**SUPPLEMENTAL MATERIAL**

**Ichnotaxonomy of trace fossils from eolian facies association**

Ichnofamily Celliformidae Genise, 2000

*Celliforma* isp. Brown, 1934

Figs. 3E, 4A

**Material:** 87 specimens with numbers ULVG-13129 to ULVG-13132, ULVG-13148, ULVG-13149, ULVG-13198 to ULVG-13225, ULVG-13233 to ULVG-13260, ULVG-13273 to ULVG-13298, and several *in situ* specimens descending from O1 and O2 surfaces.

**Description:** Sub-cylindrical cells with a rounded base and a flattened or conical top, inclined concerning the bedding plane; the walls preserve a rough microstructure. Some specimens present a constriction near the flat top, presumably vertically oriented. The walls vary from 1 to 3 mm in thickness and present a rough external surface. The cells vary from 7 to 18 mm in diameter, and the tunnels can reach 11 mm in length above the constriction (when preserved).

**Remarks:** The specimens attributed to *Celliforma* isp. (Fig. 4A) were defined due to the absence of walls and filling details. The constriction is the main diagnostic character of *Celliforma germanica* (e.g., Genise, 2000), but we kept those specimens at the ichnogeneric level due to the absence of additional diagnostic features.

*Celliforma curvata* Sarzetti et al., 2014

Fig. 4B-C

**Material:** 15 specimens with numbers ULVG-13142 to ULVG-13147, ULVG-13226 to ULVG-13232, ULVG-13299, ULVG-13300, descending from O2 surface.

**Description:** Cells with a rounded end and curved necks, presumably vertically oriented. Thick walls with a smooth external surface. The specimens vary from 15 to 20 mm in maximum horizontal diameter and 20 to 46 mm in height.

**Remarks:** All specimens attributed to *Celliforma* are characterized by ellipsoid to ovoid cells that characterize individual nests. *Celliforma* *curvata* is distinguished by its curved longitudinal axis, a particularity of the bee subfamily Diphaglossinae (Sarzetti et al., 2014). In the same way, the absence of spiral closure in *C. curvata* is also compatible with Diphaglossinae cells (Sarzetti et al., 2014). Although insect suites may indicate climatic settings, cells of Diphaglossinae are present in highly diverse climatic ranges (Sarzetti et al., 2013).

*Celliforma rosellii* Genise and Bown, 1994

Figs. 4D-E

**Material:** 6 specimens with numbers ULVG-13151 to ULVG-13156; several *in situ* specimens descending from O2 surface.

**Description:** Sub-cylindrical, thick-walled cells empty or massive filled. The walls preserve a rough structure. Walls vary from 2 to 4 mm in thickness, and the cells vary from 12 to 35 mm in diameter.

**Remarks:** Genise (2017) observed that this ichnospecies might represent *Celliforma spirifer* with the spiral cap removed by emerging adults, but they may also represent cells with no spiral caps. It is the most generalized morphology of *Celliforma*, lacking additional diagnostic characters.

*Celliforma spirifer* Brown, 1934

Fig. 4F-H

**Material:** 34 specimens with numbers ULVG -13133 to ULVG-13135, ULVG-13150, ULVG- 13163 to ULVG-13192, descending from O2 surface.

**Description:** Sub-cylindrical, thick-walled cells with internal structure concentrically disposed, in some specimens forming a short stem; the walls preserve a rough structure. Walls vary from 3 to 4 mm in thickness and the cells with 25 mm in maximum horizontal diameter.

**Remarks:** The concentric internal structure is not always integrally preserved, but when well-preserved resembles a spiral closure, a diagnostic feature of *C. spirifer* (Genise, 2017).

*Uruguay* isp. Roselli, 1939

Fig. 4I-K

**Material:** 12 specimens with numbers ULVG-13261 to ULVG-13272, descending from O2 surface.

**Description:** Cluster of smooth-walled cells with rounded bottoms divergently disposed and flat tops, locally with a spiral cap.

**Remarks:** The two known ichnospecies of *Uruguay*, *U. auroranormae* and *U. rivasi*, are distinguished mostly by clusters disposition in rows (Genise, 2017). Considering that the studied specimens are fragmented, missing general disposition, they were kept at the ichnogeneric level.

Ichnofamily Coprinisphaeridae Genise, 2004

*Rebuffoichnus casamiquelai* Roselli, 1987

Fig. 4L-M

**Material:** 34 specimens with numbers ULVG-13136 to ULVG-13141, ULVG-13193 to ULVG-13195, ULVG-13196, ULVG-13197, ULVG-13301 to ULVG-13306, descending from O2 surface.

**Description:** Oblate chambers with rough external walls and internal chamber with a circular cross-section, empty or massive filled. Some specimens preserve a circular terminal aperture, interpreted as upward oriented, varying from 4 to 8 mm.

**Remarks:** It differs from *Monesichnus* by the lack of meniscate filling. The absence of antechambers is in accordance with *R. casamiquelai* (Genise, 2017).

*Teisseirei* isp. Roselli, 1939

Fig. 4N

**Material:** 6 specimens with numbers ULVG-13157 to ULVG-13162, descending from O2 surface.

**Description:** Chambers with an elliptical outline in cross-section.

**Remarks:** The elliptical cross-section is the main diagnostic character of *Teisseirei* and allows its attribution to moths (Genise et al., 2013). Although an elliptical cross-section is observed, the absence of a multilayered wall precludes ichnospecific attribution. Neoichnological studies attributed *T. barattinia* to the shallowly emplaced pupation activity of the sphinx moth (Lepidoptera, Sphingidae). Thus, it can be an ichnomarker of the upper horizons of paleosols (Genise et al., 2013).

KrausichnidaeGenise, 2004

*Krausichnus* isp.Genise and Bown, 1994

Fig. 5A-B

**Material:** up to 10 *in situ* specimens descending from the O2 surface.

**Description:** Isolated burrow system composed of tiered, tabular chambers with flat and parallel roofs and floors disposed of in an ovoid to conical shape lacking external wall.

**Remarks:** *Krausichnus* has two valid ichnospecies, *K. altus* and *K. trompitus*. *K. altus* is characterized by a high column or tower without connection among towers; *K. trompitus* is chevron-shaped and occurs in clusters connected by wide and flat burrows and by small passages (Genise, 2017). The interconnection between described specimens were not observed, and, considering the ovoid to conical morphologies we kept them at the ichnogeneric level*.*

*Termitichnus* isp.Smith et al., 1993

Fig. 3D

**Material:** two *in situ* specimens descending from the O1 surface.

**Description:** Burrow systems with interconnected semi-spherical to flattened chambers forming a network of simple burrows presenting different diameters (primary and secondary orders). The specimens show a clear wall lined by oxides with sharp contact with surround soil.

**Remarks:** These specimens were observed as bi-dimensional sections, and chambers were not observed in connection by primary tunnels. Thus, we kept these specimens at the ichnogeneric level.

*Vondrichnus obovatus* Genise and Bown, 1994

Fig. 3A-C

**Material:** 39 specimens with numbers ULVG-13307 to ULVG-13345, several *in situ* specimens descending from the O1 surface, and a few specimens descending from the O2 surface.

**Description:** Oblate chambers interconnected by simple burrows exiting from one point on the periphery of the chamber. The internal structure of chambers presents alveolar organization. These traces show reddish colors associated with oxides, also sharp contact with the surrounding soil.

**Remarks:** *Vondrichnus* has two valid ichnospecies, *V. obovatus* and *V. planoglobus*. *V. planoglobus* is characterized by occurrence in a single horizontal plane. Also, their chambers show flat floors and arched roofs (Genise, 2017). The *V. obovatus* is developed in different planes composed of oblate chambers without flat floors, similar to specimens described.

*4.3 Other trace fossils*

Simple tunnels

Fig. 3F

**Material:** 75 fragments with numbers ULVG-13346 to ULVG-13349; several *in situ* specimens connected or not with *Vondrichnus obovatus* descending from the O1 and O2 surfaces.

**Description:** Unramified, smooth- to rough-walled tunnels ranging from 5 mm to 32 mm in diameter and reaching 22 cm in length.

**Remarks:** We infer that most of those tunnels can be connections between chambers or rhizoliths, but no ichnotaxonomic category is attributed to them due to the lack of diagnostic features.

Rhizoliths

Fig. 5C-D

**Material:** several *in situ* structures descending from the O1 and O2 surfaces.

**Description:** Root traces are abundant in some levels and occur as root mats with vertical taproots (~40 cm in length) and lateral roots with dichotomous patterns preserved in full relief. Their diameter ranges between 1 to 3 cm. The root traces showing the same colors (5YR 4/3 and 5YR 5/6) of the previously described Bhm horizons.

**Remarks:** The roots pattern and length suggest vegetation dominated by grasses and bushes (Retallack, 2001) with vertical rooting and superficial radial rooting. The color of the walls suggests iron concentration associated with the podzolization process, resulting in rhizocretions (e.g., Klappa, 1980) exposed on the outcrop due to differential erosion.