**NOTA CIENTÍFICA**

# Biogeographical and ecological comments on "A new Neotropical species of the genus *Parochlus* Enderlein, 1912 (Chironomidae: Podonominae) and new distribution in Argentina" by Rodríguez et al. 2009

**DONATO, Mariano and Paula POSADAS**

Laboratorio de Sistemática y Biología Evolutiva (LASBE), Museo de La Plata, Paseo del Bosque s/n (1900), La Plata, Argentina; e-mail: mdonato@fcnym.unlp.edu.ar; posadas@fcnym.unlp.edu.ar

## Comentarios biogeográficos y ecológicos sobre "A new Neotropical species of the genus *Parochlus* Enderlein, 1912 (Chironomidae: Podonominae) and new distribution in Argentina" por Rodríguez *et al.* 2009

■ **RESUMEN**. Rodríguez *et al.* (2009) describieron una nueva especie del género *Parochlus* Enderlein de la subfamilia Podonominae. Se discuten varios aspectos concernientes a aspectos ecológicos y biogeográficos de la antedicha contribución. El nuevo rango de temperaturas propuesto por los autores para dicha especie está apoyada en evidencias débiles y debería ser interpretada como tentativa. La aseveración que este nuevo registro se localizó en la provincia biogeográfica del Monte es errónea. La localidad tipo de la nueva especie pertenece a la provincia biogeográfica Chaqueña.

**PALABRAS CLAVE**. *Parochlus.* Neotrópico. Biogeografía. Ecología. Exuvia pupal.

■ **ABSTRACT**. Rodríguez *et al.* (2009) described a new species of the Podonominae genus *Parochlus* Enderlein. Several aspects of the abovementioned contribution concerning ecological and biogeographical aspects are discussed. The new temperature range proposed by the authors for this species is weakly supported by evidence and should be interpreted as tentative. The statement that this new record occurred in the Monte biogeographic province is erroneous. The type locality of the new species belongs to the Chacoan biogeographic province.

**KEYWORDS**. *Parochlus.* Neotropics. Biogeography. Ecology. Pupal exuvia.

Recently, Rodríguez *et al.* (2009) described a new species of the Podonominae genus *Parochlus* Enderlein. This genus has a wide distribution in the Andean Patagonian region with representatives in the Holarctic region and an undescribed species of the *araucanus* group in the higher elevations of Costa Rica. The new species *Parochlus carolinae* was fully described as adult male, pupa and larva. Very good drawings were provided showing the most important features of this species. However, several aspects of the abovementioned contribution concerning ecological and biogeographical

Recibido: 5-V-2010; aceptado: 13-V-2010

aspects require some comments.

The new species was described based on an adult male collected with a sweep net and two pupae and three pupal exuviae (one of them with its larval exuvia attached) collected with a drift net. The type locality is Carolina stream, located in the hill system of North-Central San Luis Province (Argentina). The rest of the material was collected from the Grande River, also located in San Luis hills. The Carolina stream is a tributary of the Grande River and has an altitude of 1620 m a.s.l. at the type locality. Rodriguez *et al*. (2009) stated that the headwaters of this stream were located in La Carolina village, citing a paper of Tripole *et al*. (2000). In this paper, however, Tripole *et al*. (op.cit) established the origin for the Carolina stream in Tomolasta Hill, at 1969 m a.s.l.

Adult midges emerge at the water surface, irrespective of their submerged larval microhabitat, and the cast pupal case is left floating on the water surface. Several studies have shown that pupal exuviae can drift for approximately 200 to 400 m downstream and could remain on the water surface for about two days (*e.g*. Ruse, 1995) depending on several characteristics of the river such as, surface current velocity, substratum, discharge, turbidity, etc. Ruse (1995) sampled chironomid pupal exuviae and larvae from the same stretch of stream and compared their patterns of species assemblage. His results showed that pupal exuviae are good estimators of chironomid assemblages and that the greatest discrepancies between larval and pupal assemblages occurred with species recorded as pupal exuviae but absent as larvae. Marziali *et al*. (in press) highlighted the usefulness of pupal exuviae as a technique to evaluate chironomid richness, but these authors point out that although this technique facilitates species identification, it does not provide information of habitat preferences of the taxa. Rodríguez *et al*. (2009) mentioned that the new species was recorded at a mean temperature of 14.8º C. Based on this data, they extended the range of temperature for the genus. The immature stages of *P. carolinae* were described from material collected with a drift net and therefore, it is not certain whether these materials were originated in the sampled area or upstream. In addition, several studies of chironomid larvae in the same river system (Tripole *et al*. 2000, Medina & Paggi, 2004; Medina *et al*., 2008) did not find any representatives of the subfamily Podonominae. For these reasons, the new temperature range proposed by Rodriguez *et al*. is only weakly supported by evidence and should be interpreted as tentative. New studies are needed to establish the actual ecological features of *Parochlus carolinae*, particularly focusing upstream and at the headwaters of the abovementioned localities.

The new species *Parochlus carolinae* is first record of the genus for Argentina outside the Andean-Patagonian domain. Rodríguez *et al*. (2009) stated that this new record occurred in the Monte biogeographic province, but neglected to mention the biogeographic scheme used as the basis for this statement. They also interpreted the presence of this species in San Luis Province as an Andean-Patagonian element in a biogeographic transition zone between the extensive arid lands to the South and the West (Patagonia, Monte, Puna) and the wetlands to the North and East of South America (Chaco). Rodriguez *et al*. based this statement on Morrone's (2004) assessment of the Monte biogeographic province as an ecotone between the Brazilian and Patagonian regions.

Following Cabrera & Willink (1973), the most cited biogeographic scheme for the Neotropics, San Luis hills is part of the Serrano district of the Chacoan province. Moreover, several biogeographical and ecoregional schemes (Bucher, 1980; Morrone, 2001; Olson *et al*., 2001) agree in considering the San Luis hills as part of or closely related to the Chacoan province. Curiously, Rodriguez *et al*. start the paragraph concerning the geographical distribution and ecology of *Parochlus carolinae* by assigning the San Luis hills as part of the Chaco wetland. Based on their origin, Bucher & Chani (1998) classified the Chacoan wetlands into three major systems: a) wetlands formed by rivers and streams originated in the western

mountain systems; b) wetlands formed by floods from the Paraná and Paraguay rivers; and c) temporary shallow lakes and wetlands originated by local precipitations. It is important to point out that their classification made no mention of the rivers and streams belonging to the San Luis hills. The erroneous assignment of *Parochlus carolinae* as belonging to the Monte province by Rodríguez *et al.* (2009) rejects the biogeographic hypothesis proposed by those authors. The Monte province is a well-defined biogeographic unit, different from the Chacoan province (Roig-Juñent *et al.*, 2001). The presence of *Parochlus carolinae* in the Chacoan Serrano district has an important biogeographical significance. Frenguelli (1950) considered the San Luis hills as part of the peripampasic orogenic arc establishing a biotic corridor together with the hills in the Mahuidas, Tandilia and Ventania systems. A biotic migratory route from the Andes to Brazil, extending across the Pampean Mountain range, Buenos Aires hills, Uruguay hills, and Planalto and Brazilian hills, was postulated by several authors. Ringuelet (1961) detected a disjunctive distributional pattern supported by several taxa along the Pampean Mountain range, which has been corroborated by modern biogeographical analyses (Crisci *et al.*, 2001; Roig-Juñent *et al.*, 2003 and literature cited in both papers). Roque & Trivinho-Strixino (2004) described the Podonominae species *Podonomus pepinellii* collected in Camanducaia (Brazil), located in the Serra da Mantiqueira, at an elevation of 1853 m asl. Tejerina & Molineri (2007) found podonomine larvae at high altitudes in the Pampean Mountain range. These records together with that of *Parochlus carolinae* suggest a possible biogeographic history similar to those described by Ringuelet (1961), Crisci *et al.* (2001) and Roig-Juñent *et al.* (2003). In the Middle Miocene (*ca.* 11 Mya), southern South American landscapes began to be dominated by the uplift of the Andes. Thus, during this age the climate was cooler and with more marked seasonality than it had been in the early Middle Miocene. In the late Pliocene (*ca.* 3 Mya), a new Andean uplift resulted in the elevation of the Central Cordillera of Argentina and Chile and the eastern orographic systems of Argentina (Pampean Mountain range and Tandilia and Ventania systems among others). The final uplift of the Pampean Mountain range in central Argentina and the Central Andes of Chile had evident ecological consequences, since the areas situated between them acquired their current extremely xeric nature as a result of the rain shadow effect. During the Pleistocene (*ca.* 2.5 Mya), the planet underwent several glacial–interglacial cycles accompanied by the advance and retreat of continental glaciers. During the periods of glacial maxima, the climates of many non-glaciated temperate regions were cooler and dryer than those of today. Climatic changes associated with the glacial periods caused a general expansion of steppes, savannas, and open terrestrial ecosystems instead of close-canopied ecosystems such as tropical rain forests. The distributional pattern found in the Peripampasic orogenic arc, Uruguay hills and Planalto and Brazilian hills could be explained as a consequence of these events. In the case of cold- stenothermic taxa, such as the Podonominae, the progressive environmental cooling and the alternating periods of warm-wet and cold-dry conditions may have resulted in an eventual separation of populations and subsequent speciation, or may have favored the expansion of their distributional ranges and posterior isolation. These two possible hypotheses could be corroborated with future studies of the chironomid diversity in those areas.

## LITERATURE CITED

1. BUCHER, E. H. 1980. Ecología de la fauna chaqueña: una revisión. *Ecosur* 7 (14): 111–159.
2. BUCHER, E. H. & J. M. CHANI. 1998. Región 2: Chaco. *In*: Canevari, P.; D. Blanco; E. Bucher; G. Castro & I. Davidson (Eds), *Los humedales de la Argentina. Clasificación actual, conservación y legislación*. Wetlands International, Publicación 46, Buenos Aires. pp. 73–96.
3. CABRERA A L & A. WILLINK. 1980. *Biogeografía de América Latina*. Washington D.C. OEA. Monografía n 13, Serie Biología, 109 pp.
4. CRISCI, J. V., S. E. FREIRE, G. SANCHO & L. KATINAS. 2001. Historical biogeography of the Asteraceae of Tandilia and Ventania mountain ranges (Buenos Aires, Argentina). *Caldasia* 23: 21-41.

5. FRENGUELLI, J. 1950. *Rasgos generales de la morfología y la geología de la provincia de Buenos Aires*. LEMIT Serie 2, nº 33, La Plata.
6. MARZIALI, L., D. G. ARMANINI, M. CAZZOLA, E. TOPPI, A. BUFFAGNI & B. ROSSARO. In press. Responses of Chironomid larvae (insecta, Diptera) to ecological quality in Mediterranean river mesohabitats (South Italy). *River Research & Applications.*
7. MEDINA, A. I. & A. C. PAGGI. 2004. Composición y abundancia de Chironomidae (Diptera) en un río serrano de zona semiárida (San Luis, Argentina). *Revista de la Sociedad Entomólogica Argentina* 63 (3-4): 107-118.
8. MEDINA, A. I., E. E. SCHEIBLER & A. C. PAGGI. 2008. Distribución de Chironomidae (Diptera) en dos sistemas fluviales ritrónicos (Andino-serrano) de Argentina. *Revista de la Sociedad Entomólogica Argentina* 67 (1-2): 69-79.
9. MORRONE, J. J. 2001. *Biogeografía de América Latina y el Caribe*. Sociedad Entomológica Aragonesa, Zaragoza.
10. MORRONE, J. J. 2004. Panbiogeografía, componentes bióticos y zonas de transición. *Revista Brasileira de Entomologia* 48: 149-162.
11. OLSON, D. M., E. DINERSTEIN, E. D. WIKRAMANAYA, N. D. BURGUESS, G. V. N. POWELL, E. C. UNDERWOOD, J. A. D'AMICO, I. ITOUA, H. E. STRAND, J. C. MORRISON, C. J. LOUCKS, T. F. ALLNUT, T. H. RICKETTS, Y. KURA, J. F. LAMOREAUX, W. W. WETTENGEL, P. HEDAO & K. R. KASSEM. 2001. Terrestrial Ecoregions of the World: A New Map of Life on Earth. *Biosciences* 51: 933-938.
12. RINGUELET, R. A. 1961. Rasgos fundamentales de la Zoogeografía de la Argentina. *Physis* 22: 151-170.
13. RODRÍGUEZ, M. S., A. C. PAGGI & A. I. MEDINA. 2009. A new Neotropical species of the genus *Parochlus* Enderlein, 1912 (Chironomidae: Podonominae) and new distribution in Argentina. *Zootaxa* 2300: 39-46.
14. ROIG-JUÑENT, S., G. E. FLORES, S. CLAVER, G. DEBANDI & A. MARVALDI. 2001. Monte Desert (Argentina): insect biodiversity and natural areas. *Journal of Arid Environments* 47: 77-94.
15. ROIG-JUÑENT, S., G. E. FLORES & C. MATTONI. 2003. Consideraciones biogeográficas de la precordillera (Argentina), basadas en artrópodos epígeos. *In*: Morrone, J. J. & J. E. Llorente-Bousquets (Eds) *Una perspectiva latinoamericana de la Biogeografía*. Las Prensas de Ciencias, UNAM, México, D.F. pp. 275-288.
16. ROQUE, F. O. & S. TRIVINHO-STRIXINO. 2004. *Podonomus pepinellii* n. sp., first record of the genus and subfamily from Brazil (Diptera: Chironomidae: Podonominae). *Zootaxa* 689: 1-7.
17. RUSE, L. P. 1995. Chironomid community structure deduced from larvae and pupal exuviae of a chalk stream. *Hydrobiologia* 315: 135-142.
18. TEJERINA, E. G. & C. MOLINERI. 2007. Comunidades de Chironomidae (Diptera) en arroyos de montaña del NOA: comparación entre Yungas y Monte. *Revista de la Sociedad Entomólogica Argentina* 66 (3-4): 169-177.
19. TRIPOLE, E. S., E. VALLANIA, E. ADRIANA, M. GARBAGNATI & M. A. MALLEA. 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.