggi (2008).

***Polypedilum (Polypedilum) parthenogeneticum* Donato & Paggi, 2008**

(Fig. 1)

Polypedilum parthenogeneticum Donato and Paggi 2008: 52.

Polypedilum (Polypedilum) parthenogeneticum, new combination.

Material examined. ARGENTINA: 1 male with pupal exuviae, Corrientes, Riachuelo, 27.5452754° S, 58.7159499° W, 31.xii.2018, pipette phytotelmata in *Eryngium* L. (Apiaceae), L. Baccaro (ILPLA).

Male description

Total length 2.03 mm; wing length 1.5 mm. Total length/wing length 1.35. Wing length/length of profemur 1.97.

Head. AR 1.24. Ultimate flagellomere 128 long. Temporal setae 13. Clypeus with 22 setae. Tentorium 117 long; 27 wide. Length of palp segments: 29; 31; 68; 87; 126. Third palpomere with 3 lanceolate sensilla clavata in small pit; longest 19 long.

Thorax. Dorsocentrals 11, with 3 on humeral area; acrostichals 7; prealars 3; anteprenotals 1. Scutellum with 8 setae.

Wing (Fig. 1A). VR 1.15. Brachiolum with 1 seta. R with 18; R₁ with 9; R₄₊₅ with 21; remaining veins bare. Squama with 3 setae. Lengths and proportions of legs in Table 1.

Legs. Scale of fore tibia: 45. Spur of middle tibia: 16 and 56; of hind tibia: 26 and 70. Width at apex of fore tibia 50; of middle tibia 49; of hind tibia 54. Lengths and proportions of legs in Table 1.

Hypopygium (Fig. 1B, C). Tergite IX with 14 medial setae. Phalopodeme length: 76. Transverse sternapodeme length: 49. Superior volsella 74 long, lateral seta lacking, basal portion of superior volsella with microtrichia and 4 inner setae. Inferior volsella slender 120 long, with 11 setae arranged in two rows. Gonocoxite length: 128. Gonostyle length: 159. HR= 0.81. HV= 1.28.

Table 1. Lengths (in µm) and proportions of legs of the male of *Polypedilum (Polypedilum) parthenogeneticum* Donato and Paggi (n = 1). Abbreviations: Femur (fe); Tibia (ti); Tarsomeres 1-5 (ta₁₋₅); Leg Ratio (LR), ratio of metatarsus to tibia; «Beinverhältnisse» (BV), combined length of femur, tibia, and basitarsus divided by combined length of tarsomeres 2-5; «Schenkel-Scheine-verhältnis» (SV), ratio of femur plus tibia to metatarsus.

	fe	Ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BV	SV
P ₁	763	474	886	577	392	289	144	1.87	1.51	1.40
P ₂	804	660	536	227	165	103	82	0.81	3.46	2.73
P ₃	927	660	598	309	289	165	103	0.91	2.52	2.66

Remarks

The larva and pupa of this specimen fits in the original description, except that the branches of the thoracic horn present fine spinules in its tegument. This feature was corroborated also in the females previously described, and therefore the emendation of the pupal diagnosis of *P. parthenogeneticum* is established.

Geographic distribution

Through the present study, the distribution of the *P. parthenogeneticum* extends northward (about 800 km north to the type locality), with the new record located in Argentina in the Chacoan province of the biogeographic scheme of Cabrera and Willink (1973). Because of the notorious absence of male specimens on previous studies, it is possible that *P. parthenogeneticum* presents geographical parthenogenesis such that bisexual and parthenogenetic forms of the same species differ on their distributions (Vandel 1928).

Discussion

The male of *P. parthenogeneticum* most closely resembles *P. (P.) solimoes* Bidawid-Kafka (couplet 45, Bidawid-Kafka, 1996), but differs from this species by the possession of anal tergal bands type D; the superior volsella more curved, with 4 inner setae, lateral seta absent, and lower AR and LR₁. The male of

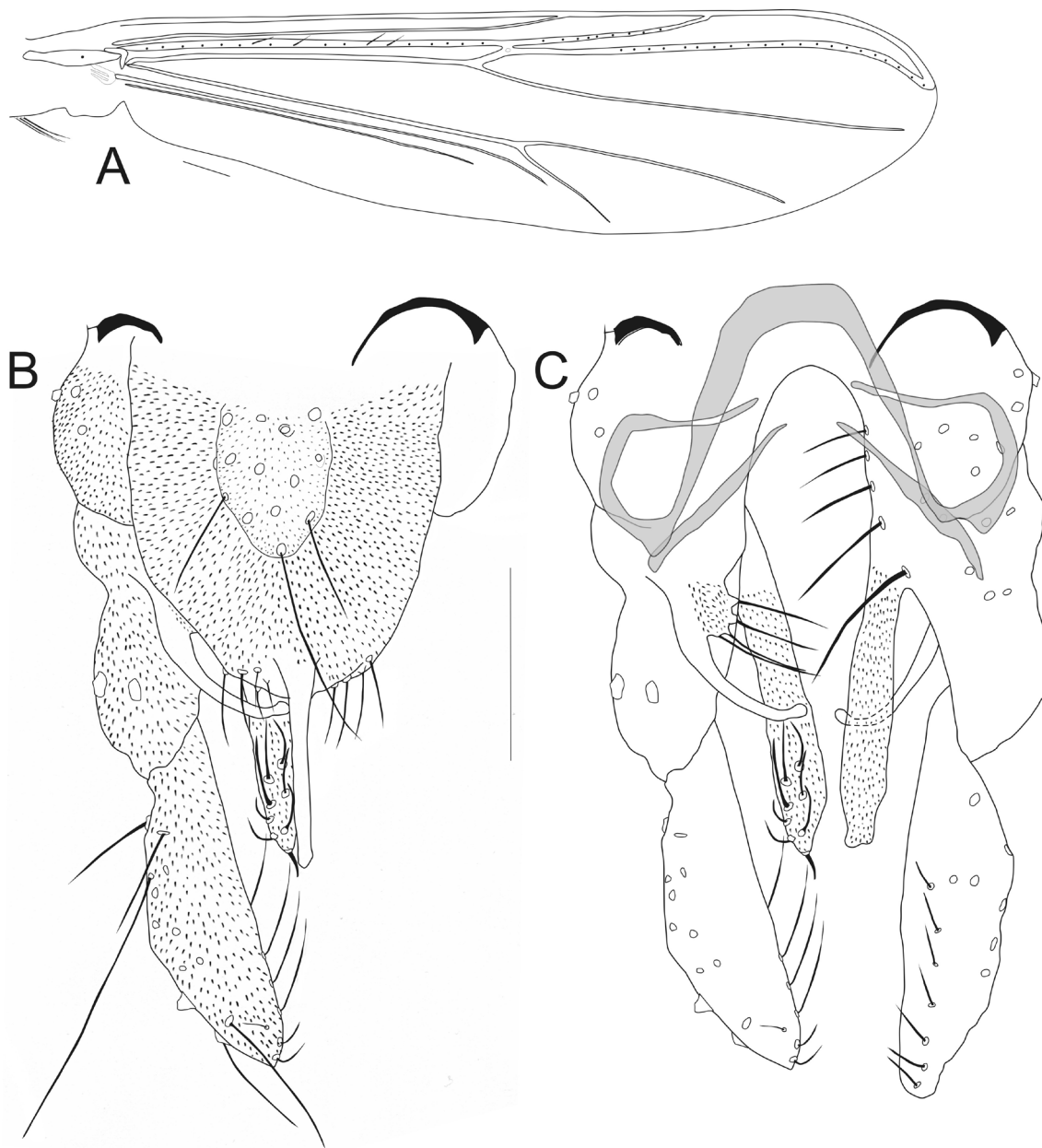


Figure 1. *Polypedilum (Polypedilum) parthenogeneticum* Donato and Paggi: A, wing; B, hypopygium, dorsal view; C, hypopygium with anal point and tergite IX removed, dorsal aspect to the left, ventral aspect to the right. Scale bar = 100 μ m.

P. parthenogeneticum resembles *P. (P.) trigonus* Townes (in Maschwitz & Cook, 2000), but it is separable by abdominal tergites without white patches, superior volsella not large with 4 inner setae and lateral seta absent.

Within the family Chironomidae, 24 formal described species have been recorded from many types of phytotelmata (Siri and Donato 2014; Paul et al. 2014; Dantas and Hamada 2017; Siri and Donato 2018), and from these species, 6 belong to the genus *Polypedilum*. One of them is *P. (P.) solimoes* that was treated above. The species *P. pedipalpus* (Picado) is known from its original description as larva, pupa and female and is not possible to be assigned to any of the subgenera. From the remaining species, two of them belong

to the subgenus *Polypedilum*. The presence of spotted wings and the superior volsella with 3 inner setae in the male and the spinules on conjunctive V-VI, lacking of median patches of shagreen in tergite III, fine and weak shagreen on tergites IV and V, and anal comb with several spines of the pupa separates the species *Polypedilum* (*P.*) *panacu* Mendes et al. 2011 from *P.* (*P.*) *parthenogeneticum*. The other species is *Polypedilum* (*Polypedilum*) *kaingangi*, described by Pinho et al. (2013). This species is clearly differentiated from *P.* (*P.*) *parthenogeneticum* by having a highly setose clypeus (63–78 to 22 in *P.* (*P.*) *parthenogeneticum*) and the superior volsella has 2 inner setae in the male; the pupa with fine and weak shagreen on tergites III, IV and V, and anal comb with several spines.

Recently the Neotropical fauna of the genus *Polypedilum* was increased by Shimabukuro et al. 2019. In that study, the authors described two species in the subgenus *Polypedilum*. The species

Polypedilum (*P.*) *caete* differs from *P.* (*P.*) *parthenogeneticum* by the possession of a long lateral seta in the superior volsella; 4–6 setae arranged in a row on inferior volsella; presence of weak marking on wings and RM distinctly darkened; and scale of fore tibia apically truncated. The other species is *Polypedilum* (*P.*) *aymbere* that is separable from *P.* (*P.*) *parthenogeneticum* by the anal point small and club-shaped; projection of superior volsella proximally enlarged, presenting a lateral seta in the middle of the projection and with 3 inner setae; and inferior volsella bearing a apical seta and 3-4 preapical.

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