



<http://dx.doi.org/10.11646/zootaxa.3821.1.2>

<http://zoobank.org/urn:lsid:zoobank.org:pub:1F1381BE-B5D5-4B35-BC6C-398F4F209FA3>

**A review of the genus *Limnocythere* (Podocopida: Limnocytheridae) in the Pampean region (Argentina), with the description of a new species, *Limnocythere cusminskyae* sp. nov.**

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**Abstract**

Occurrences of Quaternary and extant limnocytherids in the Pampean region of Argentina are reviewed, particularly in relation with their use as paleohydrological indicators in environmental reconstruction research. In spite of its spread occurrence, the systematic of the genus in the area is still little known, which results in most records being left in open nomenclature and paleoenvironmental inferences being made on the basis of general considerations of the genus. We describe a new species, *Limnocythere cusminskyae* sp. nov., which we consider to be the taxon featured in several of these works, and discuss its morphological and ecological differences with coexisting *Limnocythere* species, particularly the proposed indicator species *L. rionegroensis* Cusminsky & Whatley.

**Key words:** Paleoecological reconstruction, hydrological preferences, Buenos Aires province

**Introduction**

In natural continental waters, both the solute composition and the ionic concentration (salinity) reflect the outcome of major hydrological processes affecting the water balance. Under evaporative conditions, salinity and solute composition will evolve through distinctive solute paths, depending on the waterbody's original characteristics (Hardie & Eugster 1970; Eugster & Hardie 1978). The result is the depletion or enrichment of the water in determined major ions simultaneously with an increase in salinity, such that variations along both of these gradients can be used to define a number of hydrochemical fields. Many ostracod species are known to respond to these solute differences, such that an adequate knowledge of their autoecology renders them very useful proxies for hydrochemical changes within lakes (e.g., De Deckker & Forester 1988; Smith & Horne 2002). In particular, the genus *Limnocythere* Brady is noted for the hydrochemical partitioning exhibited by some of its species, that is, their differential distribution within hydrochemical fields (e.g., Forester 1986; Forester *et al.* 2005a).

Although this phenomenon has been well documented for only Nearctic limnocytherids, there is evidence that the distribution of some Neotropical species of the genus conforms to a hydrochemically partitioned pattern as well. More specifically, two *Limnocythere* species found in the Patagonian region, *L. patagonica* Cusminsky & Whatley and *L. rionegroensis* Cusminsky & Whatley appear to be indicators of contrasting water types (Whatley & Cusminsky 1999; Ramón-Mercau *et al.* 2012). The former has been found in low salinity, bicarbonate-dominated waters, indicative of a positive hydrological balance, while the latter was collected in high salinity (mostly within the mesohaline range), sodium and chlorine-sulphate-dominated waters, indicative of evaporative enrichment. For its part, several paleoenvironmental studies concerning diverse proxies from Quaternary lacustrine and marginal marine sediments from the Pampean region mention the occurrence of limnocytherids, using them as indicators of broad salinity / ionic composition (e.g., Bertels & Martínez 1990; Laprida 1998; Fontana 2005; among others). In spite of such spread usage, the paleoenvironmental interpretability of these findings is hindered by the fact that the majority of records of limnocytherids in the region—in paleoenvironmental studies or otherwise—have been left in

due to the great external resemblance of the female valves of these species, distinction between them on the basis of valve morphology alone relies heavily on the presence of males. Since *L. cusminskyae* sp. nov. occurs in amphimictic populations but *L. rionegroensis* is known from both amphimictic and parthenogenetic populations, the distinction by valve morphology might be problematic in case of coexistence of both species. On the other hand, the soft part morphology of *L. rionegroensis*, *L. solum* and *L. multiperforata* is still unknown—no extant record of the latter has, in fact, been published yet.

This suggests that a reevaluation of the *Limnocythere* material left in open nomenclature recovered in diverse studies carried out in the region, coupled with further sampling of current populations, would allow a better identification of both Quaternary and fossil limnocytherids through assessment of their intra- and interspecific variability, as well as a more accurate characterization of their ecological requirements. In turn, this would lend a more solid basis for their use as indicator species, thus enhancing their use in paleoecological reconstructions.

## Acknowledgments

The authors wish to thank two anonymous reviewers, whose suggestions and comments helped improve an earlier version of this manuscript. The present work was funded by the University of Buenos Aires (UBACyT Projects 20020110100153 and 20020100100999). This is the IDEAN contribution number R-123.

## References

- Bertels, A. & Martínez, D.E. (1990) Quaternary ostracodes of continental and transitional littoral-shallow marine environments. *Courier Forschungsinstitut Senckenberg*, 123, 141–159.
- Bertels, A. & Martínez, D.E. (1997) Ostrácodos Holocenos de la desembocadura del Arroyo Napostá Grande, sur de la provincia de Buenos Aires, Argentina. *Revista Española de Micropaleontología*, 29 (3), 29–69.
- Bertels-Psotka, A. & Laprida, C. (1998) Ostrácodos (Arthropoda, Crustacea) del Miembro Cerro de la Gloria, Formación Las Escobas (Holoceno), provincia de Buenos Aires, República Argentina. *Revista Española de Micropaleontología*, 30 (1), 103–128.
- Brouwers, E.M. (1990) Systematic paleontology of Quaternary Ostracode assemblages from the Gulf of Alaska, part 1: Families Cytherellidae, Bairdiidae, Cytheridae, Leptocytheridae, Limnocytheridae, Eucytheridae, Krithidae, Cushmaniidae. *United States Geological Survey, Professional Paper*, 1510, 1–43.
- Cusminsky, G.C. & Whatley, R. (1996) Quaternary non-marine ostracodes from lake beds in northern Patagonia. *Revista Española de Paleontología*, 11, 143–154.
- Cusminsky, G.C., Pérez, P.A., Schwab, A. & Whatley, R.C. (2005) Modern lacustrine ostracods from Patagonia, Argentina. *Revista Española de Micropaleontología*, 37, 431–450.
- Cusminsky, G.C., Martínez, D. & Bernasconi, E. (2006) Foraminíferos y ostrácodos de sedimentos recientes del estuario de Bahía Blanca, Argentina. *Revista Española de Micropaleontología*, 38 (2–3), 395–410.
- Danielopol, D.L., Martens, K. & Casale, L.M. (1989) Revision of the genus *Leucocythere* Kaufmann, 1892 (Crustacea, Ostracoda, Limnocytheridae) with the description of a new species and two new tribes. *Bulletin de l'Institut Royal des Sciences Naturelles de Belgique, Biologie*, 59, 63–94.
- De Deckker, P. & Forester, R.M. (1988) The use of ostracods to reconstruct continental palaeoenvironmental records. In: De Deckker, P., Colin, J.-P. & Peypouquet, J.-P. (Eds.), *Ostracoda in the Earth Sciences*. Elsevier, Amsterdam, pp. 175–199.
- Delorme, L.D. (1971) Freshwater ostracods of Canada. Part 5. Families Limnocytheridae, Loxoconchidae. *Canadian Journal of Zoology*, 49, 43–64.  
<http://dx.doi.org/10.1139/z71-009>
- Eugster H.P. & Hardie L.A. (1978) Saline lakes. In: Lerman, A. (Ed.), *Lakes: Chemistry, Geology, Physics*. Springer, New York, pp. 237–289.
- Ferguson, E. Jr. (1967) Three new species of freshwater ostracodes (Crustacea) from Argentina. *Notulae Naturae*, 405, 1–7.
- Ferrero, L. (1996) Paleoecología de ostrácodos holocenos del estuario del río Quequén Grande (Provincia de Buenos Aires). *Ameghiniana*, 33 (2), 209–222.
- Ferrero, L. (2009) Foraminíferos y ostrácodos del Pleistoceno tardío (Mar Chiquita, provincia de Buenos Aires, Argentina). *Ameghiniana* [online] 46 (4): 637–656. Available from: [http://www.scielo.org.ar/scielo.php?pid=S0002-7014200900040005&script=sci\\_arttext](http://www.scielo.org.ar/scielo.php?pid=S0002-7014200900040005&script=sci_arttext) (accessed 29 April 2014)
- Ferrero, L., Obenat, S. & Zárate, M.A. (2005) Mid-Holocene serpulid build-ups in an estuarine environment (Buenos Aires Province, Argentina). *Palaeogeography, Palaeoclimatology, Palaeoecology*, 222 (3), 259–271.  
<http://dx.doi.org/10.1016/j.palaeo.2005.03.017>
- Fontana, S.L. (2005) Holocene vegetation history and palaeoenvironmental conditions on the temperate Atlantic coast of Argentina, as inferred from multi-proxy lacustrine records. *Journal of Paleolimnology*, 34 (4), 445–469.  
<http://dx.doi.org/10.1007/s10933-005-5792-8>

- Forester, R.M. (1986) Determination of the dissolved anion composition of ancient lakes from fossil ostracodes. *Geology*, 14 (9), 796–799.
- Forester, R.M., Lowenstein, T.K. & Spencer, R.J. (2005) An ostracode based paleolimnologic and paleohydrologic history of Death Valley: 200 to 0 ka. *Geological Society of America Bulletin*, 117 (11–12), 1379–1386.  
<http://dx.doi.org/10.1130/B25637.1>
- Forester, R.M., Smith, A.J., Palmer, D.F. & Curry, B.B. (2005) North American Non-Marine Ostracode Database Version 1. Kent State University, Kent, Ohio, U.S. Available from: <http://www.kent.edu/NANODE> (accessed 29 April 2014)
- García, A. (1999) Quaternary charophytes from Salina del Bebedero, Argentina: their relation with extant taxa and palaeolimnological significance. *Journal of Paleolimnology*, 21 (3), 307–323.
- Gutentag, E.D. & Benson, R.H. (1962) Neogene (Plio-Pleistocene) fresh-water ostracodes from the central high plains. *Bulletin of the State Geological Survey of Kansas*, 157, 1–60.
- Hardie, L.A. & Eugster, H.P. (1970) The evolution of closed-basin brines. *Mineralogical Society of America Special Paper*, 3, 273–290.
- Irurzún, M.A., Gogorza, C.S.G., Sinito, A.M., Chaparro, M.A.E., Prieto, A.R., Laprida, C., Lirio, J.M., Navas, A.M. & Núñez, H. (2014) A high-resolution palaeoclimate record for the last 4800 cal. years BP on Lake La Brava, SE Pampas plains, Argentina. *Geofísica Internacional*, in press.
- Kihn, R.G. & Pall, J.L. (2013) Diversity of the present ostracofauna in lagoons of the central region of the Republic Argentina. *Munis Entomology & Zoology*, 8 (1), 273–277.
- Laprida, C. (1998) Micropaleontological assemblages (Foraminifera and Ostracoda) from Late Quaternary marginal marine environments (Destacamento Río Salado Formation), Salado Basin, Argentina. *Revue de paléobiologie*, 17, 461–478.
- Laprida, C. (2006) Ostrácodos recientes de la llanura pampeana, Buenos Aires, Argentina: ecología e implicancias paleolimnológicas. *Ameghiniana*, 43, 181–204.
- Laprida, C., Orgeira, M.J. & García Chaporí, N. (2009) El registro de la Pequeña Edad de Hielo en las lagunas pampeanas. *Revista de la Asociación Geológica Argentina*, 65, 603–611.
- Laprida, C. & Valero-Garcés, B. (2009) Cambios ambientales de épocas históricas en la pampa bonaerense en base a ostrácodos: historia hidrológica de la laguna de Chascomús. *Ameghiniana*, 46 (1), 95–111.
- Laprida, C., Plastani, M.S., Irurzún, A., Gogorza, C., Navas, A.N., Valero-Garcés, B. & Sinito, A.M. (2014) Mid-Late Holocene lake levels and trophic states of a shallow lake from the southern pampa plain, Argentina. *Journal of Limnology*, in press.
- Martens, K. (1990) Revision of African *Limnocythere* ss Brady, 1867 (Crustacea, Ostracoda), with special reference to the Rift Valley Lakes: morphology, taxonomy, evolution and (palaeo-) ecology. *Archiv für Hydrobiologie*, Supplement 83 (Monographische Beiträge) (4), 453–524.
- Martens, K. (1992) On *Namibocypris costata* n. gen., n. sp. (Crustacea, Ostracoda, Candoninae) from a spring in northern Namibia, with the description of a new tribe and a discussion on the classification of the Podocopina. *Stygologia*, 7 (1), 27–42.
- Mechaly, A.S., Martínez, D.E. & Cervellini, P.M. (2003) Primer hallazgo de *Pampacythere solum* Whatley y Cholich, 1974 (Ostracoda, Limnocytheridae) viviente en el Salitral de La Vidriera, Provincia de Buenos Aires, Argentina. *Proceedings of V Jornadas Nacionales de Ciencias del Mar*. Mar del Plata, December 2003. [unpaginated]
- Meisch, C. (1996) Contribution to the taxonomy of *Pseudocandona* and four related genera, with the description of *Schellencandona* nov.gen., a list of the Candoninae genera, and a key to the European genera of the subfamily (Crustacea, Ostracoda). *Bulletin de la Société des naturalists luxembourgeois*, 97, 211–238.
- Meisch, C. (2000) Freshwater Ostracoda of Western and Central Europe. In: Schwoerbel, J. & Zwick, P. (Eds.), *Süßwasserfauna von Mitteleuropa*. Spektrum Akademischer Verlag, Heidelberg, Berlin, 8/3, pp. 1–522.
- Plastani, M.S., Laprida, C., Massaferró, J. & Lami, A. (2012) Late Holocene environmental history of a shallow pampean lake based on fossil pigments and ostracods. *Ameghiniana*, 49 (4), 154. [Supplement]
- Plastani, M.S., Laprida, C., Ramón Mercau, J., Massaferró, J. & Lami, A. (2013) Hydrological changes in a small lake at the Pampean region of the South American central plains (Argentina) during the last centuries. *Il Naturalista Siciliano*, S. IV, XXXVII (1), 297–298.
- Ramón Mercau, J., Laprida, C., Massaferró, J., Rogora, M., Tartari, G. & Maidana, N.I. (2012) Patagonian ostracods as indicators of climate-related hydrological variables: implications for paleoenvironmental reconstructions in Southern South America. *Hydrobiologia*, 694 (1), 235–251.  
<http://dx.doi.org/10.1007/s10750-012-1192-z>
- Smith, A.J. & Horne, D.J. (2002) Ecology of marine, marginal marine and non marine ostracodes. In: Holmes, J.A. & Chivas, A.R. (Eds.), *The Ostracoda: Applications in Quaternary Research*. Geophysical Monograph Series. Vol. 131. American Geophysical Union, Washington, DC, pp. 37–64.
- Stutz, S., Borel, C.M., Fontana, S.L., del Puerto, L., Inda, H., García-Rodríguez, F. & Tonello, M.S. (2010) Late Holocene climate and environment of the SE Pampa grasslands, Argentina, inferred from biological indicators in shallow, freshwater Lake Nahuel Rucá. *Journal of Paleolimnology*, 44 (3), 761–775.  
<http://dx.doi.org/10.1007/s10933-010-9450-4>
- Whatley, R.C. & Cholich, T.D.C. (1974) A new Quaternary ostracod genus from Argentina. *Palaeontology*, 17 (3), 669–684.
- Whatley, R.C. & Cusminsky, G.C. (1999) Lacustrine ostracoda and late Quaternary palaeoenvironments from the lake Cari-Laufquen region, Rio Negro province, Argentina. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 151 (1), 229–239.  
[http://dx.doi.org/10.1016/s0031-0182\(99\)00022-x](http://dx.doi.org/10.1016/s0031-0182(99)00022-x)