# The Upper Carboniferous-Lower Permian Tepuel fauna of Patagonia: updated brachiopods records

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The Upper Paleozoic fauna of central Patagonia is known since Suero's survey (1948). The fauna includes brachiopods, molluscs, bryozoans, cnidarians, echinoderms, ostracods and scarce trilobites, warm-water fossils such as foraminifers and conodonts being absent. The Tepuel Group attains more than 5000 m in thickness and contains the homonymous fauna. The mid section of the Pampa de Tepuel Formation consists of some 2900 m thick glacimarine deposits, which yielded the older fossil assemblages. The first, the *Lanipustula* fauna is characterized by *Lanipustula patagoniensis* Simanauskas. Associated bryozoans together with brachiopods and ostracods indicate an early Late Carboniferous age (Bashkirian-Moscovian). The next *Tuberculatella* association appears approximately 500 m above the former. It includes *Beecheria patagonica* Amos, *Tuberculatella laevicaudata* (Amos), *Amosia sueroi* (close to *Jakutella* Abramov), *Aseptella patriciae* Simanauskas, new species of *Verchojania* Abramov and *Lanipustula* Klets (including specimens described by Amos, 1961, as *Levipustula levis* Maxwell), and some elements shared with the preceding biozone, characterize the fauna that extends until the top of the Pampa the Tepuel Formation. Brachiopods and molluscs suggest a late Carboniferous age for the base, the top of the biozone reaching an age not younger than Asselian. Both *Lanipustula* and *Tuberculatella* faunal associations are intercalated with diamictite levels, which were deposited mainly by direct action of glacier ice (González Bonorino, 1992). This scenario supports the position of Patagonia near the south paleopole covered by a peripherical satellite ice sheet of the main polar Gondwana ice cap (González Bonorino, 1992; Isbell et al., 2003), at least during the Late Carboniferous. The overlying Mojón de Hierro Formation is a more than 900 m thick sequence that contains a relatively diversified fauna with *Cimmeriella* Archbold and Hogeboom, *Costatumulus* and *Sulciplica* Waterhouse, *Tivertonia* and *Coolkilella* Archbold, *Brachythyrinella* Waterhouse and Gupta, and *Spirelytha* Fredericks. This was interpreted as a postglacial sea level rise and would be synchronous with the major and widespread sea level rise in Gondwana (Dickins, 1985). This *Cimmeriella* faunal association may have coexisted with the *Eurydesma* fauna and/or with the *Globiella* (actually corresponding to *Cimmeriella*) fauna of Dickins *et al*. (1993), that appeared during the progressive global climatic amelioration of the Late Asselian-Tastubian. However, a tripartite glacimarine succession of diamictite/shale/sandstone (200 m of maximum thickness) occurs intercalated between the precedent *Cimmeriella* fauna and a younger assemblage with *Costatumulus*, *Trigonotreta* Koenig, *Kochiproductus* Dunbar, *Jakutoproductus australis* Simanauskas & Archbold, *Piatnitzkya borreloi* Taboada and the *Glossopteris* flora, which are not associated with clear evidence of glaciation (Late Sakmarian-Artinskian). The Carboniferous fauna shows affinities mainly with the Namurian *Levipustula levis* fauna of Antarctica and eastern Australia, and the late Carboniferous boreal Verchojan fauna of northeastern Angara (Russia). Regarding the Early Permian assemblage, it shows remarkable affinities with faunas of northern Africa, India, eastern and western Australia, Antarctica and New Zealand. Upper Paleozoic glacigenic petroleum reservoirs are important sources within Gondwana and the Tepuel fauna is a desirable tool to refine biostratigraphical correlation for petroleum exploration.

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