Zootaxa 2300: 39–46 (2009)
www.mapress.com/zootaxa/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

A new Neotropical species of the genus *Parochlus* Enderlein, 1912 (Chironomidae: Podonominae) and new distribution in Argentina

MARIANA S. RODRÍGUEZ[1, 3], ANALÍA C. PAGGI[1] & ANA MEDINA[2]
[1]*Instituto de Limnología "Dr. Raúl A. Ringuelet" (ILPLA), Florencio Varela, Buenos Aires, Argentina*
[2]*Area Zoología, Universidad Nacional de San Luis, San Luis, Argentina*
[3]*Corresponding author. E-mail: mrodriguez@ilpla.edu.ar*

Abstract

Adults and immatures of *Parochlus carolinae* **n. sp.** are described and figured. The specimens were collected from a stream and a river in the pampasic hills system in the centre-northern part of the San Luis Province, Argentina. The adult male is distinct in having hairy eyes. The pupa differs from other known species of the genus by the structure of the thoracic horn and the arrangement of setae on the anal spurs. The distribution of the genus *Parochlus* Enderlein is widened from an austral Andean *Parochlus* proper zone to a subtropical zone with Brazilian fauna.

Key words: Diptera, Chironomidae, *Parochlus*, new species, semiarid stream, South America

Introduction

The distribution of the subfamily Podonominae displays a fascinating pattern of distribution involving disjunctions and bipolarity at very different taxonomic levels. The concentration of the majority of the extant genera, species and primitive types is confined to the circumantarctic land areas (Brundin 1966).

The large genus *Parochlus* shows a wider distribution than any other genera of the subfamily due to *P. kiefferi* (Garrett, 1925) Brundin, 1966, which lives in the Holarctic region, comprising a broad belt across North America, Greenland and Europe, and an undescribed species of the *araucanus* group in the higher elevations of Costa Rica (Watson & Heyn 1992).

The present distribution of *Parochlus* in South America is in the Andean Subregion following the biogeographical schemes of Morrone (2001), where no fewer than 26 known species are living (Brundin 1966, Spies & Reiss 1996). It stands out as a "successful" genus because of its adaptation to different habitats, mainly mountain streams, cold springs and the uppermost course of their outflow (Brundin 1966).

This genus includes seven groups. The *araucanus* group comprises 16 species divided into 5 subgroups: *spinosus*, *araucanus*, *trigonocerus*, *paupeatus* and *novaezelandiae*. Five of these species live in South America. The subgroup *araucanus* includes *P. araucanus* Brundin from South Andes, *P. bassianus* Brundin from Tasmania, *P. maorii* Brundin from New Zealand and *P. kiefferi* from North America, Greenland and Europe (Brundin 1966).

The purpose of this study is to describe the new species *Parochlus carolinae* as adult male, pupa and larva and to discuss its relationship with other members of the genus.

This new species belongs to the *araucanus* group. The adult male has an extremely narrow wing cell r_1, second palpal segment lacking thickened setae, a swollen basal portion of the gonostylus, a narrower gonostylus apical lobe compared to the subapical lobe and a very short apical lobe *t* seta, slender and weakly visible in dorsal view. The pupa has anal spurs without denticles and never directed straight outwards at right angles. The larva has a ringed third antennal segment. *P. carolinae* is a member of the *araucanus* subgroup.

Accepted by W. Gilka: 27 Oct. 2009; published: 30 Nov. 2009

The pupa has a middle-size porous plate, the stalk approximately half the length of the porous plate, typical microsculpture and a wide ventral lamella in the second abdominal segment. Both adult and pupae key out in the dichotomy identifying *Parochlus araucanus* and *Parochlus kiefferi* in the key by Brundin (1966). Because of this, the different stages of *P. carolinae* are compared here separately.

Furthermore, this species represents the first record of a formally described species of the genus in the Neotropical Region. The material has been taken from the Carolina mountain stream and Grande River in San Luis Province, Argentina, during a study aimed at characterizing lowland and hill streams by chironomid pupal exuviae.

Material and methods

Pupae and pupal exuviae, one of the latter with the larval integument attached, were collected with a drift net, while the adult male was collected with a sweep net. Part of the material was fixed in 70% ethanol, cleared with 10% KOH and slide-mounted in Canada balsam.

Morphological nomenclature and abbreviations follow Brundin (1966) and Saether (1980). All measurements are in micrometers (µm), unless otherwise stated and given as ranges followed by the number of specimens measured in parenthesis. Larval postmentum length is given as the ventral head length from the tip of the mentum to the postoccipital margin. This measure is less susceptible to deformation during slide mounting than the total head capsule length.

The holotype is deposited at the La Plata Museum (Argentina, MLP). Paratypes are also deposited in the Institute of Limnology "Dr. Raul A. Ringuelet" (Argentina, ILPLA).

Results

Parochlus carolinae sp. n.

Type material. Holotype male: ARGENTINA, San Luis Province, Carolina stream, 66º2'S, 32º50'W, 17.XI.2006, entomological net, M. Donato col. (MLP). Paratypes: 1 larval exuviae and pupa, 13.VII.2006, drift net, (MLP); 1 pupal exuviae, same data as holotype; 1 pupal exuviae and 2 pupae, Rio Grande river, upstream, 7.IX.2006, drift net, Medina & Paggi col. (ILPLA).

Etymology. The name of the new species refers to its type locality.

Diagnostic characters. As in *Parochlus duseni* (Brundin 1966) the male adult of *P. carolinae* **sp. n.** differs from other *Parochlus* species by having hairy eyes over the whole surface and could be distinguished from *P. duseni* by the following characters: a fully developed antennae with 14 flagellomeres (reduced antennae with 12 flagellomeres in *P. duseni*), wing cell r_1 extremely narrow (wing cell r_1 broad in *P. duseni*) and costa long, reaching wing tip (costa short, not reaching wing tip in *P. duseni*). The male is separable from *P. araucanus* by having a lower length ratio value between 13–14 flagellomeres and a lower number of supraalar, scutellar and prealar setae. It differs from *P. kiefferi* by having a smaller overall size, distinctly shorter wing, non dusky halteres, no anepisternal or preepisternal setae, shorter and narrower antennal segments, the last flagellomere without apical bristle, shorter palpomeres, lower VR, shorter tibial spurs, lower BV and SV of fore, mid and hind legs, lower HR and HV, wing with M_{1+2} and Cu_1 straight, narrower basal portion of apical lobe and broader distal portion of gonostylus, shorter gonostylus, with shorter *p*, *t* and *y* setae, lower number of prealar, scutellar and scale setae (Saether 1967).

The pupae of the new species have a well developed distinct thoracic horn, broader at the apex than at the base. The porous plate has a coup-shaped form, somewhat longer than broad and its surface is provided with very small well-marked 5–6 porous groups, like in *P. araucanus*. It also has an additional reticulate structure beneath the porous plate upper surface, as in *P. rieki* Brundin, 1966. Some specimens present a lobe and sharp

incisures apical margin of the porous plate (Figure 12), which resembles the *trigonocerus* group as well as *P. kiefferi* (Brundin 1966). The stalk is always considerably shorter than the plate, tapering proximally, and dorsally showing weakly developed transverse furrows and spines. The felt chamber does not end at the border between the stalk and the porous plate, but it extends into the porous plate. The setae of the anal spurs are also specific. The median seta is shorter than the lateral seta and the spur; the lateral seta is placed in the distal third of the anal spurs.

The pupae from *P. carolinae* can be distinguished from *P. araucanus* by having a stouter thoracic horn, with a shorter and more serrated stalk, a triangular porous plate, much shorter anal spur median setae and longer lateral setae that is never terminally inserted. The pupa differs from *P. kiefferi* by having its anal spur with two well developed setae, the lateral setae never being in terminal position and a shorter stalk of the thoracic horn.

Description. **Male** (n = 1) (Figures 1–8)

Body length 2 mm; wing length 1.51 mm, width 0.41 mm. Body length/wing length ratio 1.32. Wing length/wing width ratio 3.66.

Coloration. Coloration uniformily dark brown; head dark brown; thorax slightly shining, mesonotum, preepisternum and postnotum dark brown, scutellum yellowish; abdomen and legs uniformily light brown, wings grayish, halteres yellowish pallid.

Head (Figure 1). Height 0.48 mm. Eyes reniform, with a dorsomedial extension, hairy. Antenna with 14 flagellomeres, each one with dense setae. Length of antennal segments: 72, 48, 36, 28, 29, 40, 40, 40, 40, 42, 40, 39, 40, 144, 87. Diameters of scapus and segments 2–5: 142, 30, 25, 25, 26. Last segment with bristles 45–60 µm long whorl and 20 µm long strongly curved distally hyaline sensory bristles at apex (Figure 7). AR 0.5; setae of head: temporals 16, frontals 8, postorbitals 8, clypeals 7; frontal tubercles absent; clypeus width 120 µm; tentorium 140 µm long; palpomere lengths: 34, 61, 91, 81, 106; first palpomere hyaline, remaining palpomeres pigmented. Proboscis extended; mandibles serrated, 65 µm long.

Thorax (Figure 2). Antepronotum notched at middle. Chaetotaxy: Aps 4, Dc 44, Pa 24, Su 2, Scts 8, Ac 18, Pscts 4. Anapleural suture 165.6 µm long; pleura without setae.

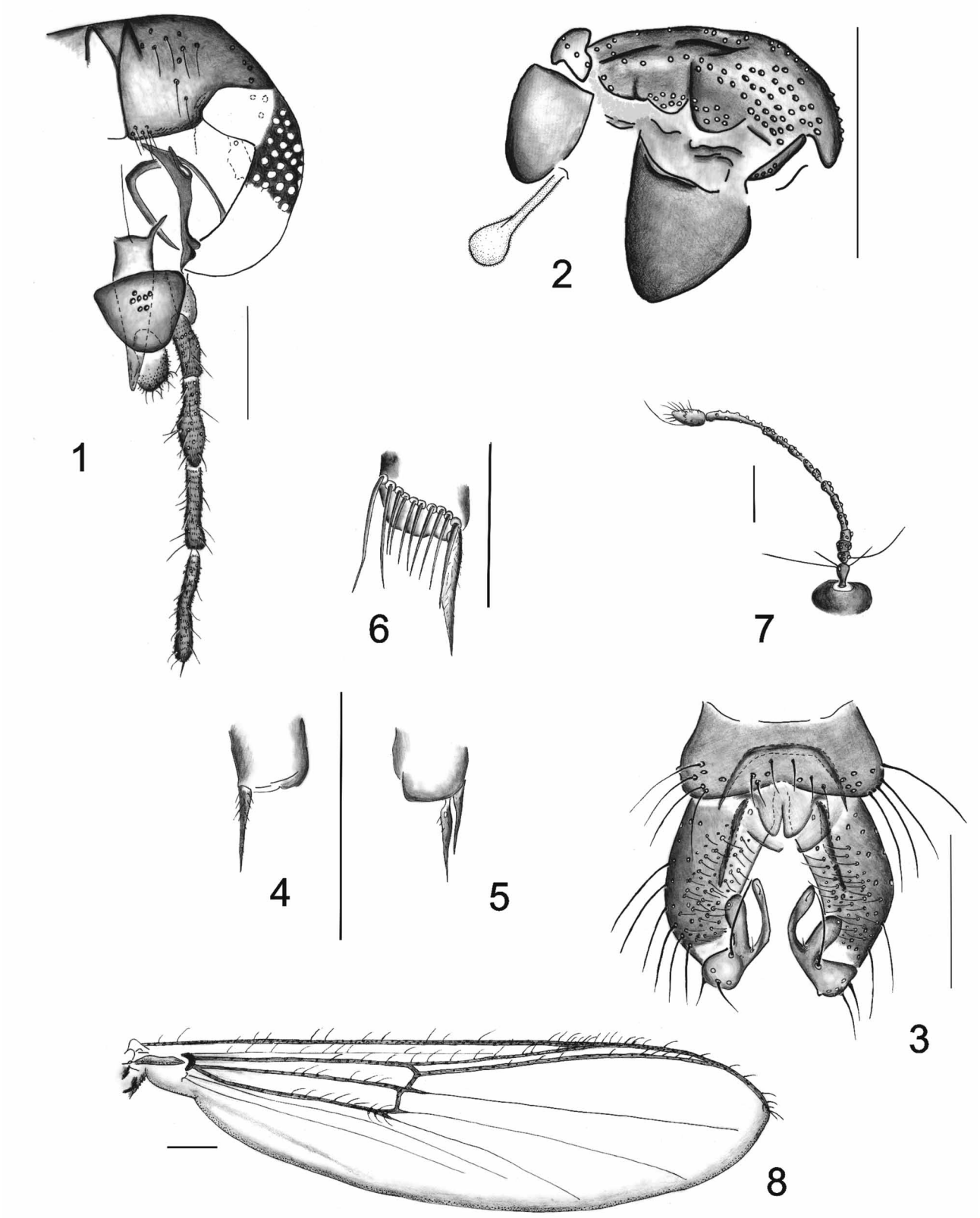
Wings (Figure 8). Wing length 1.51 mm; membrane and veins with c. 4 µm long microtrichia and c. 37 µm long macrotrichia. R_1 ending in distal third of the wing and more than half as long as R_{4+5}. Costal extension 0.12 mm long, reaching tip of to wing tip, R_{2+3} absent with thickening on R_1 and R_{4+5}, R_{4+5} close to R_1 and curving gently to terminate close to wing apex, rm and mcu equal in length. Squama with 4 setae, alula bare, brachiolum with 2 setae. C, R, R_1, R_{4+5}, M and Cu setose. Anal lobe not right-angle. RL 628 µm, Cu 538 µm long; VR 0.86. Halteres covered totally with microtrichia, only visible at 400X resolution.

Legs. Lengths and proportions as in Table. Bristles mostly uniformly dispersed reaching 0.5–1.5 the width of segment on front femora, 0.5–2 on middle and hind femora, 1–2 on front and middle tibiae, 1–2.5 on hind tibia. Spur of front tibia 36 µm long (Figure 4); spurs of middle tibia 30 µm and 22 µm long (Figure 5); of hind tibia 30 µm and 20 µm long. All tibial spurs with lateral spinules, bearing an annular mark situated at c. 1/4 length from its base. Comb of hind tibia with 10 setae 26–44 µm long (Figure 6). Empodium present, reaching 40 µm on front legs. Pulvilli lacking. Claws c. 27.2 µm long, with 3 long ventral hairs at base, 4–5 shorter dorsal hairs and 4–5 blunt apical teeth.

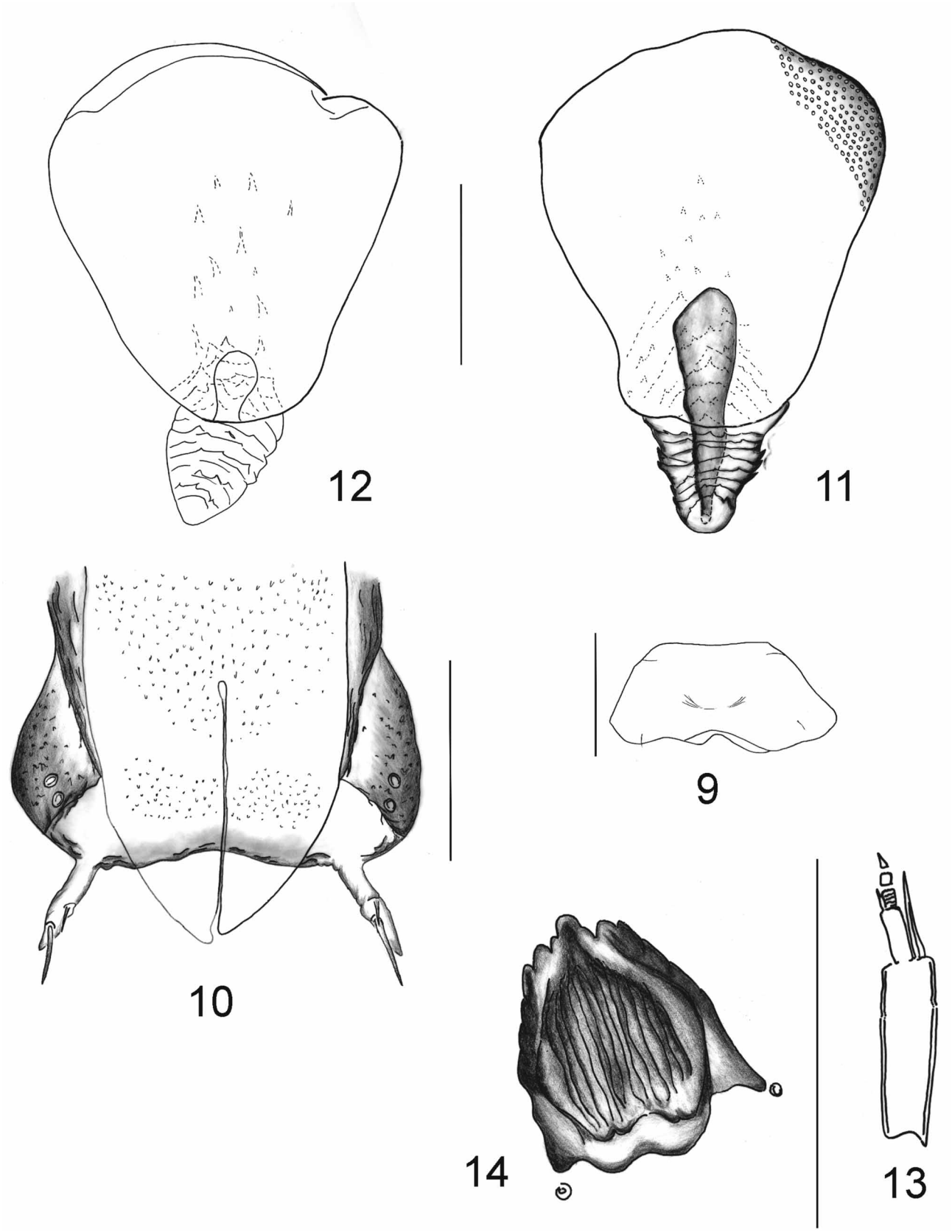
TABLE. Length (in µm) and leg proportions of *Parochlus carolinae* **sp. n.**

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV
p_1	530	538	318	171	90	57	65	0.59	3.62	3.36
p_2	595	538	245	163	82	57	65	0.45	3.75	4.62
p_3	653	702	351	204	122	57	65	0.5	3.8	3.86

Abdomen. Tergites and sternites covered with dense setae concentrated primarily at lateral side on tergites and in the middle on sternites.



FIGURES 1–8. *Parochlus carolinae* **sp. n.** Male imago (1) head, frontal view; (2) thorax, lateral view; (3) hypopygium, dorsal view; (4) spur of front tibia; (5) spur of middle tibia; (6) spur and comb of hind tibia; (7) antenna; (8) wing. Scale bars: (1–5, 7–8) 100 µm; (6) 50 µm.



FIGURES 9–14. *Parochlus carolinae* **sp. n.** Pupa (9) frontal apotome, dorsal view; (10) anal segment; (11) and (12) thoracic horns. Larva (13) antenna; (14) mentum. Scale bars: 100 µm.

Hypopygium (Figure 3). Tergite IX 146 µm long with 42 setae. Coxite with many bristles dorsally on inner side. Apodemes strongly sclerotised, phallapodeme 77 µm long; transverse sternapodeme 51 µm long. Gonocoxite 150 µm long; gonostylus 81 µm long, swollen and setose at base, with c. 7 setae 61 µm long. extended into a pair of lobes; basis of gonostylus 38 µm long; apical lobe 60 µm long, subapical lobe 38 µm long; podonomine seta (*p*) 60 µm, terminal seta of the apical lobe (*t*) 10 µm, terminal seta of the subapical lobe (*t*) 4 µm, ventral seta of the apical lobe (*x*) 17.5 µm, dorsal seta of the subapical lobe (*y*) 12.5 µm. Anal point and virga absent. HR 1.85; HV 3.

Pupa (n = 5, 3 pupae and 2 pupal exuviae except when otherwise stated) (Figures 9–12)

Total length 2.7–3.4, 3 mm (3). Pale brown with darker apophyses.

Cephalothorax. Frontal apotome with pair of short lateral setae (Figure 9). Thoracic horn well developed, 248–331, 293 µm long (5); porous plate 162–203, 193 µm wide (5); porous plate 207–257, 230 µm long (5); stalk 61–87, 71 µm long (5) (Figure 11). Posterior pronotal setae present. Frontal setae 10 µm long (1). Anterior dorsocentral (Dc_1) 10 µm (2); Dc_2 10–16, 13 µm (2); Dc_3 7 µm (1) and Dc_4 20–30, 25 µm (2) long and distance from Dc_1–Dc_3 to Dc_4 193 µm. Precorneals up to 16 µm long.

Abdomen. Light brown, margins darker, shagreen uniformly coloured. Number of setae on tergite VIII 5 (4). Conjunctives broad without setae. Ventral lamella on second segment. Anal spurs of anal lobe 41–61, 54 µm long (4). Two anal macrosetae 315–331, 323 µm long (4). The median seta of the anal spurs 8–12, 8 µm long (2); lateral seta 28–32, 30 µm long (3) (Figure 10).

Larva (n = 1) (Figures 13–14)

Head. Dark brown to black head with much darker mentum and mandible. Eye spot single and compact. Head capsule 373 µm long; 265 µm wide. Postmentum 206 µm long.

Antenna with third segment annulated (Figure 13); length of articles: 60, 20, 8, 2, 4 µm; AR 1.76; blade broad 24 µm long, accessory blade narrower 4 µm long. Mandible length 81 µm. Mentum width 69 µm, median tooth width 14 µm (Figure 14).

Geographical distribution and ecology. The studied region is a part of the San Luis hills which belong to the Pampasic Hills System, located in the north-central area of San Luis Province, Argentina, corresponding to the Chaco wetland (Canevari *et al*. 1998). The Carolina stream is a tributary of the Grande River and is situated in the centre-north part of the province, at altitude of 1620 m a.s.l. It rises in La Carolina village and presents a dense drainage network made up of a series of tributaries of different size, some of which are temporary and flow only during the rainy season (Tripole *et al*. 2000). The Grande River belongs to the upper valley of the Rio Quinto River and drains over the oriental slope of the San Luis hills. It rises at 2160 m a.s.l., run over around 24 km and its average annual flow is 2.81 m^3s^{-1} (Medina & Paggi 2004).

Both lotic systems present their own hydrological characteristics of headwaters, in which a thick pebble and gravel substratum prevails, having an 0.14 m average depth, an 0.18 ms^{-1} average speed, a 14.8 °C average temperature, a 266.25 μScm^{-1} average conductivity, a 10.4 mgl^{-1} dissolved oxygen average and 3 (FTU) average turbidity (Medina *et al*. 2008). The climate is semiarid, with estival rainfalls and an annual average precipitation of 500–600 mm (Ceci & Cruz Coronado 1981).

Brundin claimed in 1966 that Parochlus was a successful genus, showing great adaptation to different types of habitats: from running waters to still and shallow ones at low temperatures (0.5–8.8 °C) both in the Northern and Southern Hemispheres. The new species was recorded at higher water temperature (14.8 °C average) as those stated by Brundin showing a new kind of adaptation for this genus. Other members of the subfamily such as Podonomus species are also present in these environments and have recently been recorded in Brazil under similar ecological factors (Roque & Trivinho-Strixino 2004). Furthermore, the highest sites (Monte and higher Yungas) from Northwestern Argentinean stream systems has firstly recorded Podonominae taxa also at high temperature ratios (Tejerina & Molineri 2007).

If we seek to find out why this kind of adaptation has occurred we must consider the fact that this new record appeared in a transitional geographical zone, between a moderately high altitude and relatively low latitude, as is the San Luis Hills System. A good characterization of this zone is discussed in Medina *et al*. 2008.

Several studies have shown the dominance of warm eurythermal taxa in tropical-subtropical zones and the dominance of a cold stenothermal fauna in templated Andean Patagonian zones, including the Podonominae (Cranston 1995, Lobinske *et al*. 1996, Higuti *et al*. 1993, Corigliano *et al*. 1996). The presence of *Parochlus carolinae* **sp. n.** in San Luis Province constitutes an Andean-Patagonian element in a zone of transition and biogeographic mix between the big dry lands of the south and the west (Patagonia, Monte, Puna) with the wetlands of north and the east of South America (Chaco). The "Monte" Biogeographic Province was defined as an ecotone between the "Brazilian and Patagonian regions" (Morrone 2004). This biogeographic system is very important for migration and colonization of species in this part of the continent (Bucher 1982, Cabrera & Willink 1973).

Acknowledgements

The authors wish to thank to the anonymous reviewers for the valuable comments on the manuscript and PIP Nº 5334 (CONICET-CCT La Plata) for financial support. The article is ILPLA Scientific Contribution N° 836.

References

Brundin, L. (1966) Transantarctic relationships and their significance, as evidenced by chironomid midges. With a monograph of the subfamilies Podonominae and Aphroteniinae and the austral Heptagyiae. *Kungliga Svenska Vetenskapsakademiens Handlingar*, 11, 1–492.

Bucher, E. (1982) Chaco and Caatinga: South American arid savannas, woodlands and tickets. *In*: Huntley, B. & B. Walker (Eds.), *Ecology of tropical savannas*. *Ecological studies* 42, 48–79.

Cabrera, A.L. & Willink, A. (1973) Biogeografía de America Latina. *Monografía de la Secretaría General de la OEA, Serie Biología*. Monografía N° 13, pp. 120.

Canevari, P., Blanco, D., Bucher, E., Castro, G. & Davidson, I. (1998) Los humedales de la Argentina. Clasificación, situación actual, conservación y legislación. *Wetlands International Publication* 46, Buenos Aires, 208 pp.

Ceci, J. & Coronado, M. (1981) Recursos Hídricos Subterráneos. *In:* Irigoyen M. (Ed.), *Geología de la Provincia de San Luis*. Relatorio VIII Congreso Geológico Argentino, pp 301–322.

Corigliano, M., Gualdoni, C., Oberto, A. & Raffaini, G. (1996) Macroinvertebrados acuáticos de Córdoba. *In:* Tada, I.E. & Bucher E.H. (Eds.), *Biodiversidad de la provincia de Córdoba*. Fauna. Córdoba, Volumen I, pp. 119–165.

Cranston, P.S. (1995) Biogeography. *In:* Armitage, P, Cranston P.S. & Pinder L.C.V. (Eds.), *The Chironomidae. The biology and ecology of non-biting midges*. Chapman & Hall, London, Glasgow, Weinheim, N. Y., Melbourne, Madras., pp. 62–84.

Higuti, J., Takeda, A.M. & Paggi, A.C. (1993) Distribução espacial das larvas de Chironomidae (Insecta, Diptera) do rio Baía (MS-Brasil). *UNIMAR*, 15, 65–81.

Lobinske, R.J., Ali, A. & Stout, J. (1996) Qualitative and quantitative studies on Chironomidae and selected physico-chemical parameters in two tributaries of the Wekiva River, Central Florida. *Florida Entomologist*, 79, 531–542.

Medina, A.I. & Paggi, A.C. (2004) Composición y abundancia de Chironomidae (Diptera) en un río serrano de zona semiárida (San Luis, Argentina). *Sociedad Entomológica Argentina*, 63, 107–118.

Medina, A.I., Scheibler, E.E. & Paggi, A.C. (2008) Distribución de Chironomidae (Diptera) en dos sistemas fluviales ritrónicos (andino-serrano) de Argentina. *Sociedad Entomológica Argentina*, 67, 69–79.

Morrone, J.J. (2001) *Biogeografía de America Latina y el Caribe*. Manuales & Tesis. Programa Iberoamericano de Ciencia y Tecnología para el Desarrollo (CYTED). Oficina Regional de Ciencia y Tecnología de United Nations Educational, Scientific and Cultural Organization para América Latina y el Caribe (ORCYT-UNESCO) Sociedad Entomológica Aragonesa, Volumen 3, Zaragoza. Spain, 148 pp.

Morrone, J.J. (2004) Panbiogeografía, componentes bióticos y zonas de transición. *Revista Brasileira de Entomología* 48, 149–162.

Roque, F.O. & Trivinho-Strixino, S. (2004) *Podonomus pepinellii* n. sp., first record of the genus and subfamily from Brazil (Diptera: Chironomidae: Podonominae). *Zootaxa*, 689, 1–7.

Sæther, O.A. (1967) Descriptions of *Lasiodiamesa bipectinata* spec. nov. and *Parochlus kiefferi* (Garrett) Brundin. (Diptera: Chironomidae). *Beiträge zur Entomologie*, 17, 235– 249.

Sæther, O.A. (1980) Glossary of chironomid morphology terminology (Chironomidae: Diptera), *Entomologica*

scandinavica, supplement, 14, 1–51.

Spies, M. & Reiss, F. (1996) Catalog and bibliography of Neotropical and Mexican Chironomidae (Insecta, Diptera). *Spixiana*, supplement, 22, 61–119.

Tejerina, E.G. & Molineri, C. (2007) Comunidades de Chironomidae (Diptera) en arroyos de montaña del NOA: comparación entre Yungas y Monte. *Sociedad Entomológica Argentina*, 66, 169–177.

Tripole, E.S., Vallania, E., Adriana, E., Garbagnati, M. & Mallea, M.A. (2000) Aguas ácidas y fauna asociada. *In: Memorias del XVIII Congreso Nacional del Agua*, Instituto de Recursos Hídricos, Facultad de Ciencias Exactas y Tecnológicas, Universidad Nacional de Santiago del Estero, Santiago del Estero, Argentina, pp. 307–308.

Watson, C.N. Jr. & Heyn, M.W. (1992) A preliminary survey of the Chironomidae (Diptera) of Costa Rica, with emphasis on the lotic fauna. *Netherlands Journal of Aquatic Ecology*, 26, 257–262.