SOUTHBOUND

Late Pleistocene Peopling of Latin America

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Late Pleistocene Peopling of Latin America

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SOUTHBOUND: LATE PLEISTOCENE PEOPLING OF LATIN AMERICA

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Diatom Analysis in Santa Cruz Central Massif (Patagonia, Argentina): Preliminary Results

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➤**Keywords:** Palaeoenvironments, diatoms, early Holocene, early peopling of South America

Cueva Maripe (47° 51′ 05″ S; 68° 56′ 03″ W; 560 masl) is located near a wetland identified as La Primavera in the Deseado Massif (Santa Cruz, Argentina). It is a large cave (26 m by 24 m) with two chambers separated by a rock wall (Miotti et al. 2004, 2007) (Figure 1). Its main walls and roof bear negative hand paintings (Carden 2008). The cave was occupied by humans recurrently from 9500 to 1000 ^{14}C RCYBP, the earliest events in the southern chamber having been dated to 9518 ± 64 (AA-65175) and 8333 ± 63 RCYBP (AA-65174), whereas in the northern chamber they took place at 8992 ± 65 (AA-65179) and 8762 ± 50 RCYBP (AA-65178) (Miotti et al. 2007).

PART 3

The stratigraphy of Cueva Maripe shows a varied lithology in the 45 m^2 excavated; different sedimentation rates and post-depositional processes in each sector affect the degree of preservation of archaeological materials. Agents including roof land sliding, waterlogging and water percolation in different parts of the cave, rodent activities, cattle trampling, a thick level of dung in surficial strata, and human activity until as late as A.D. 1950 have seriously impacted the archaeological context (Miotti et al. 2007).

The main aims of this article are to determine the degree to which human activities or post-depositional processes in Maripe Cave have influenced the conservation of siliceous remains, and to understand the habitability conditions of each sector of the cave during different periods.

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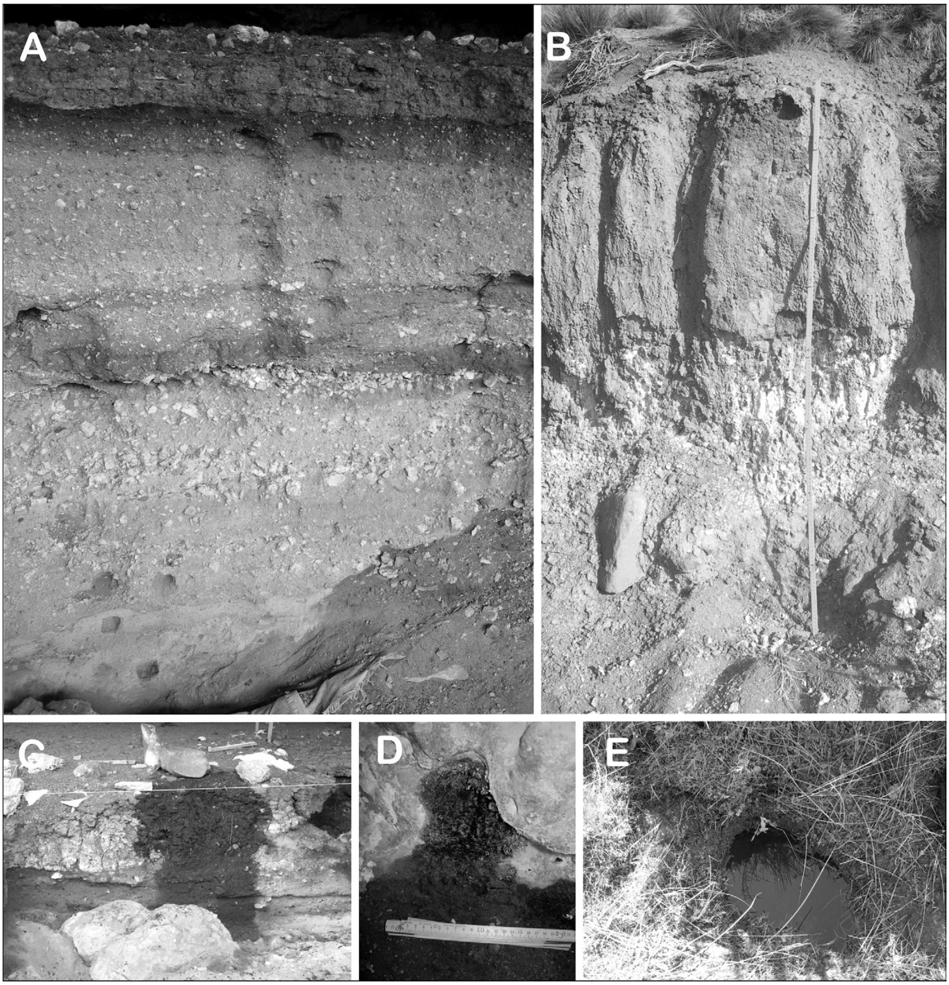

Figure 1. Main sampling locations at Cueva Maripe. **A,** square D5 (northern chamber); **B,** gully near the cave; **C,** square A11 (southern chamber)—note percolation on the profile (black spot); **D,** innermost sector of the cave in an active spring; **E,** active spring.

Here we explore both problems through diatom analysis and compare results with phytolith studies.

Methodology

Sediment and water samples were taken from different locations, inside and outside the cave (Table 1). Inside the cave (Figure 2, **A, C, D**), samples were collected from squares D5 (northern chamber, A) and A11 (southern chamber, C), as well as from the innermost sector of the cave in an active spring (D). Outside the cave (Figure 2, **B, E**), samples were collected from a 1.3-m-deep gully (B), two ponds (La Primavera and La Playita), and an active spring nearby the cave (E).

Table 1. Location of samples collected in the excavated area and surroundings of Cueva Maripe.

Sample level	Description	Sample No.	Depth (m)	Anthropological feature	RCYBP	Diatoms species
D5-2	Burned dung	1	0.84			*Pseudostaurosira brevistriata, Staurosirella pinnata, Denticula elegans*, indet. fragment
D5-3	Gravels with sandy matrix	2	0.99			*Nitzschia sp., Staurosirella pinnata,* indet. fragment
D5-3 microlayer	Microlayer of dung	3	1.11			*Pinnularia borealis, Achnantes* sp., indet. fragment
D5-4a	Large charcoal particles	4	1.21			*Pinnularia borealis, Diat. Degradadas,* indet. fragment
D5-4b	Angular clast of ignimbrites	5	1.4			*Pinnularia borealis, Denticula* sp., indet. fragment
D5-4c	Light brown-gray; little charcoal	6	1.5			*Pinnularia borealis, Achnantes* sp., indet. fragment
D5-4c	Sand and very angular clast of ignimbrite	7	1.63	Hearth	N/D	*Pinnularia borealis, Achnantes* sp., *Fragilaria* sp., *Denticula* sp., indet. fragment
D5-4d	Very fine sand	8	1.73			*Pinnularia borealis, Nitzschia* sp., indet. fragment
D5-5b	Ash, charcoal, and dung	9	1.48	Hearth	8992 ± 65 (AA 65179)	*Pinnularia borealis, Achnantes* sp., *Nitzschia* sp., indet. frag.
D5-5c	Clast of ignimbrites	10	1.81			*Denticula* sp., *Staurosirella pinnata,* indet. fragment
D5-5c	Clast of ignimbrites	11	1.99			*Denticula* sp., *Nitzschia* sp., *Diploneis* sp., *Fragilaria pinnata,* indet. fragment
D5-5d	Silty-sandy sediment	12	2.1			*Denticula* sp., *Staurosirella pinnata, Pseudostaurosira brevistriata, Pinnularia microstauron, Deiploneis elliptica,* indet. frag.
A11-1	Charcoal lens	1	0.5			*Pinnularia borealis, Denticula* sp., indet. fragment
A11-2	Whitish silty lens	2	0.89			*Denticula* sp., indet. fragment
A11-3	Silty sandy sediment	3	0.92			*Denticula* sp.
Gully	Sandy sediment	1	0.15			*Pinnularia* sp., indet. fragment
Gully	Sandy sediment	2	0.3			*Achnanthes* sp., *Pinnularia borealis,* indet. fragment
Gully	Sandy sediment	3	0.75			*Nitzschia* sp., *Rophalodia* sp., indet. fragment
Gully	Sandy sediment	4	0.9			Sterile
Gully	Silty sand sediment	5	1.3			Indet. fragment

To preserve the water samples, formaldehyde was added. Water temperature was measured in situ. Permanent slides were made to analyze the samples by means of an optical microscope with ocular objectives exceeding 750X.

Results

Results of the diatom analysis are presented below, by sampling area.

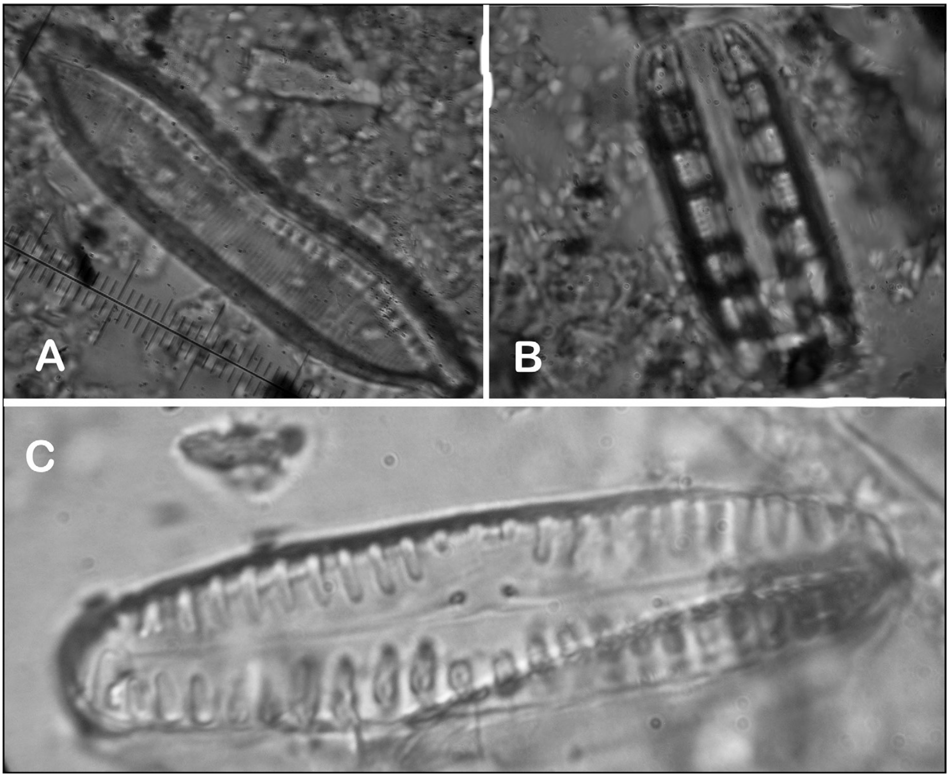

Figure 2. Microscopic photographs of diatoms. **A,** *Hantzschia* sp., valvar view; **B,** *Denticula* sp., girdle view; **C,** *Pinnularia borealis,* valvar view.

Square D5. A few diatom valves were identified (more than 70% of them are only fragments); some are very badly preserved. Among the identified diatoms, the following taxa are dominant: *Staurosirella pinnata* (Ehr.) Williams and Round, *Achnanthes* sp., *Denticula* sp., and *Nitzschia* sp. In the deeper samples (11 and 12), however, dominant taxa are *Pseudostaurosira brevistriata* (Grunow) Williams and Round, *Denticula* sp., *Diploneis elliptica*, and *Pinnularia* sp.

Square A11. Among a large number of indeterminate fragments, only a few complete valves, mainly of *Pinnularia borealis*, *Denticula* sp., and *Nitzschia* sp., were identified.

Innermost sector of the cave. Valves of *Staurosirella pinnata*, *Denticula* sp., *Nitzschia* sp., and *Aulacoseira* sp. were recorded, as well as a significant amount of *Fragilaria* sp.

Gully. A few valves belonging to *Achnanthes* sp., *Nitzschia* sp. and *Pinnularia* sp. were identified, as well as several indeterminate fragments.

Water samples. The largest diversity and quantity of diatoms came from the sample taken from a pond 100 m north of the cave. *Staurosirella pinnata*, *Pseudostaurosira brevistriata*, *Denticula* sp., *Gomphonema* sp. and *Staurosira construens* Ehr. were identified. No fragmented diatoms were recorded.

Variable frequencies of sphere or crysophytes cysts occur in all samples; moreover, most of the studied samples contained charcoal particles and phytoliths.

Discussion and Conclusions

Preliminary diatom analyses in Cueva Maripe enlarge the existing knowledge of the Deseado Massif diatom flora. Siliceous remains within the archaeological contexts in both chambers are unevenly preserved (Miotti et al. 2007). A large number of fragmented valves and low frequencies of complete diatoms hindered the characterizing of possible environments inside the cave for periods of occupation; this may be due to variable depositional and post-depositional processes.

The samples from deeper layers, however, coincidentally the ones that present the largest diversity and best preservation, provide an important measure of environmental conditions existing before the earliest human occupation in the cave. Considering the diatom flora, the cave may have been flooded by shallow and quiet waters, which deposited a large quantity of periphytic species associated with palustral vegetation. The water samples collected in La Primavera and La Playita ponds, in the surroundings of Cueva Maripe, show significant diversity. Moreover, they show a flora characteristic of an oligotrophic (i.e., clear-water) environment.

At the Piedra Museo archaeological site (47° 53′ 42″ S; 67° 52′ 04″ W), samples from the upper 1.0 m of paleo-lake sediments from in front of the site contained fragmented diatoms as well. There, geological and taphonomic processes might be strongly related to the conservation of the siliceous frustules; as in Maripe Cave, valves that are complete show excellent preservation. Most of the samples contain phytoliths and a remarkable amount of clay. Nonetheless, the first results of the Piedra Museo phytolith analyses suggest a regional environment characterized by grassland vegetation around 8700 RCYBP (Miotti et al. 2008), in agreement with available pollen analyses (Borromei 2003; Paez et al. 2003).

The results from Deseado Cave and Piedra Museo confirm the value of diatom analyses in reconstructing prehistoric environments. Our future plans include analyzing samples from other sites of the Deseado Massif, mainly ponds and sediments from the paleo-basins, to compare with the preliminary results presented in this study. Comparing phytolith analysis (e.g., Miotti et al. 2008) with the results presented here will contribute to the paleoenvironmental knowledge of the region at the time of the early human colonization of southern Patagonia.

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