

Portable X-Ray Fluorescence Analysis of Levantine and Schematic Art Pigments from the River Vero Shelters (Huesca, NE Spain)

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SUPPLEMENTARY MATERIAL



Figure S1. Sampled points in section A of sector 1 of Muriecho shelter (based on the tracing of the paintings presented in Figure 10 in [1]).

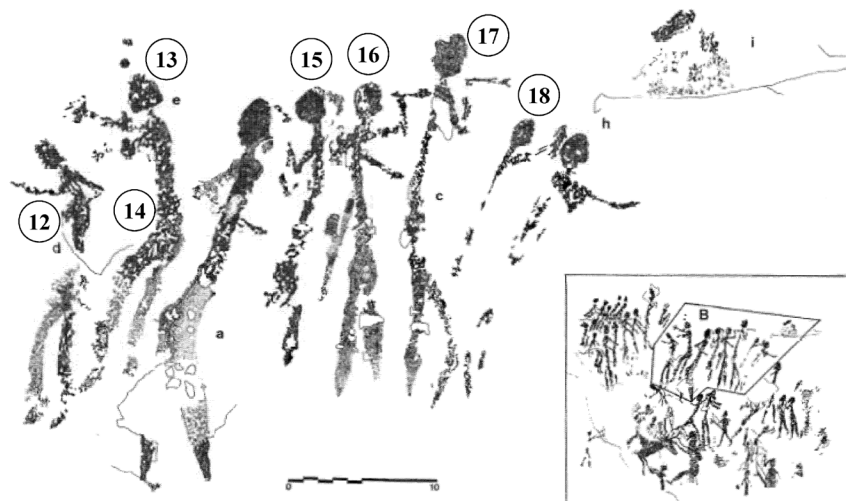


Figure S2. Sampled points in section B of sector 1 of Muriecho shelter (based on the tracing of the paintings presented in Figure 11 in [1]).

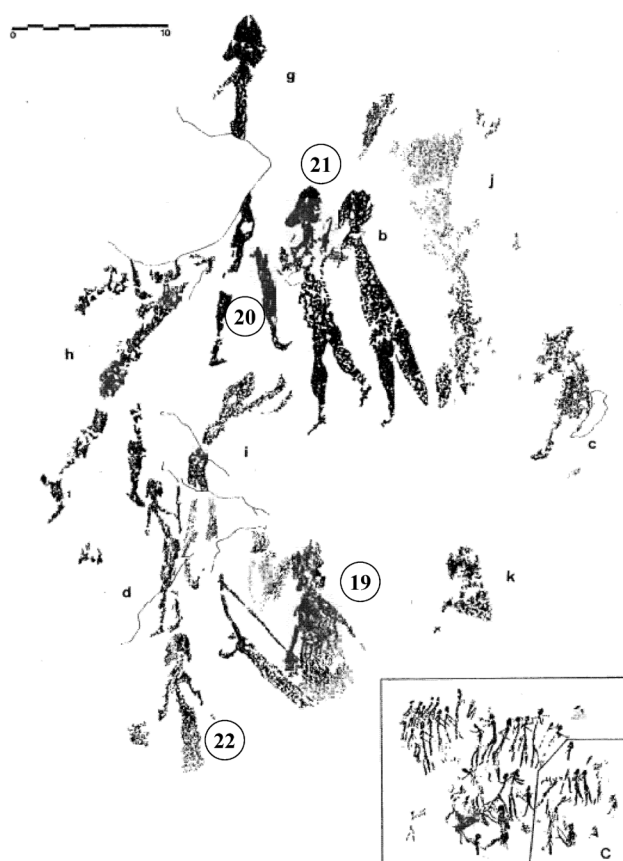


Figure S3. Sampled points in section C of sector 1 of Muriecho shelter (based on the tracing of the paintings presented in Figure 12 in [1]).

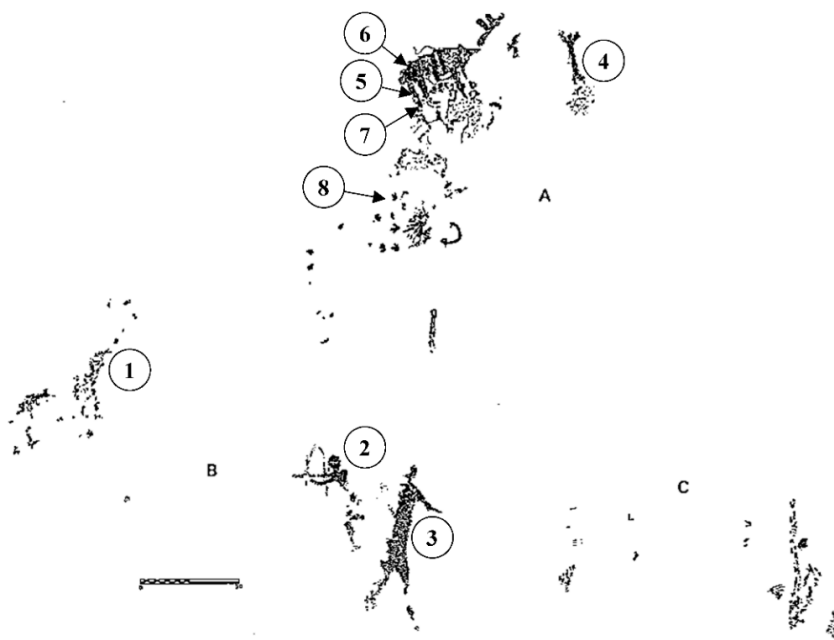


Figure S4. Sampled points in sector 1 of Arpán I shelter (based on the tracing of the paintings presented in Figure 4 in [2])

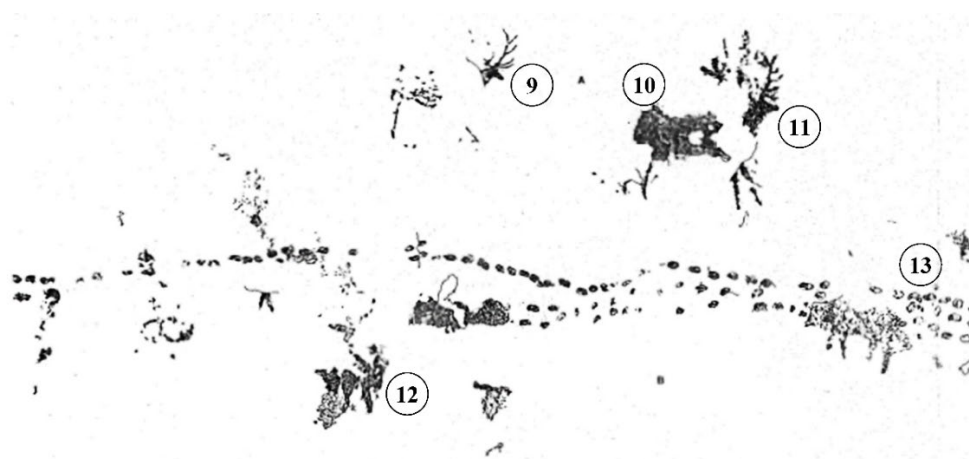


Figure S5. Sampled points in zones A and B of sector 3 of Arpán I shelter (based on the tracing of the paintings presented in Figure 10 in [2])

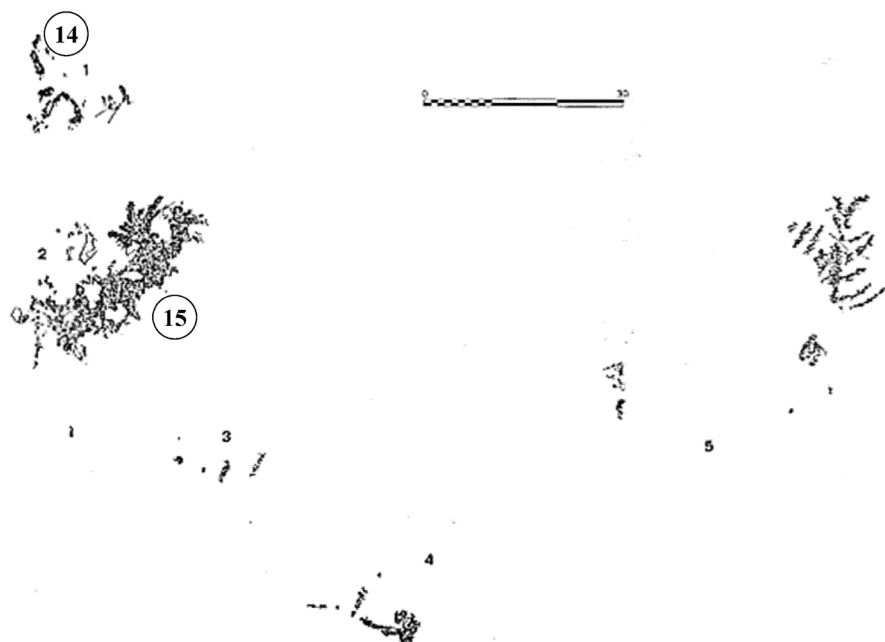


Figure S6. Sampled points in zone C of sector 3 of Arpán L shelter (based on the tracing of the paintings presented in Figure 21 in [2]).



Figure S7. Sampled points in zone D of sector 3 of Arpán L shelter (based on the tracing of the paintings presented in Figure 27 in [2]).

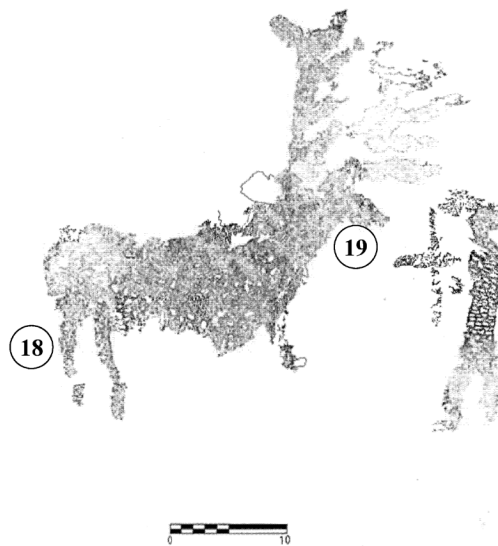


Figure S8. Sampled points in sector 4 of Arpán L shelter (based on the tracing of the paintings presented in Figure 29 in [2])

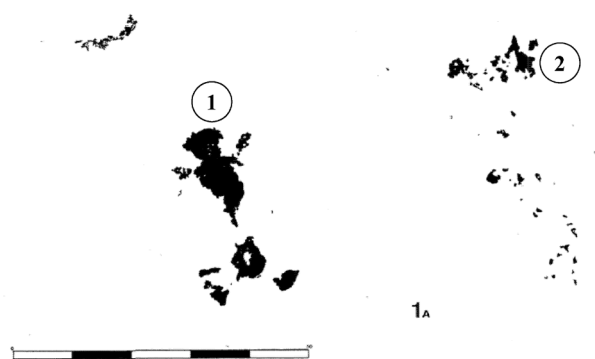


Figure S9. Sampled points in sector 1a of Mallata I shelter (based on the tracing of the paintings presented in Figure 2 in [3])

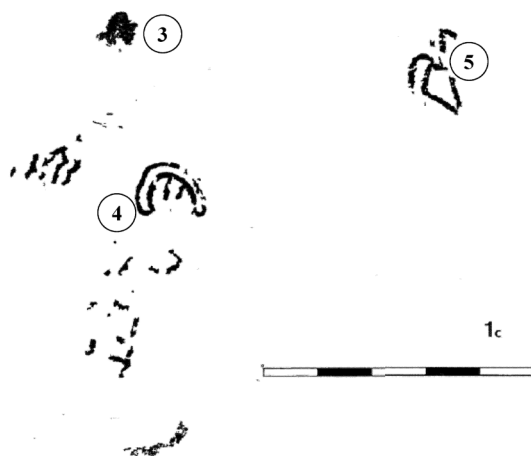


Figure S10. Sampled points in sector 1c of Mallata I shelter (based on the tracing of the paintings presented in Figure 2 in [3])

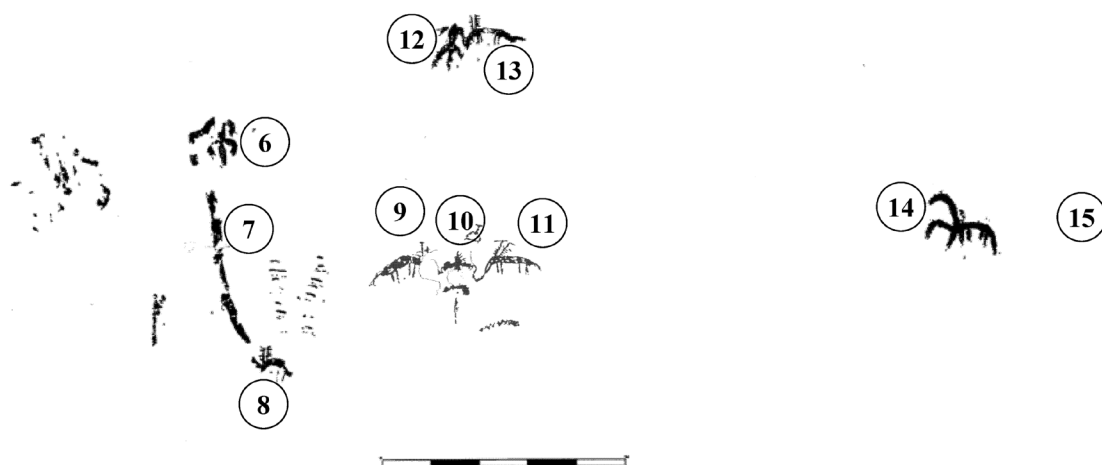


Figure S11. Sampled points in sector 2 of Mallata I shelter (based on the tracing of the paintings presented in Figure 3 in [3])

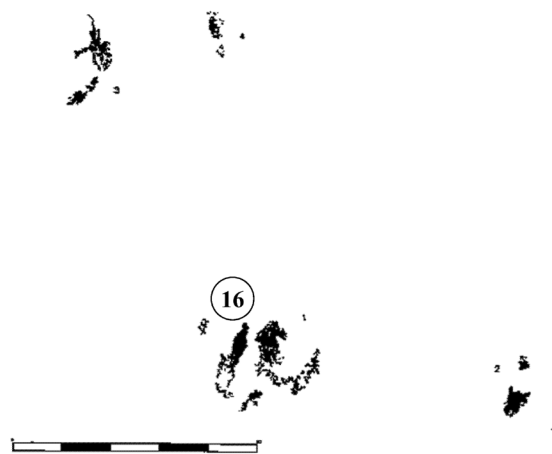


Figure S12. Sampled figure in sector 3 of Mallata I shelter.

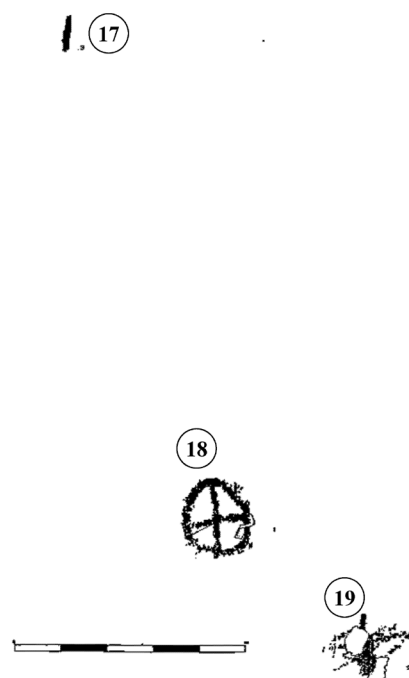


Figure S13. Sampled points in sector 4 of Mallata I shelter (based on the tracing of the paintings presented in Figure 2 in [4])

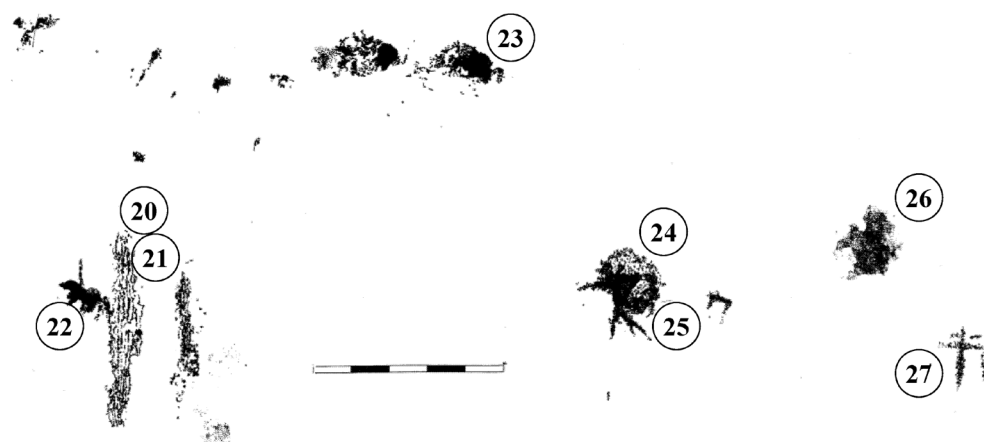


Figure S14. Sampled points in sector 5 of Mallata I shelter (based on the tracing of the paintings presented in Figure 3 in [3])

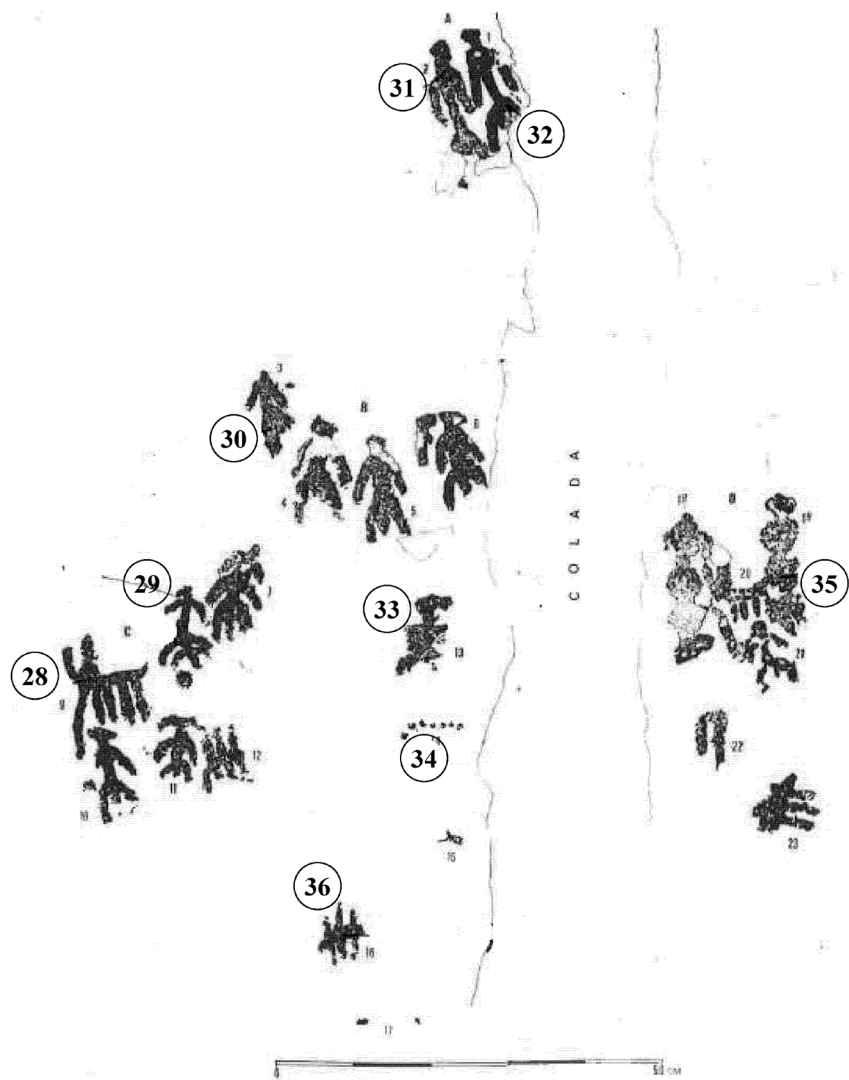


Figure S15. Sampled points in sector 1 of Mallata B1 (based on the tracing of the paintings presented in Figure 2 in [5])



Figure S16. Sampled points in sector 2 of Mallata B1 shelter (based on the tracing of the paintings presented in Figure 3 in [5])

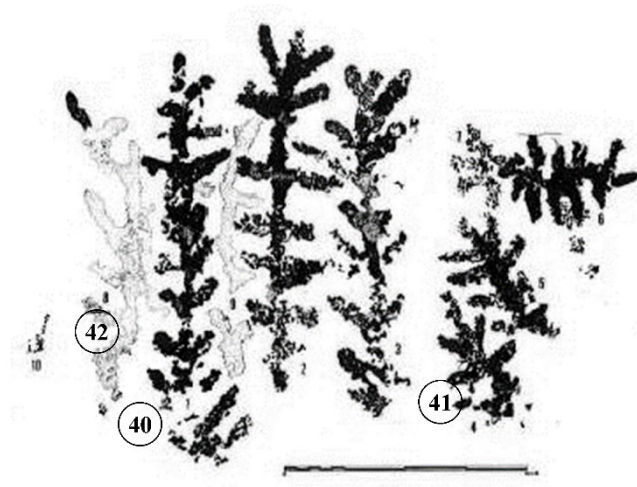


Figure S17. Sampled points in sector 3 of Mallata B1 (based on the tracing of the paintings presented in Figure 4 in [5])

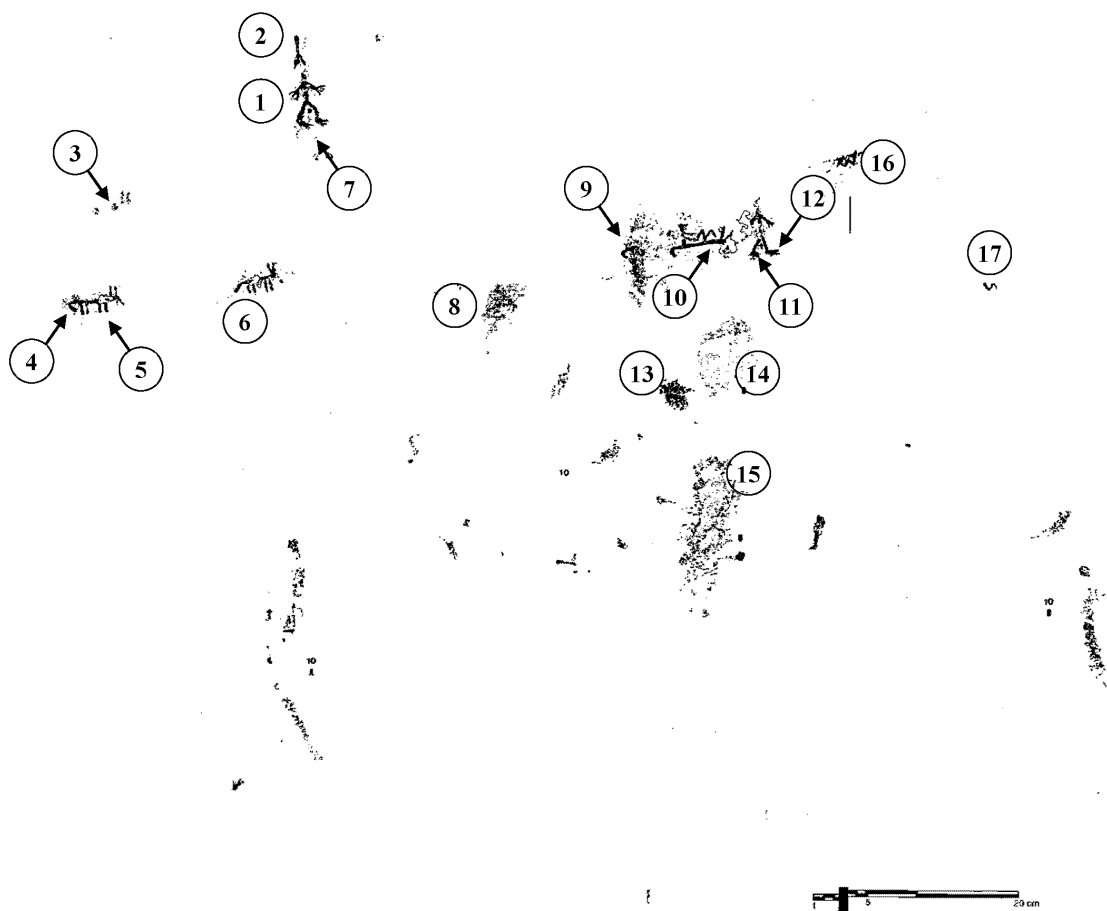


Figure S18. Sampled points in sector 1 of Barfaluy I shelter (based on the tracing of the paintings presented in Figure 5 in [6])

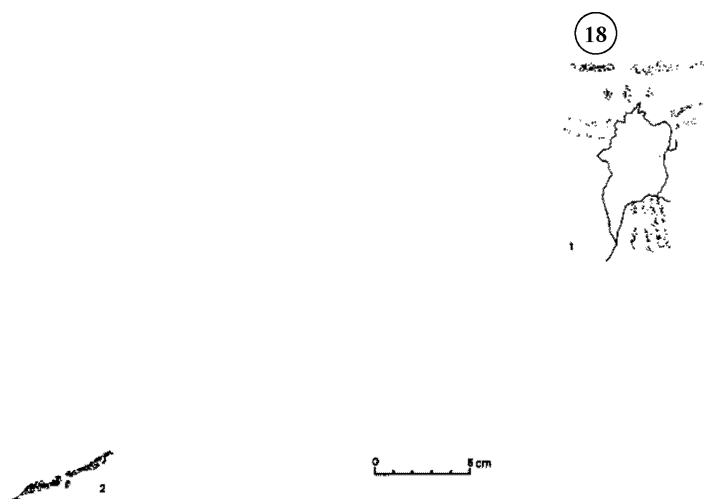


Figure S19. Sampled point in sector 2 of Barfaluy I shelter (based on the tracing of the paintings presented in Figure 6 in [6])

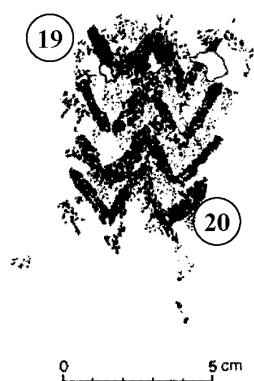


Figure S20. Sampled points on the figure in sector 3 of Barfaluy I shelter (based on the tracing of the painting presented in Figure 7 in [6])

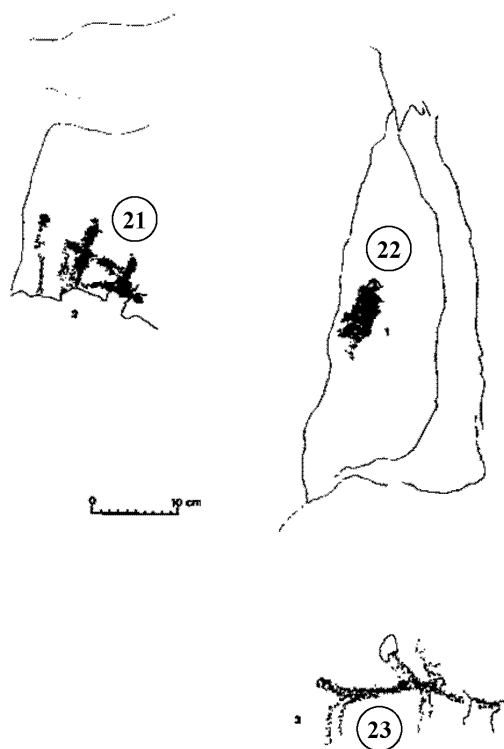


Figure S21. Sampled points on panel 3 in sector 3 of Barfaluy II shelter (based on the tracing of the paintings presented in Figure 14 in [6])

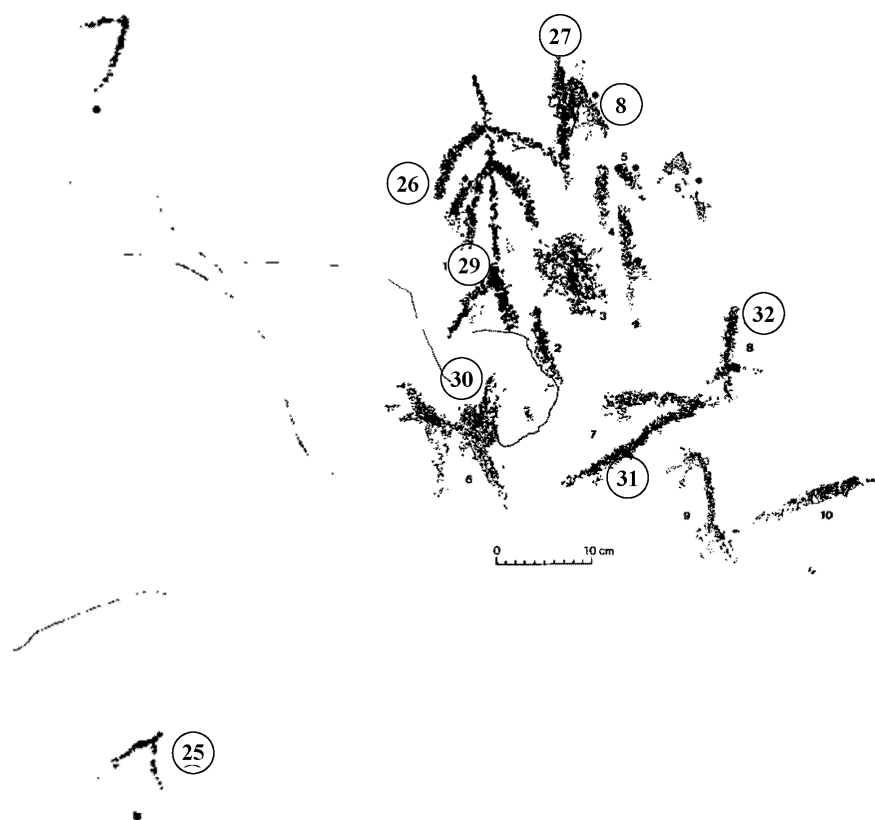


Figure S22. Sampled points on panel 2 in sector 3 of Barfaluy II shelter (based on the tracing of the paintings presented in Figures 11 and 13 in [6])

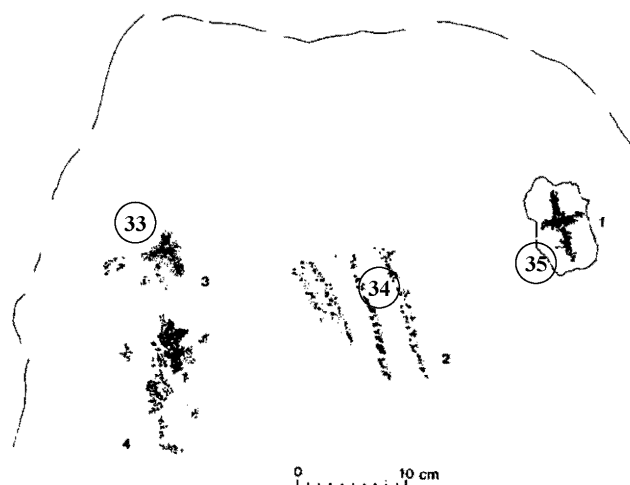


Figure S23. Sampled points on panel 1 in sector 3 of Barfaluy shelter (based on the tracing of the paintings presented in Figure 12 en [6])

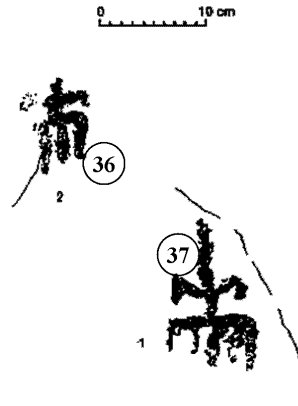


Figure S24. Sampled points in sector 1 of Barfaluy II shelter (based on the tracing of the paintings presented in Figure 9 in [6])

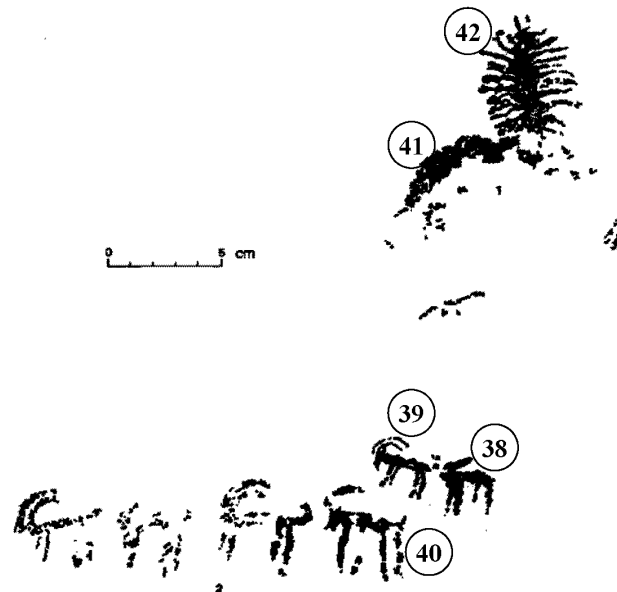


Figure S25. Sampled points in sector 1 of Barfaluy III shelter (based on the tracing of the paintings presented in Figure 17 in [6])

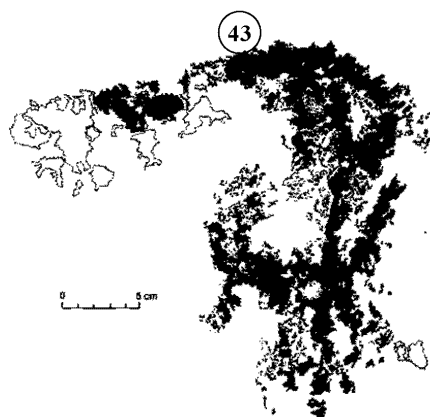


Figure S26. Sampled points in sector I of Barfaluy III shelter (based on the tracing of the painting presented in Figure 16 in [6])



Figure S27. Paintings on Quizans I shelter (based on the tracing of the paintings presented in Figure 2 in [7]).

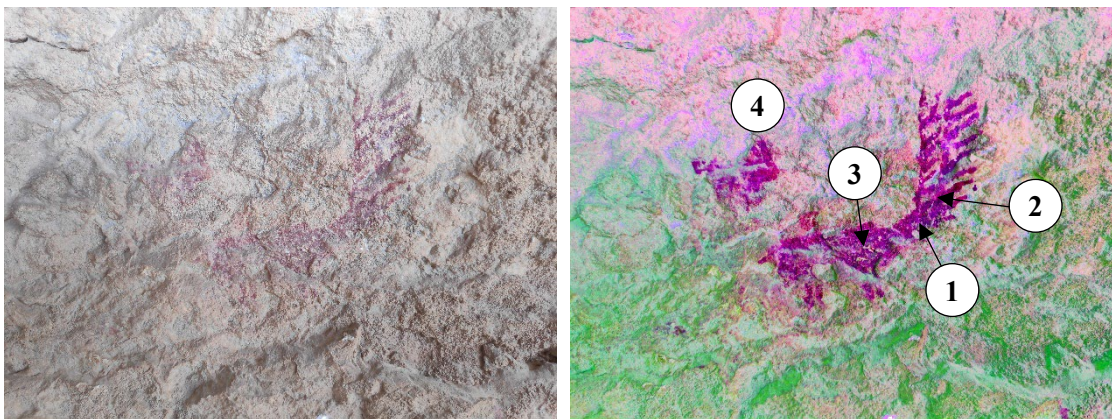


Figure S28. Sampled painting in Quizans I shelter (*left*: original photograph; *right*: after the application of a CRGB filter to facilitate visualization).

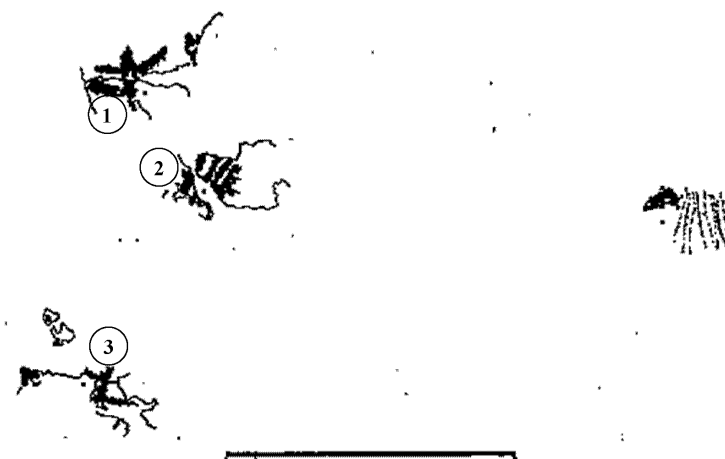


Figure S29. Sampled points in sector 1 of Lecina Superior shelter (based on the tracing of the paintings presented in Figure 3 in [8])

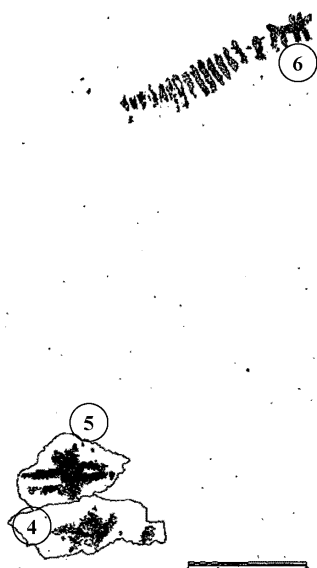


Figure S30. Sampled points in sector 2 of Lecina Superior shelter (based on the tracing of the paintings presented in Figure 6 in [8])

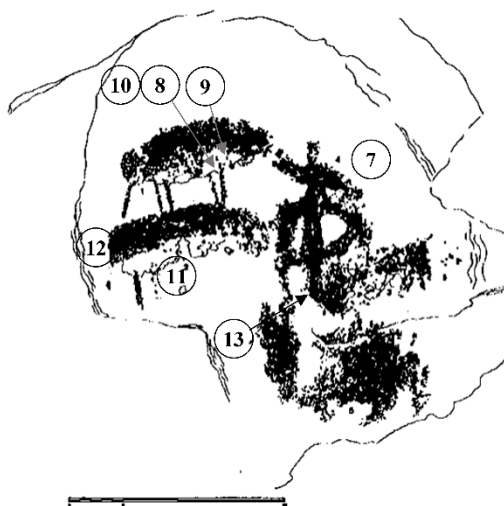


Figure S31. Sampled points in sector 3 of Lecina Superior shelter (based on the tracing of the paintings presented in Figure 7 in [8])

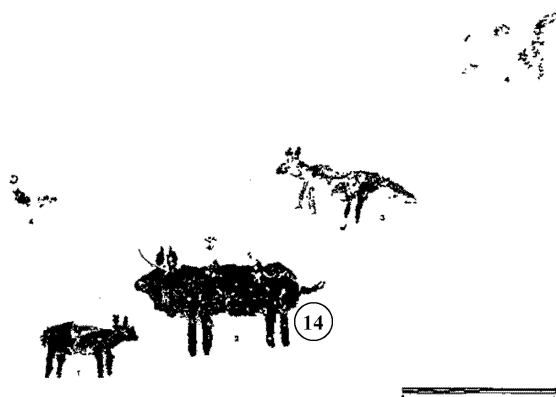


Figure S32. Sampled point in sector 5 of Lecina Superior shelter (based on the tracing of the paintings presented in Figure 9 in [8])

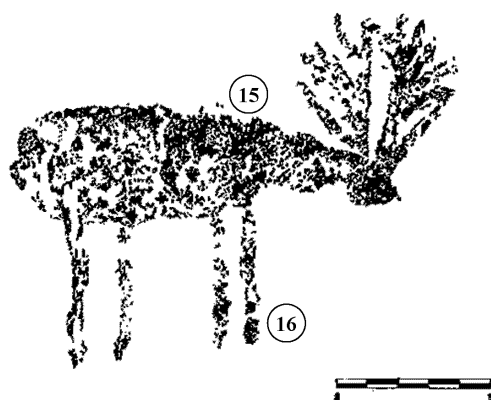


Figure S33. Sampled points in sector 6 of Lecina Superior shelter (based on the tracing of the painting presented in Figure 10 in [8])

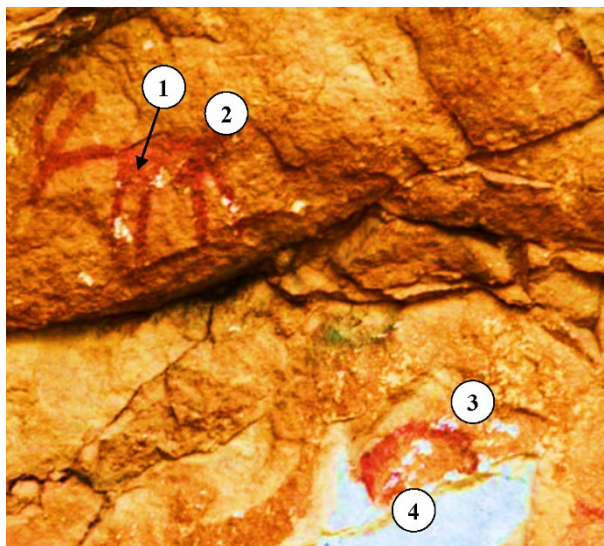


Figure S34. Sampled point in 'Covacho I' of Forau del Cocho shelter.

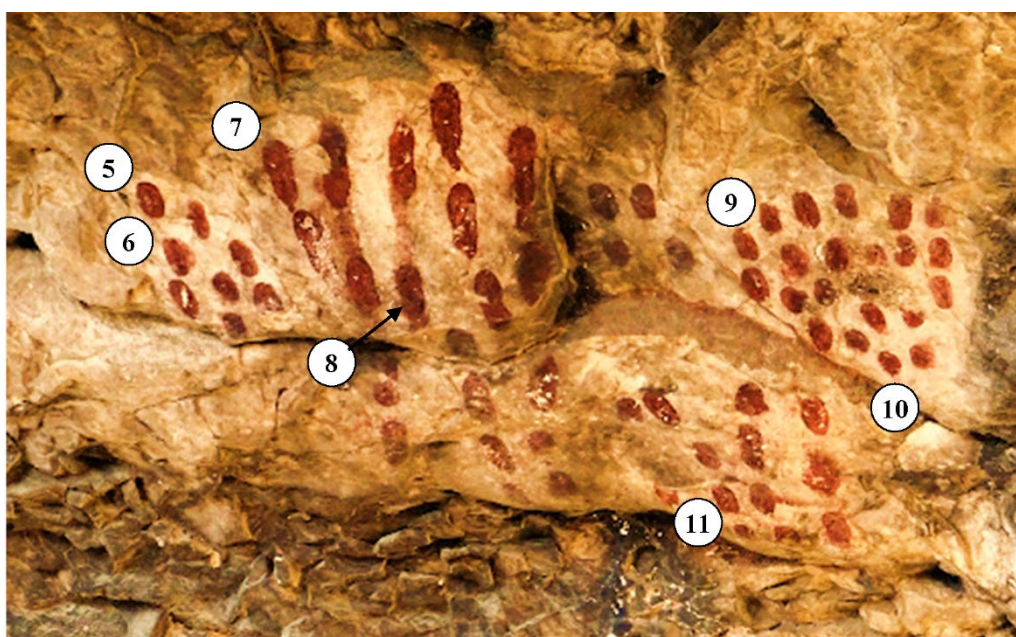


Figure S35. Sampled points in 'Covacho VIII' of Forau del Cocho shelter.

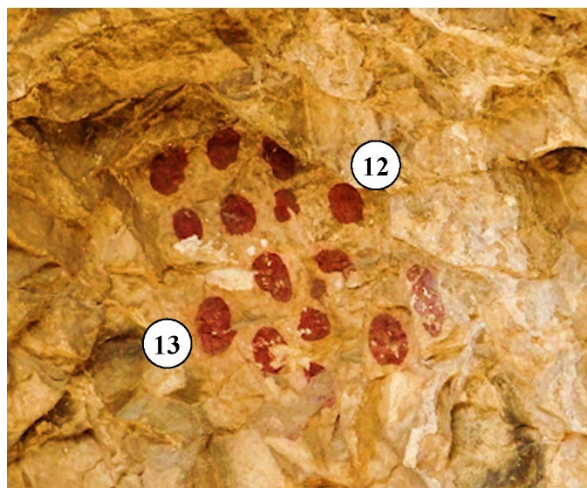


Figure S36. Sampled points in 'Covacho VIII' of Forau del Cocho shelter.

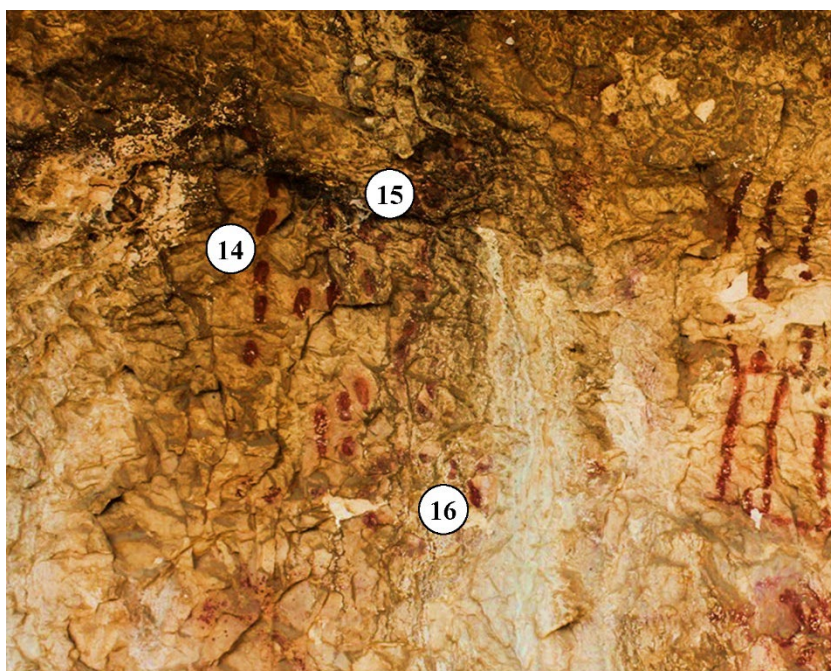


Figure S37. Sampled points in 'Covacho VII' of Forau del Cocho shelter.

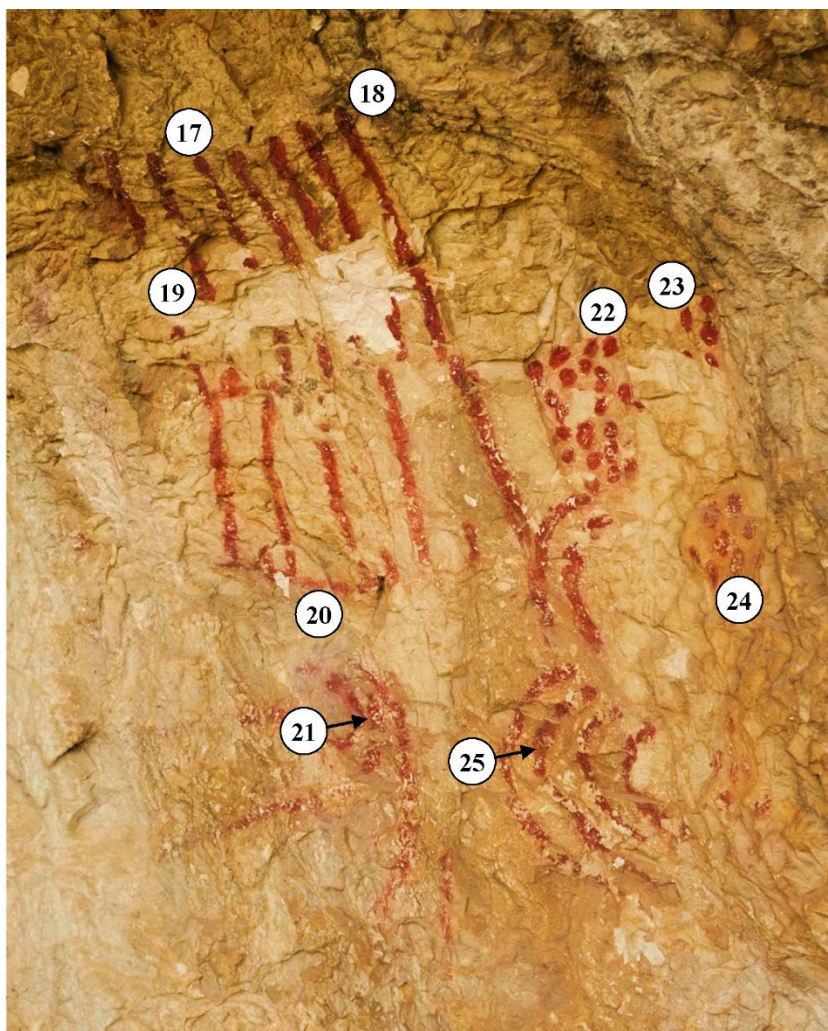


Figure S38. Sampled points in ‘Covacho VII’ of Forau del Cocho shelter.

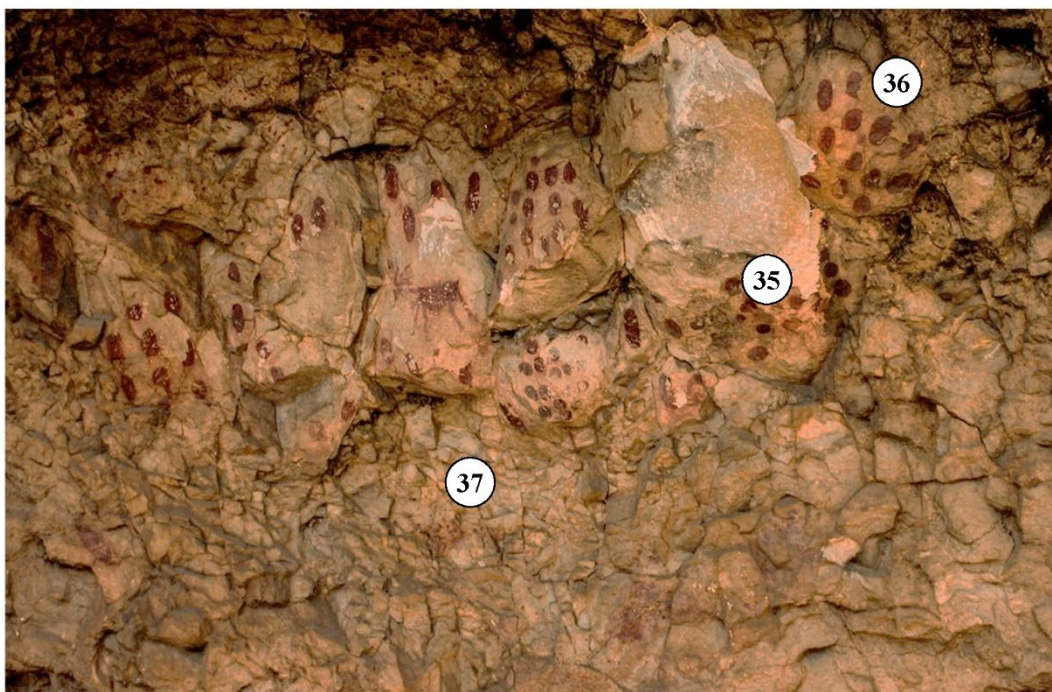
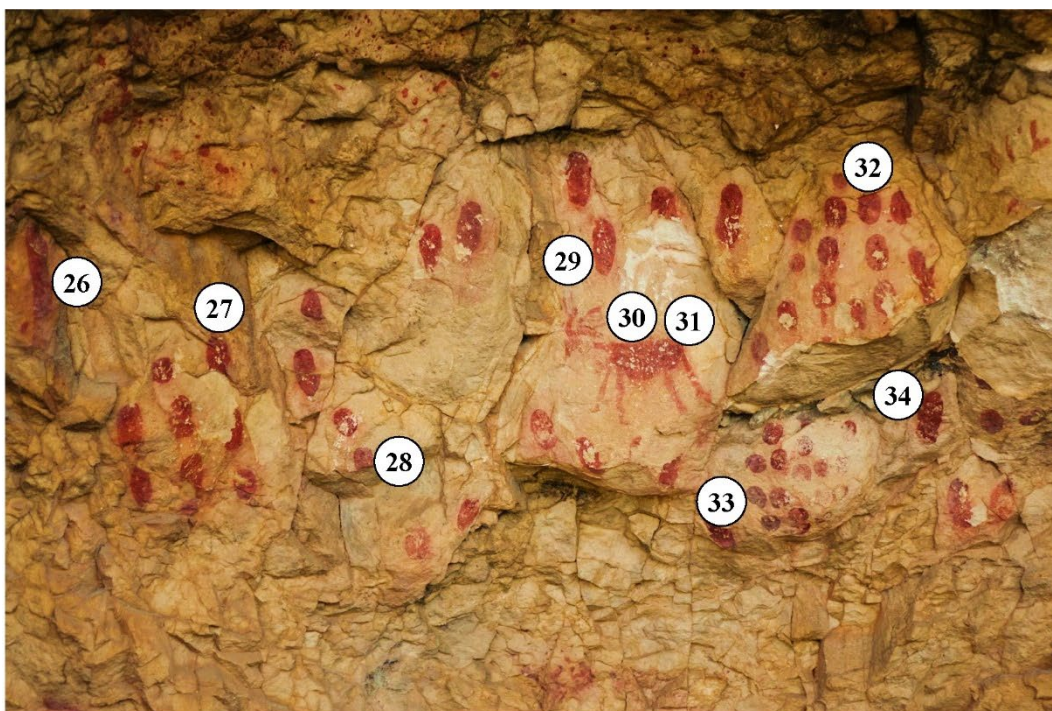


Figure S39. Sampled points in ‘Covacho VI’ of Forau del Cocho shelter.

Table S1. Chemical composition of the paintings of Muriecho shelter (in %) determined by pXRF.

Ref. point	Sector	<i>Bal</i> (C, N, O, F, Na)	Fe	Ti	Ca	Al	Si	P	S	Cl	K
1	A	54.41	5.23	0.04	23.03	0.89	2.17	0.35	13.29	0.09	0.41
2	A	56.86	2.30	0.04	27.94	1.01	2.68	0.18	8.50	0.11	0.31
3	A	56.81	3.20	0.05	27.05	0.91	2.40	0.20	8.89	0.11	0.32
4	A	52.81	4.10	0.04	25.57	0.79	2.09	0.18	13.93	0.09	0.33
5	A	49.96	4.00	0.04	26.91	1.01	2.32	0.16	14.31	0.08	0.35
6	A	48.97	2.69	0.06	27.66	1.04	2.41	0.24	16.44	0.07	0.34
7	A	50.07	3.48	0.06	27.39	1.60	3.58	0.31	12.88	0.09	0.44
8	A	50.84	2.40	0.06	28.59	1.43	3.48	1.01	10.60	0.11	0.44
9	A	55.41	4.27	0.07	24.38	0.81	2.54	0.61	11.16	0.07	0.57
10	A	53.79	2.45	0.06	27.94	1.10	2.83	0.10	11.26	0.08	0.35
11	A	55.30	2.50	0.07	27.66	0.92	2.84	0.73	9.28	0.09	0.50
<i>Average</i>	<i>Sector A</i>	<i>53.20</i>	<i>3.33</i>	<i>0.05</i>	<i>26.74</i>	<i>1.05</i>	<i>2.67</i>	<i>0.37</i>	<i>11.97</i>	<i>0.09</i>	<i>0.40</i>
12	B	51.98	3.12	0.08	27.81	0.99	2.92	0.61	11.96	0.07	0.37
13	B	46.89	3.24	0.07	25.56	1.00	2.41	0.25	20.08	0.04	0.38
14	B	42.72	2.59	0.06	28.30	1.17	2.69	0.35	21.59	0.08	0.38
15	B	43.45	2.15	0.06	26.14	0.80	1.87	0.32	24.75	0.05	0.34
16	B	45.11	3.00	0.06	24.97	0.86	1.97	0.29	23.24	0.04	0.39
17	B	45.04	8.10	0.07	24.39	1.04	2.15	0.19	18.48	0.07	0.39
18	B	49.36	3.49	0.05	24.16	0.40	1.45	0.16	20.55	0.05	0.28
<i>Average</i>	<i>Sector B</i>	<i>46.36</i>	<i>3.67</i>	<i>0.06</i>	<i>25.90</i>	<i>0.89</i>	<i>2.21</i>	<i>0.31</i>	<i>20.09</i>	<i>0.06</i>	<i>0.36</i>
19	C	47.65	2.04	0.10	25.13	1.52	3.93	0.47	18.48	0.04	0.50
20	C	45.99	3.35	0.06	23.72	1.00	2.25	0.44	22.73	0.04	0.38
21	C	42.19	3.42	0.06	24.94	1.24	3.06	0.12	24.43	0.05	0.37
22	C	47.90	2.26	0.10	27.76	2.48	5.50	1.03	11.52	0.10	0.60
<i>Average</i>	<i>Sector C</i>	<i>45.93</i>	<i>2.77</i>	<i>0.08</i>	<i>25.39</i>	<i>1.56</i>	<i>3.69</i>	<i>0.51</i>	<i>19.20</i>	<i>0.06</i>	<i>0.46</i>
23	D	51.04	1.79	0.08	30.09	1.79	4.33	1.62	8.55	0.12	0.46
24	D	51.39	5.25	0.09	25.50	1.60	4.21	1.15	9.88	0.10	0.59
25	D	48.69	3.01	0.10	26.19	1.63	4.12	0.76	13.84	0.11	0.63
26	D	51.37	1.78	0.10	27.84	1.99	4.79	0.84	10.41	0.15	0.63
27	D	56.67	2.18	0.08	25.98	1.34	3.83	1.24	7.97	0.07	0.50
28	D	44.65	2.07	0.07	26.56	1.53	3.44	0.61	20.43	0.05	0.46
29	D	44.36	1.89	0.07	26.30	1.49	3.34	0.64	21.33	0.06	0.42
30	D	45.65	2.47	0.07	24.92	1.93	3.99	0.47	19.88	0.06	0.48
31	D	51.67	1.92	0.10	25.09	1.12	3.13	0.72	15.03	0.06	0.44
32	D	49.49	3.80	0.10	25.09	2.11	4.86	0.66	12.93	0.07	0.68
33	D	47.57	0.90	0.10	25.17	1.88	4.18	0.41	19.05	0.05	0.60
<i>Average</i>	<i>Sector D</i>	<i>49.32</i>	<i>2.46</i>	<i>0.09</i>	<i>26.25</i>	<i>1.67</i>	<i>4.02</i>	<i>0.83</i>	<i>14.48</i>	<i>0.08</i>	<i>0.53</i>
<i>Average</i>	<i>Total</i>	<i>49.58</i>	<i>3.04</i>	<i>0.07</i>	<i>26.23</i>	<i>1.29</i>	<i>3.14</i>	<i>0.53</i>	<i>15.38</i>	<i>0.08</i>	<i>0.44</i>

Table S2. Chemical composition of the bedrock of Muriecho shelter (in %) determined by pXRF.

Ref. point	<i>Bal</i> (C, N, O, F, Na)	Fe	Ti	Ca	Al	Si	P	S	Cl	K
C1	56,59	-	0.05	41.03	-	0.60	-	1.64	0.04	-
C2	57,71	0.33	0.05	38.79	0.67	2.13	-	0.14	-	0.14

Table S3. Chemical composition of the paintings of Arpan shelter (in %) determined by pXRF.

Ref. point	Sector	<i>Bal</i> (C, N, O, F, Na)	Fe	Ti	Ca	Al	Si	P	S	Cl	K
1	1	56.69	0.89	0.06	34.42	1.36	4.29	-	1.73	0.15	0.35
2	1	53.69	1.49	0.10	29.57	1.30	5.03	0.55	7.49	0.12	0.63
3	1	58.05	2.98	0.06	27.62	1.71	6.42	1.36	1.22	0.09	0.41
4	1	45.49	1.07	0.04	29.10	0.52	1.20	0.20	22.14	0.03	0.17
5	1	58.20	2.01	-	31.29	0.68	3.46	0.32	3.67	0.09	0.21
6	1	58.41	0.97	0.03	31.51	0.52	4.90	0.13	3.22	0.09	0.17
7	1	58.77	1.62	0.04	31.01	0.43	2.61	0.10	5.09	0.08	0.17
8	1	59.22	1.05	0.05	34.57	0.55	2.15	0.18	1.84	0.12	0.24
9	3A/B	42.96	1.03	0.04	28.96	1.08	2.53	0.57	22.58	0.04	0.15
10	3A/B	51.41	5.85	0.06	22.69	0.44	1.68	0.12	17.10	0.09	0.44
11	3A/B	50.86	3.07	0.06	27.10	0.56	1.51	0.06	16.29	0.12	0.32
12	3A/B	50.23	1.30	0.09	27.44	1.27	3.67	-	15.22	0.13	0.51
13	3A/B	54.52	1.08	0.13	25.53	0.88	3.82	0.27	12.86	0.21	0.64
14	3C	43.91	6.54	0.03	24.22	0.85	1.55	0.37	22.21	0.05	0.19
15	3C	52.95	0.89	0.05	30.00	0.94	2.72	0.23	11.73	0.12	0.30
16	3D	55.32	4.97	0.04	28.28	0.79	2.95	0.67	6.44	0.17	0.31
17	3D	55.38	0.79	0.05	35.12	0.64	1.97	0.27	5.42	0.18	0.13
18	4	50.95	1.94	0.15	24.19	2.88	8.03	1.83	8.85	0.21	0.82
19	4	47.88	1.72	0.08	25.56	2.75	8.11	3.16	9.83	0.27	0.57
Average		52.89	2.17	0.06	28.85	1.06	3.61	0.61	10.26	0.12	0.35

Table S4. Chemical composition of the bedrock of Arpan shelter (in %) determined by pXRF.

Ref. point	<i>Bal</i> (C, N, O, F, Na)	Fe	Ti	Ca	Al	Si	P	S	Cl	K
C1	53.17	0.13	-	41.77	0.87	2.83	-	0.95	0.11	0.13
C2	50.09	0.08	0.03	39.54	0.47	1.36	0.09	8.11	0.06	0.10
C3	49.68	0.65	0.11	30.18	1.45	4.56	0.08	12.49	0.17	0.56
C4	50.54	0.85	0.12	26.18	1.59	5.06	0.55	14.23	0.16	0.66

Table S5. Chemical composition of the paintings of Mallata I and Mallata B1 shelters (in %) determined by pXRF

<i>Mallata I</i>											
Ref. point	Sector	Bal (C, N, O, F, Na)	Fe	Ti	Ca	Al	Si	P	S	Cl	K
1	1	59.74	2.21	0.08	25.88	0.84	5.32	0.35	5.12	0.10	0.29
2	1	52.30	1.04	0.07	28.93	1.58	10.09	0.15	5.11	0.23	0.40
3	1	59.06	2.20	0.07	28.39	1.05	2.84	0.89	4.95	0.23	0.25
4	1	56.05	3.25	0.06	28.77	0.97	3.28	0.17	5.88	0.22	0.36
5	1	55.21	3.48	0.07	29.12	1.55	4.50	0.33	5.11	0.21	0.33
6	2	47.91	3.57	0.05	28.22	1.36	2.86	-	14.29	0.14	0.30
7	2	51.40	2.87	0.05	28.07	0.67	2.12	0.43	12.95	0.05	0.20
8	2	50.74	3.49	0.07	26.95	1.38	3.51	0.55	11.68	0.12	0.38
9	2	49.81	2.43	0.05	28.84	1.21	2.74	0.48	14.08	0.05	0.24
10	2	48.20	1.80	0.08	30.04	1.23	3.80	0.52	13.86	0.07	0.34
11	2	50.39	4.32	0.06	27.71	1.05	2.84	1.02	10.96	0.21	0.35
12	2	50.36	0.69	0.04	33.91	1.10	2.57	0.22	10.76	0.13	0.15
13	2	54.05	4.35	0.03	28.68	0.76	2.05	0.35	9.30	0.14	0.22
14	2	51.61	5.08	0.05	30.46	1.25	4.21	0.46	6.33	0.05	0.39
15	2	52.06	0.74	0.06	34.85	0.72	2.28	0.50	8.44	0.06	0.24
16	3	55.04	1.34	0.08	25.84	0.56	2.13	0.09	14.22	0.11	0.52
17	4	52.38	0.81	0.04	34.65	0.40	1.17	0.10	10.26	0.07	0.09
18	4	54.13	5.27	0.06	24.39	0.70	2.12	0.47	12.30	0.11	0.31
19	4	59.46	2.90	0.05	27.05	0.65	2.26	0.22	6.83	0.16	0.32
20	5	55.79	2.28	0.04	32.36	0.39	1.85	0.14	6.72	0.15	0.21
21	5	53.28	0.48	0.04	32.70	0.76	2.43	0.16	9.62	0.18	0.29
22	5	53.35	0.89	0.06	32.88	0.61	2.52	-	9.11	0.18	0.30
23	5	57.72	0.29	0.04	35.77	0.47	1.23	-	4.14	0.19	0.11
24	5	55.26	0.64	0.06	32.75	0.85	2.83	-	7.12	0.17	0.27
25	5	53.42	0.93	0.09	29.19	1.29	3.88	-	10.47	0.18	0.51
26	5	53.40	0.63	0.09	31.80	1.06	3.71	-	8.60	0.20	0.42
27	5	56.94	1.44	0.04	33.45	1.01	3.30	-	3.12	0.25	0.31
<i>Average</i>	<i>Mallata I</i>	<i>53.67</i>	<i>2.20</i>	<i>0.06</i>	<i>30.06</i>	<i>0.94</i>	<i>3.13</i>	<i>0.38</i>	<i>8.94</i>	<i>0.15</i>	<i>0.30</i>
<i>Mallata B1</i>											
Ref. point	Sector	Bal (C, N, O, F, Na)	Fe	Ti	Ca	Al	Si	P	S	Cl	K
28	1	61.77	6.78	0.05	25.75	0.51	1.68	0.06	2.76	0.14	0.43
29	1	55.87	8.61	-	26.18	0.67	1.77	-	6.40	0.14	0.21
30	1	58.21	4.87	-	31.01	0.63	1.93	-	2.97	0.16	0.13
31	1	62.72	3.22	-	29.25	0.39	1.61	-	2.32	0.09	0.32
32	1	55.67	1.82	-	31.96	0.71	5.17	-	2.07	0.27	0.28
33	1	57.94	10.58	-	26.13	0.75	2.08	-	1.84	0.25	0.25
34	1	54.28	1.56	-	35.85	0.98	2.49	-	3.09	0.14	0.18
35	1	55.52	5.08	0.03	30.77	0.63	4.50	-	2.51	0.37	0.50
36	1	58.24	6.63	0.04	22.77	1.01	3.31	0.55	6.94	0.12	0.27
37	2	50.64	4.85	0.09	27.04	2.98	7.17	0.63	5.72	0.12	0.59
38	2	54.71	1.29	-	34.16	0.60	1.74	-	7.08	0.13	0.19
39	2	59.24	1.12	0.03	33.82	0.37	1.28	-	3.85	0.09	0.15
40	3	61.22	0.53	-	28.62	0.32	2.03	0.07	6.85	0.13	0.16
41	3	47.55	9.98	0.03	27.39	0.51	2.09	0.17	11.87	0.09	0.19
42	3	57.74	2.18	0.04	29.59	0.96	3.17	-	5.77	0.18	0.29
<i>Average</i>	<i>Mallata B1</i>	<i>56.75</i>	<i>4.61</i>	<i>0.04</i>	<i>29.35</i>	<i>0.80</i>	<i>2.80</i>	<i>0.30</i>	<i>4.80</i>	<i>0.16</i>	<i>0.28</i>
<i>Average</i>	<i>Total</i>	<i>54.77</i>	<i>3.06</i>	<i>0.06</i>	<i>29.81</i>	<i>0.89</i>	<i>3.01</i>	<i>0.36</i>	<i>7.46</i>	<i>0.15</i>	<i>0.29</i>

Table S6. Chemical composition by pXRF of the paintings of Barfaluy shelters (in %).

Ref. point	Sector	<i>Bal</i> (C, N, O, F, Na)	Fe	Ti	Ca	Al	Si	P	S	Cl	K
1	I.1	64.13	3.09	0.17	27.21	0.67	2.60	-	0.82	0.08	0.46
2	I.1	63.65	1.58	0.08	30.94	0.34	1.54	-	1.42	0.09	0.26
3	I.1	63.12	0.50	0.05	31.74	0.36	1.58	-	2.39	0.09	0.13
4	I.1	47.16	0.29	0.07	43.45	1.83	3.76	0.16	2.94	0.11	0.19
5	I.1	51.56	0.45	0.05	37.57	1.07	2.91	0.24	4.81	0.08	0.21
6	I.1	56.76	2.33	0.12	32.88	1.09	3.41	0.19	2.76	0.07	0.34
7	I.1	58.91	0.19	0.03	35.50	0.70	2.01	-	2.42	0.09	0.10
8	I.1	54.20	1.10	0.11	34.49	1.73	3.84	0.16	3.94	0.09	0.28
9	I.1	56.52	1.81	0.10	34.75	1.08	3.38	-	1.86	0.06	0.31
10	I.1	55.22	1.04	0.08	35.13	1.62	3.55	0.06	2.94	0.06	0.24
11	I.1	57.45	1.71	0.12	31.04	1.52	3.81	-	2.10	0.06	0.38
12	I.1	55.87	1.77	0.14	33.78	1.37	3.58	0.14	2.93	0.06	0.31
13	I.1	57.26	1.13	0.14	32.74	1.34	4.19	0.24	2.45	0.06	0.39
14	I.1	56.47	0.42	0.11	34.46	1.17	3.06	-	3.92	0.04	0.30
15	I.1	58.71	0.47	0.11	33.37	0.78	3.44	-	2.75	0.05	0.30
16	I.1	59.79	1.28	0.09	33.05	0.53	1.61	-	3.37	0.06	0.18
17	I.1	60.13	0.28	0.06	32.11	0.36	1.57	-	5.23	0.07	0.15
18	I.2	56.60	0.24	0.07	32.44	-	1.57	-	8.83	0.06	0.15
— ^a	I.3	57.76	0.19	0.07	32.80	0.35	1.60	-	5.82	0.07	0.11
19	I.3	48.54	0.31	0.08	39.71	0.69	1.98	0.15	8.19	0.09	0.19
20	I.3	56.49	0.39	0.07	33.12	0.38	1.59	0.16	7.52	0.10	0.14
Average	Barf. I	56.97	0.98	0.09	33.92	0.95	2.69	0.17	3.78	0.07	0.24
21	II	52.40	3.53	0.08	27.22	1.44	4.42	0.47	9.65	0.15	0.52
22	II	55.08	4.28	0.06	24.84	-	1.37	0.20	13.45	0.06	0.25
23	II	46.55	3.26	0.09	26.44	1.47	3.58	0.50	17.49	0.07	0.44
24	II	52.72	3.21	0.05	30.62	0.41	1.42	-	9.98	0.15	0.24
25	II	51.77	2.79	0.06	29.26	0.33	1.57	-	13.84	0.06	0.22
26	II	51.75	2.06	0.06	31.90	0.36	1.77	0.10	11.66	0.06	0.17
27	II	56.91	4.53	0.05	27.97	-	1.00	-	7.77	0.10	0.25
28	II	58.84	0.99	0.16	27.72	0.81	3.15	0.09	7.68	0.14	0.37
29	II	56.93	4.41	0.07	28.50	0.39	1.67	-	7.57	0.04	0.25
30	II	56.66	4.26	0.04	27.91	0.50	1.36	-	8.70	0.12	0.27
31	II	48.50	3.27	0.06	28.20	0.78	1.42	0.12	17.19	0.05	0.27
32	II	58.50	4.02	0.07	27.13	0.54	1.83	0.30	6.90	0.20	0.35
33	II	50.56	3.94	0.05	27.98	0.78	2.38	0.17	13.66	0.05	0.25
34	II	52.71	0.40	0.06	34.95	0.57	2.38	-	8.37	0.24	0.20
35	II	56.44	1.77	0.06	31.37	0.60	1.91	0.17	6.35	0.06	0.17
— ^b	II	53.35	0.70	0.08	32.29	1.08	2.61	0.35	9.04	0.13	0.32
— ^c	II	53.94	0.40	0.09	33.66	0.72	2.38	0.09	8.36	0.10	0.21
36	II.1	53.54	0.45	0.09	30.15	0.57	2.93	0.24	10.07	0.12	0.30
37	II.1	52.15	0.92	0.15	26.20	1.25	5.41	0.43	12.72	0.09	0.58
Average	Barf. II	55.43	1.73	0.08	31.72	0.86	2.53	0.21	6.92	0.09	0.27
38	III	64.04	0.35	0.08	28.46	0.87	2.91	-	2.81	0.13	0.31
39	III.2	59.06	0.36	0.08	31.12	0.96	3.68	0.20	3.98	0.17	0.32
40	III.2	59.00	0.35	0.08	29.28	1.14	4.14	0.12	5.29	0.16	0.36
41	III.2	61.98	0.22	0.07	30.57	0.53	2.07	-	4.23	0.14	0.18
42	III.2	63.77	0.22	0.06	30.31	0.50	1.98	-	2.78	0.15	0.19
43	III.1	57.49	0.14	0.05	35.27	0.27	1.03	-	5.18	0.27	0.29
Average	Barf. III	60.89	0.27	0.07	30.84	0.71	2.64	0.16	4.05	0.17	0.28
Average	Total	56.11	1.55	0.08	31.56	0.83	2.54	0.21	6.61	0.10	0.27

^a Seated idol, not shown in the tracings of the paintings.^{b-c} Vertical stain in panel 1, sector 3, not shown in tracings of the paintings.

Table S7. Chemical composition of the bedrock of Barfaluy shelters (in %) determined by pXRF.

Ref. point	<i>Bal</i> (C, N, O, F, Na)	Fe	Ti	Ca	Al	Si	P	S	Cl	K
C1	56.58	0.11	0.05	35.91	0.57	2.31	0.08	3.23	0.05	0.14
C2	43.32	0.05	0.04	40.66	0.41	1.14	-	14.18	0.03	0.09

Table S8. Chemical composition of the paintings of Lecina Superior shelter (in %) determined by pXRF.

Ref. point	Sector	<i>Bal</i> (C, N, O, F, Na)	Fe	Ti	Ca	Al	Si	P	S	Cl	K
1	1	60.16	4.44	0.07	25.94	1.21	3.94	0.94	1.50	0.09	0.51
2	1	56.92	6.33	0.09	24.54	1.65	5.30	1.97	1.24	0.08	0.54
3	1	57.48	1.91	0.06	31.11	1.24	3.84	0.58	2.08	0.05	0.44
4	2	59.54	1.67	0.03	33.92	0.63	2.04	0.11	1.66	0.08	0.24
5	2	58.60	0.93	0.06	32.57	0.60	2.65	0.22	3.91	0.10	0.29
6	2	57.40	0.23	0.06	34.83	0.94	3.92	0.06	2.13	0.09	0.29
7	3	48.48	2.76	0.10	28.46	1.86	5.48	0.07	10.89	0.08	0.61
8	3	53.54	0.05	-	29.32	0.43	1.51	-	14.88	0.09	0.08
9	3	52.54	0.13	0.04	29.91	0.69	2.37	-	13.99	0.10	0.17
11	3	51.93	0.09	0.04	27.95	1.05	3.22	0.06	14.30	0.09	0.13
12	3	49.59	0.11	0.03	29.65	0.27	1.52	-	18.57	0.09	0.12
13	3	53.19	0.29	0.04	31.35	-	1.70	-	11.92	0.13	0.15
14	5	54.79	0.64	0.10	30.00	1.82	6.19	0.67	4.04	0.10	0.57
15	6	61.51	0.14	0.05	34.19	0.50	1.86	-	1.39	0.07	0.21
16	6	59.58	0.25	0.06	31.95	0.87	2.99	0.10	3.78	0.11	0.26
— ^a	6	60.40	0.47	0.06	30.87	0.52	2.53	-	4.77	0.06	0.24
Average		55.98	1.21	0.06	30.06	0.95	3.19	0.48	7.07	0.09	0.29

^a Orange pigment, not natural, on the left in sector 5, not shown in the tracings of the paintings.

Table S9. Chemical composition of the bedrock of Lecina superior shelter (in %) determined by pXRF.

Ref. point	<i>Bal</i> (C, N, O, F, Na)	Fe	Ti	Ca	Al	Si	P	S	Cl	K
C1	47.83	0.14	0.03	36.44	0.40	2.05	0.16	12.07	0.37	0.45
C2	58.99	-	-	36.33	-	2.95	0.11	1.34	0.06	0.13
C3	46.53	0.04	-	44.80	0.61	1.44	-	6.45	0.02	0.04

Table S10. Chemical composition of the paintings of Forau del Cocho shelter (in %) determined by pXRF.

Ref. point	'Covacho'	<i>Bal</i> (C, N, O, F, Na)	Fe	Ti	Ca	Al	Si	P	S	Cl	K
1	I	53.19	0.76	0.07	30.96	1.49	4.49	0.95	7.69	0.06	0.29
2	I	52.76	1.01	0.09	27.64	1.55	4.80	0.43	11.18	0.08	0.38
3	I	48.98	0.56	0.05	28.42	0.68	2.70	0.59	17.68	0.05	0.25
4	I	46.90	0.53	0.05	28.73	0.97	3.13	0.17	19.15	0.05	0.29
*	I	45.41	0.70	0.05	32.88	0.80	2.44	0.25	17.11	0.08	0.22
5	VIII	54.31	7.69	0.05	22.11	0.77	2.66	0.26	10.16	0.18	0.26
6	VIII	46.59	10.81	0.04	25.39	1.03	2.25	0.14	11.70	0.18	0.22
7	VIII	59.78	7.72	0.04	23.12	0.40	1.79	0.08	6.65	0.12	0.23
8	VIII	56.66	4.46	0.05	26.49	0.77	3.07	1.11	5.74	0.17	0.33
9	VIII	56.80	8.55	0.03	25.66	0.52	1.65	-	6.38	0.15	0.20
10	VIII	48.93	6.36	0.04	28.10	1.26	2.92	0.42	11.54	0.19	0.18
11	VIII	54.26	6.01	-	29.80	0.61	2.34	0.13	6.39	0.15	0.21
12	VIII	51.27	2.18	0.05	28.80	0.70	1.98	0.06	14.58	0.11	0.21
13	VIII	51.86	2.32	0.05	27.78	0.68	2.32	0.21	14.41	0.11	0.22
14	VII	58.62	1.70	0.04	31.01	0.92	2.79	-	4.29	0.26	0.26
15	VII	57.50	1.09	0.04	26.98	0.55	1.64	-	11.72	0.22	0.23
16	VII	51.08	0.89	0.07	31.71	1.65	4.12	0.44	8.16	0.22	0.32
17	VII	53.06	4.05	0.03	27.82	0.68	1.69	-	12.23	0.18	0.14
18	VII	63.12	3.42	0.03	27.86	0.62	2.19	-	2.28	0.22	0.21
19	VII	53.62	0.64	0.04	33.16	0.30	1.14	0.51	10.23	0.15	0.15
20	VII	50.88	0.63	0.05	32.52	0.63	1.91	0.07	12.90	0.14	0.23
21	VII	50.07	1.31	0.06	29.30	1.77	4.53	1.01	10.04	0.31	0.33
22	VII	56.29	2.22	0.04	29.47	0.73	2.48	0.30	8.10	0.16	0.18
23	VII	47.26	1.79	0.06	30.87	1.40	3.70	0.34	13.91	0.23	0.39
24	VII	53.54	1.70	0.07	29.61	1.32	3.75	0.32	9.01	0.20	0.43
25	VII	58.22	1.87	0.06	24.01	0.71	2.74	0.13	11.59	0.18	0.43
26	VI	53.03	2.34	0.08	26.77	0.97	3.89	0.11	12.14	0.19	0.43
27	VI	46.53	1.99	0.04	30.47	0.94	2.28	0.28	17.03	0.19	0.18
28	VI	46.58	1.36	0.05	31.02	0.57	1.92	-	18.17	0.13	0.17
29	VI	50.71	1.01	0.03	30.41	0.27	1.25	-	15.99	0.13	0.17
30	VI	44.89	1.27	0.06	30.50	0.96	2.61	-	19.30	0.12	0.27
31	VI	43.60	1.54	0.05	29.84	0.81	2.01	0.09	21.72	0.09	0.18
32	VI	51.44	1.88	0.05	29.75	1.28	2.88	0.22	11.91	0.28	0.23
33	VI	43.36	4.29	0.05	27.58	0.58	2.03	0.23	21.44	0.09	0.28
34	VI	46.46	2.59	0.05	27.39	0.90	2.59	0.50	16.40	0.12	0.24
35	VI	49.28	1.88	0.03	27.60	0.66	1.80	0.35	18.15	0.09	0.11
36	VI	51.34	0.99	0.06	31.92	0.79	4.05	-	10.41	0.19	0.20
37	VI	47.96	1.24	0.06	30.84	1.14	2.62	0.21	15.42	0.13	0.34
Average		51.48	2.72	0.05	28.80	0.88	2.66	0.34	12.44	0.15	0.25

* Small dots not shown in the photograph.

Table S11. Chemical composition of the bedrock of Forau del Cocho shelter (in %) determined by pXRF.

Ref. point	<i>Bal</i> (C, N, O, F, Na)	Fe	Ti	Ca	Al	Si	P	S	Cl	K
C1	49.33	0.19	0.06	32.03	0.73	1.92	-	15.29	0.22	0.19

Principal Component Analysis Results

When calcium was excluded as a common factor of the support, as well as titanium and chlorine (minority elements that did not help to discriminate), 84.6% of the variance was explained by three factors. The parameters of specific extracted initial communalities were checked by the Kaiser–Mayer–Olkin (KMO) test and the Bartlett test of sphericity to test data rationality and sampling adequacy of the analysis. The KMO value of 0.579 (>0.5) revealed sufficient sampling, and the significance level from the Bartlett test <0.0001 indicated that the data were appropriate and useful to substantially reduce the data dimension. Factor F1 (which accounted for 50.14% of the total cumulative variance) was linked to Al, Si, P, and K, i.e., to components of clay; factor F2 (which explained 18.47% of the variance) consisted of S, and factor F3 (which explained 16.0% of the total cumulative variance) was linked to Fe. In the F1 vs. F2 plot (Figure S40a), it may be observed that the measurements from some shelters appear as clusters, in such a way that Barfaluy measurements (black) are concentrated in the lower left corner, Muriecho (fuchsia) in the upper right corner, and Chimiachas-Forau del Cocho-Quizans in the intermediate zone. On the other hand, Mallata and Arpan's measurements are scattered. This mainly points to differences in the bedrock composition. Conversely, the F3 factor (associated with iron) did not allow for pigment discrimination among shelters (Figure S40b).

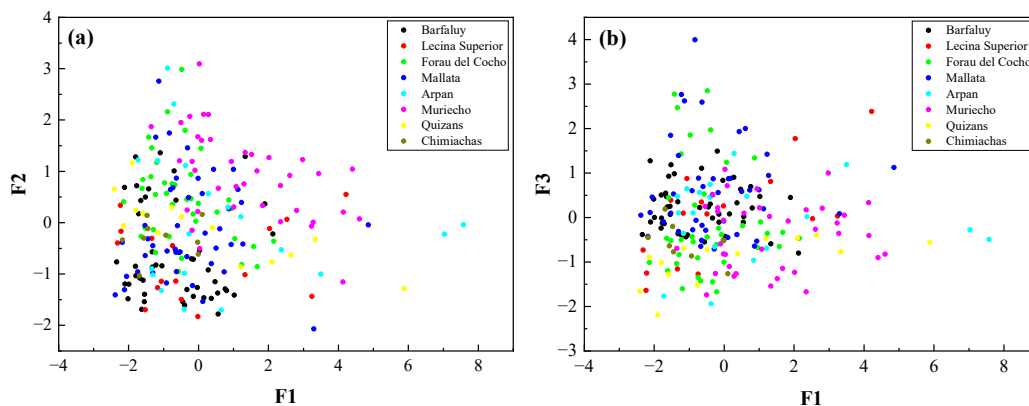


Figure S40. (a) F2 vs. F1 biplot; (b) F3 vs. F1 biplot.

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