

Abstract Summary

- Few extinct giant ground sloths exhibit integumentary armor called dermal ossicles.

Dermal ossicles:

- Mostly found scattered, isolated due to soft tissue degradation.
- Might exhibit patterns (rows, mosaics) around skeletal elements.

Definitive evidence of correlation requires a specimen with:

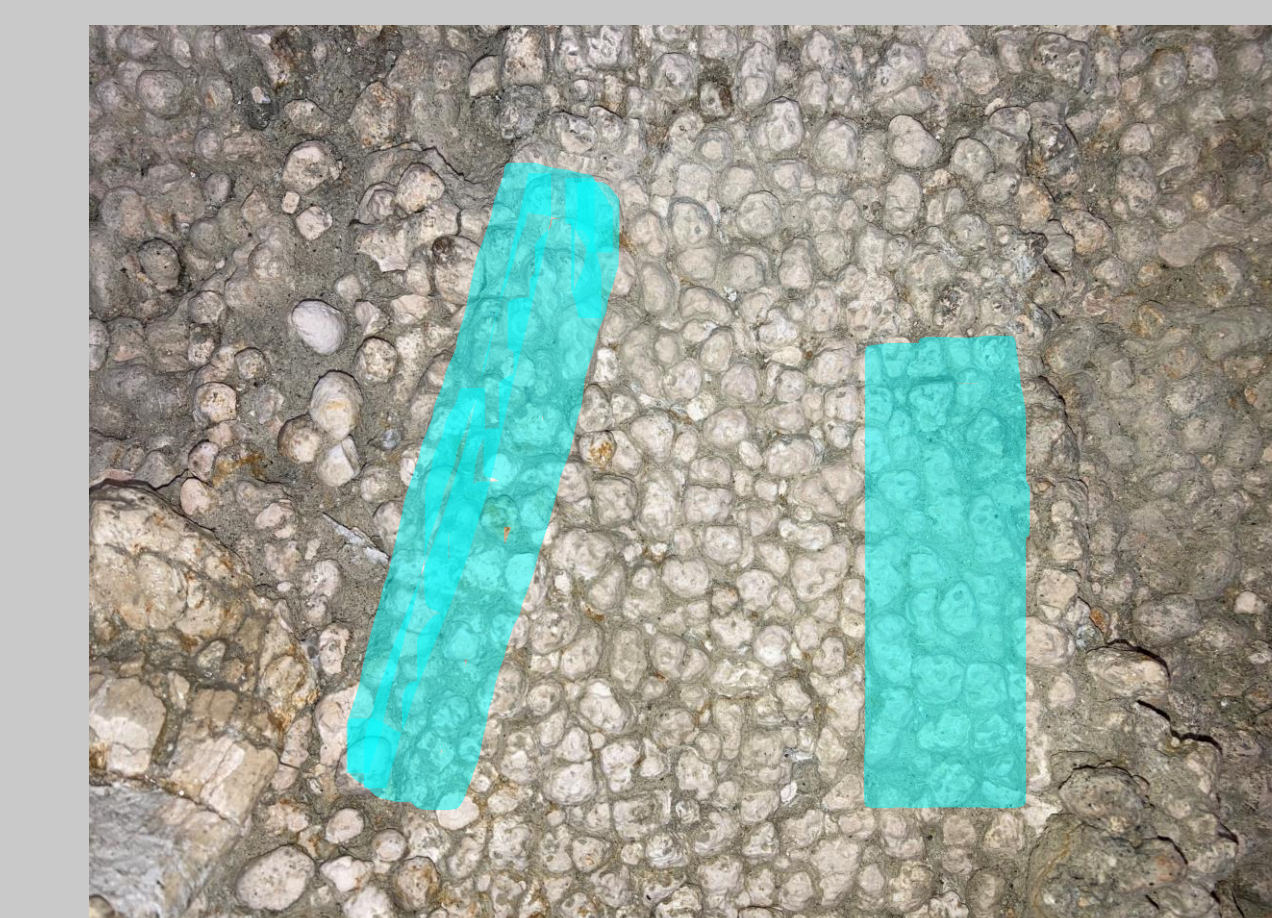
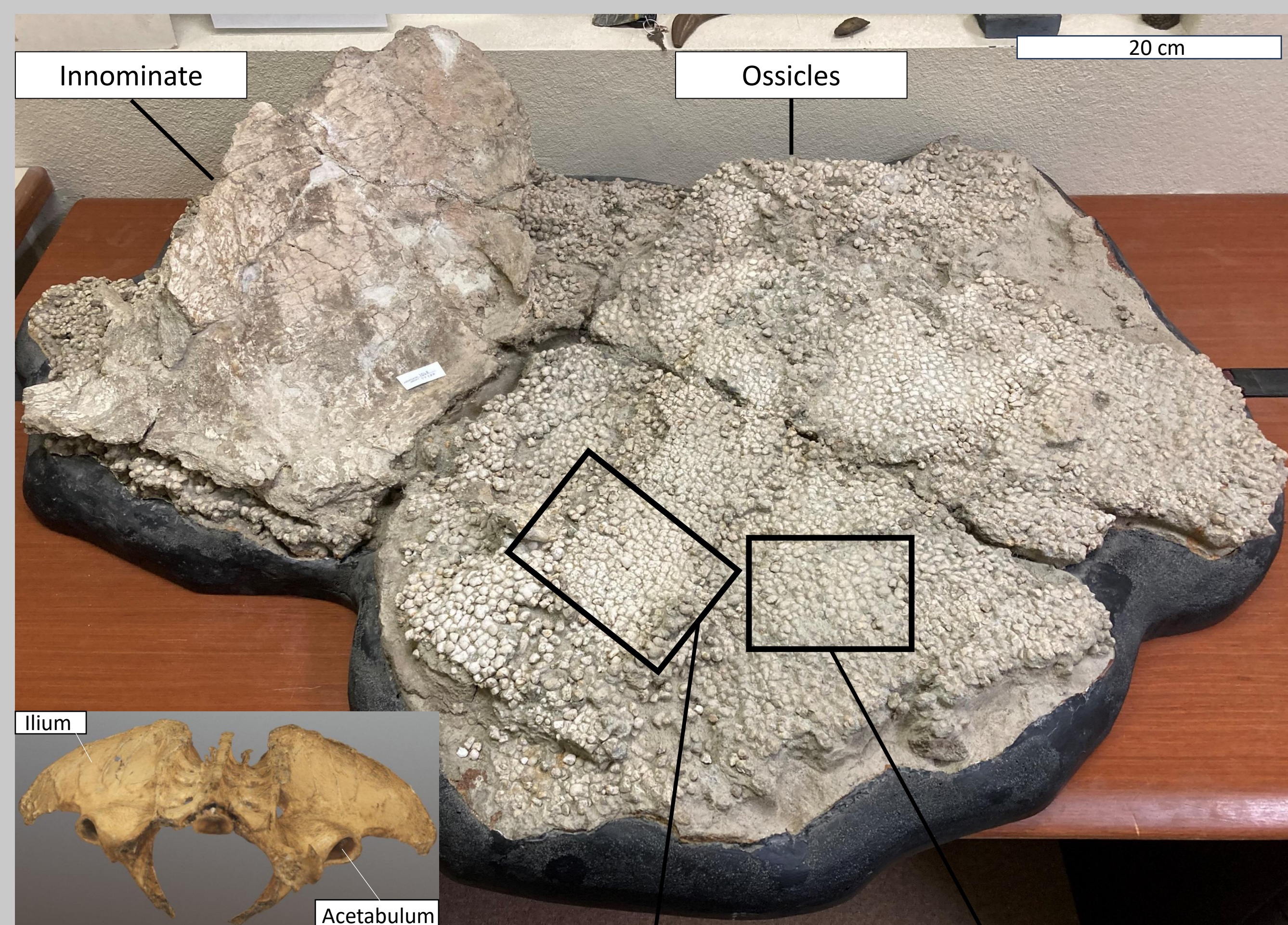
- Ossicles in their original orientation
- A clear link to a portion of the ground sloth's skeleton.

Fossil satisfying conditions currently housed at Anza-Borrego Desert State Park® (ABDSP):

- Partial innominate resting on mat of fossilized dermal ossicles.
- Currently identified as *Paramylodon harlani*.

Purpose of project:

- Utilize 3D modeling, fit ABDSP specimen to full *Paramylodon harlani* skeleton.
- Wrap ossicle bed, simulate life position.
- Observe patterns and their position relative to full skeleton.



Row Patterns



Mosaic Patterns

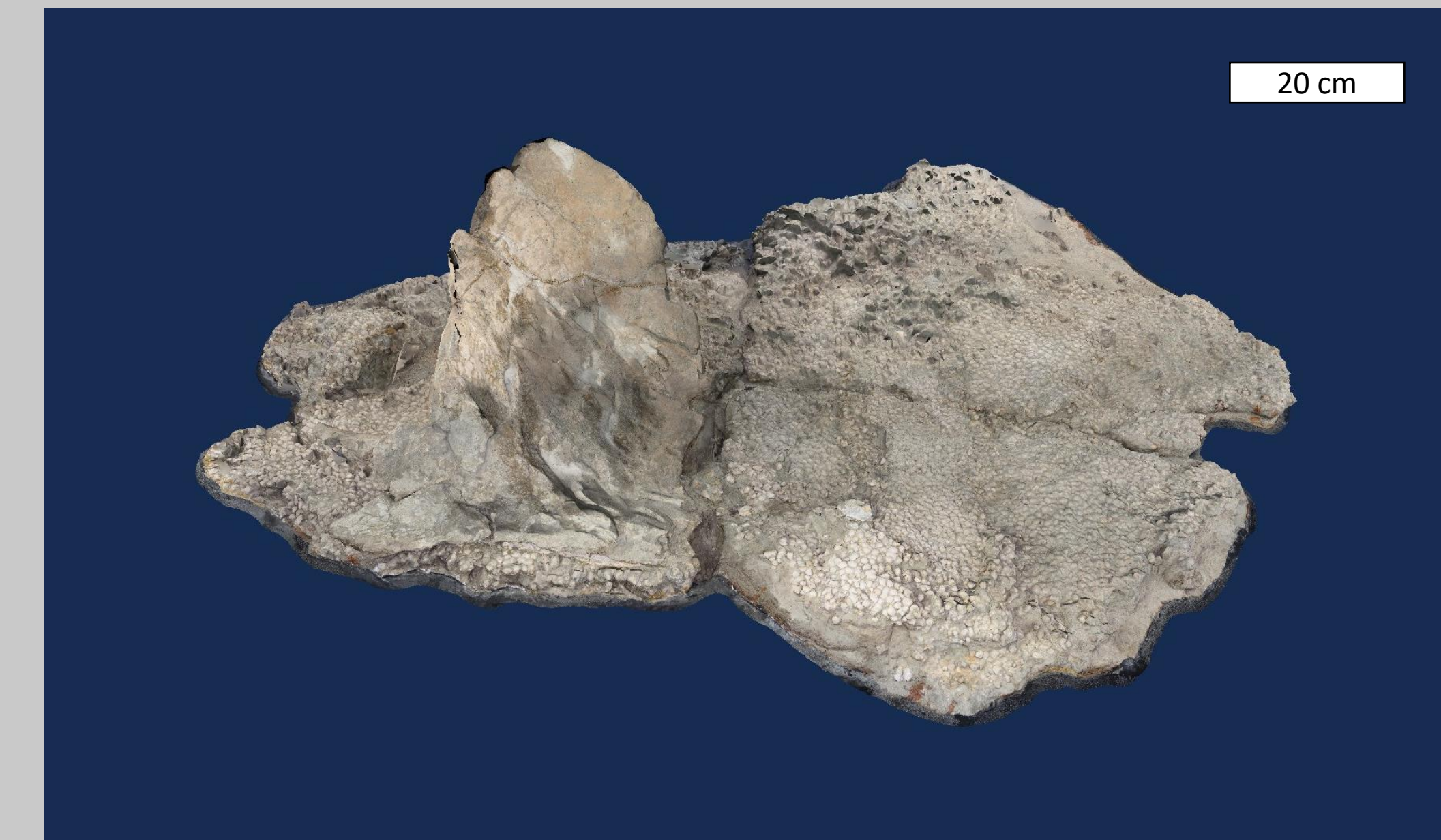
Methods

Step 1: Imaging



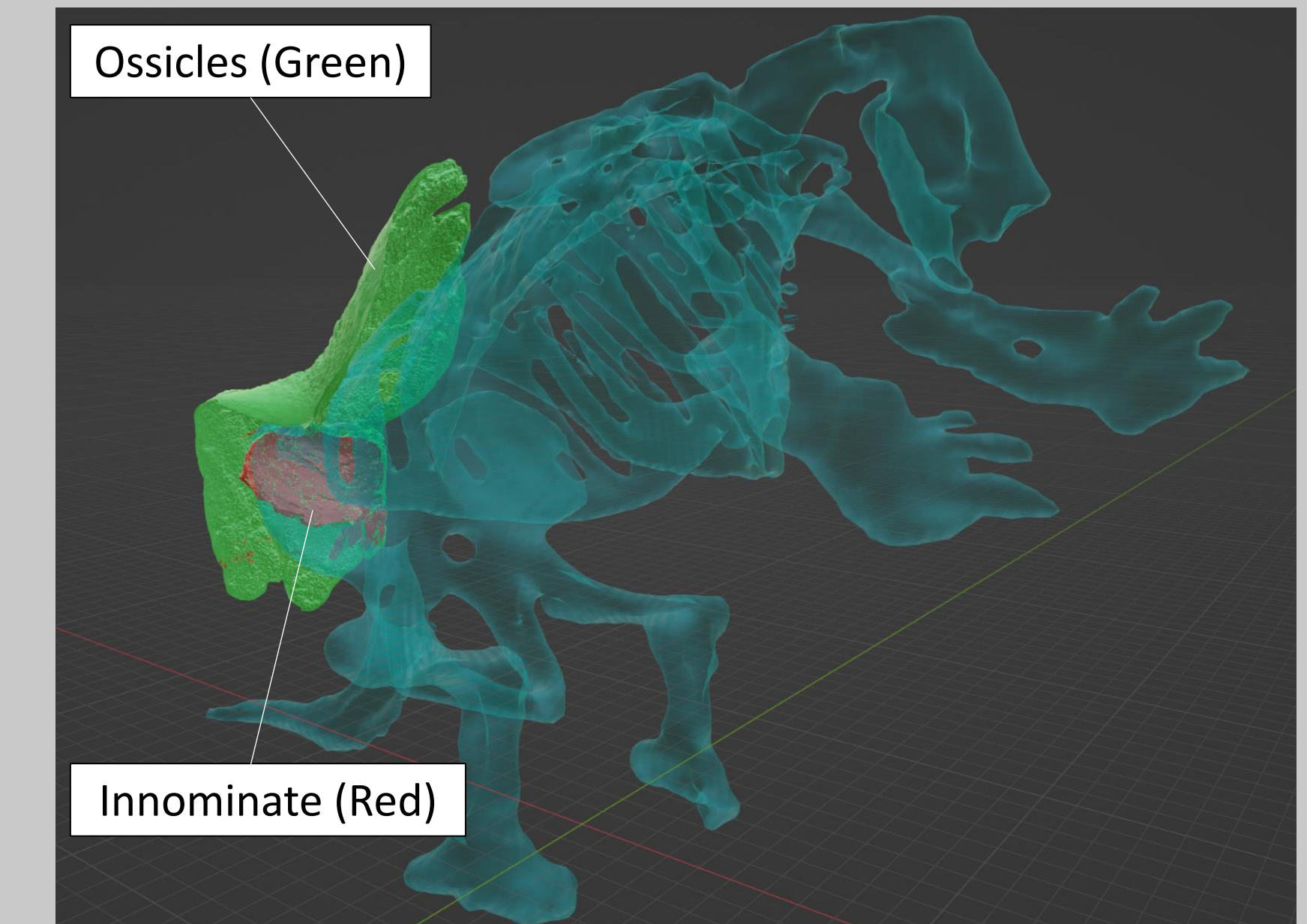
- Pictured: Corey Behringer (left) and John Hess (right) assist with photography.
- 236 photographs of the specimen taken.
- Each image overlaps the previous one by about 1/3 of frame.

Step 2: Modeling



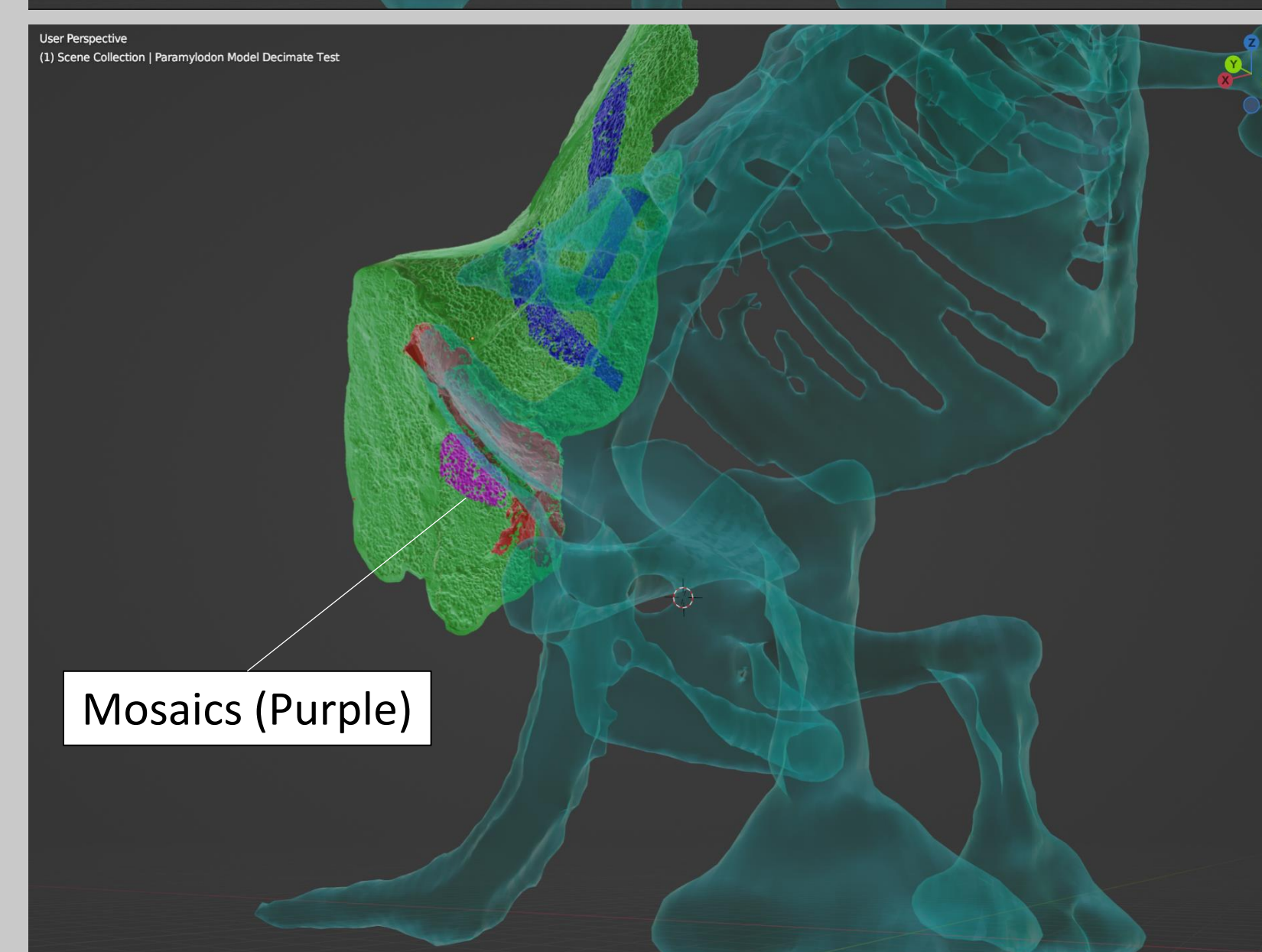
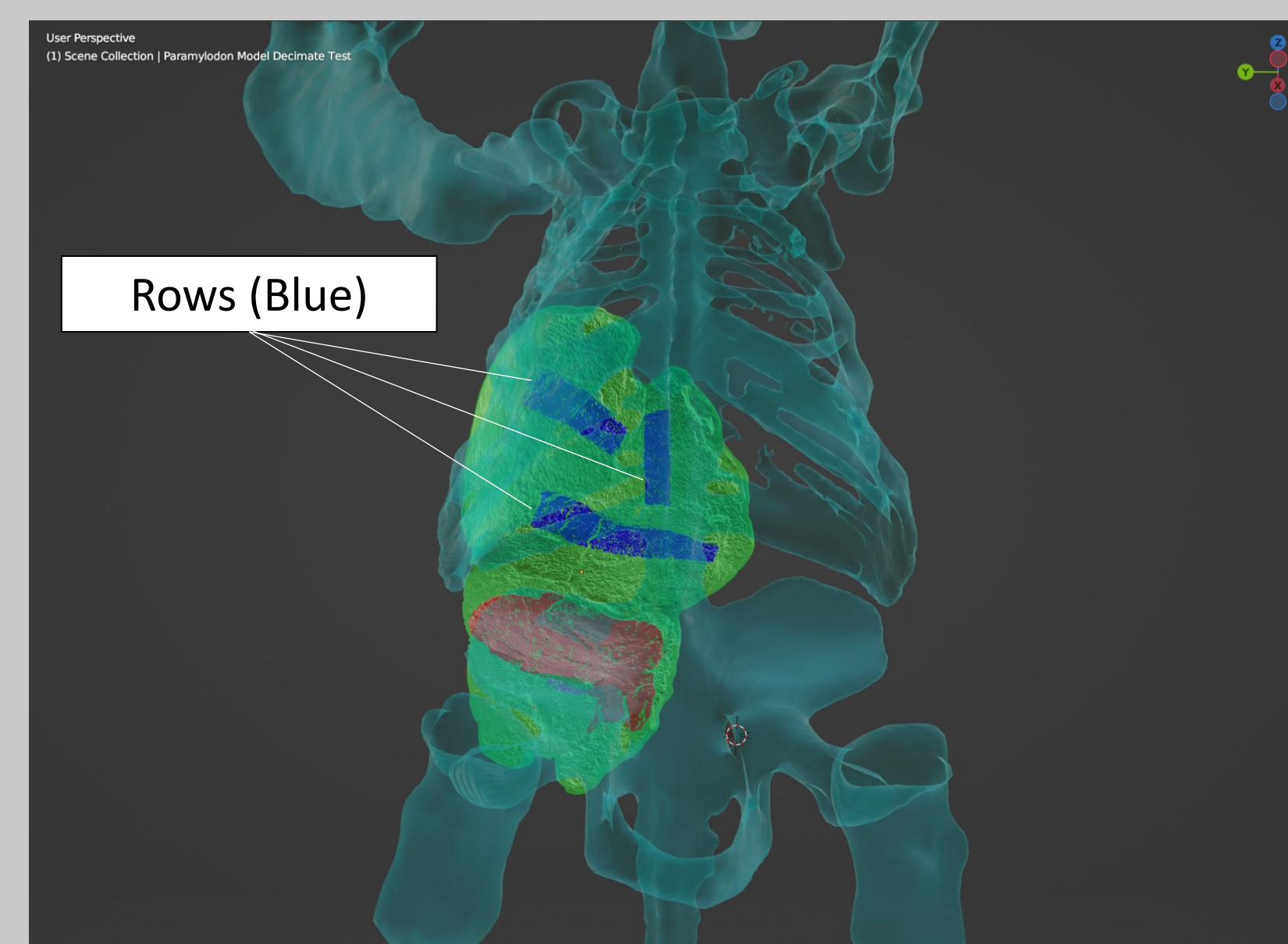
- Photos converted to JPG, uploaded to Agisoft Metashape to create digital 3D model.
- Program uses key points in overlapping images to construct model.
- Model exported as OBJ file.

Step 3: Combining and Analyzing

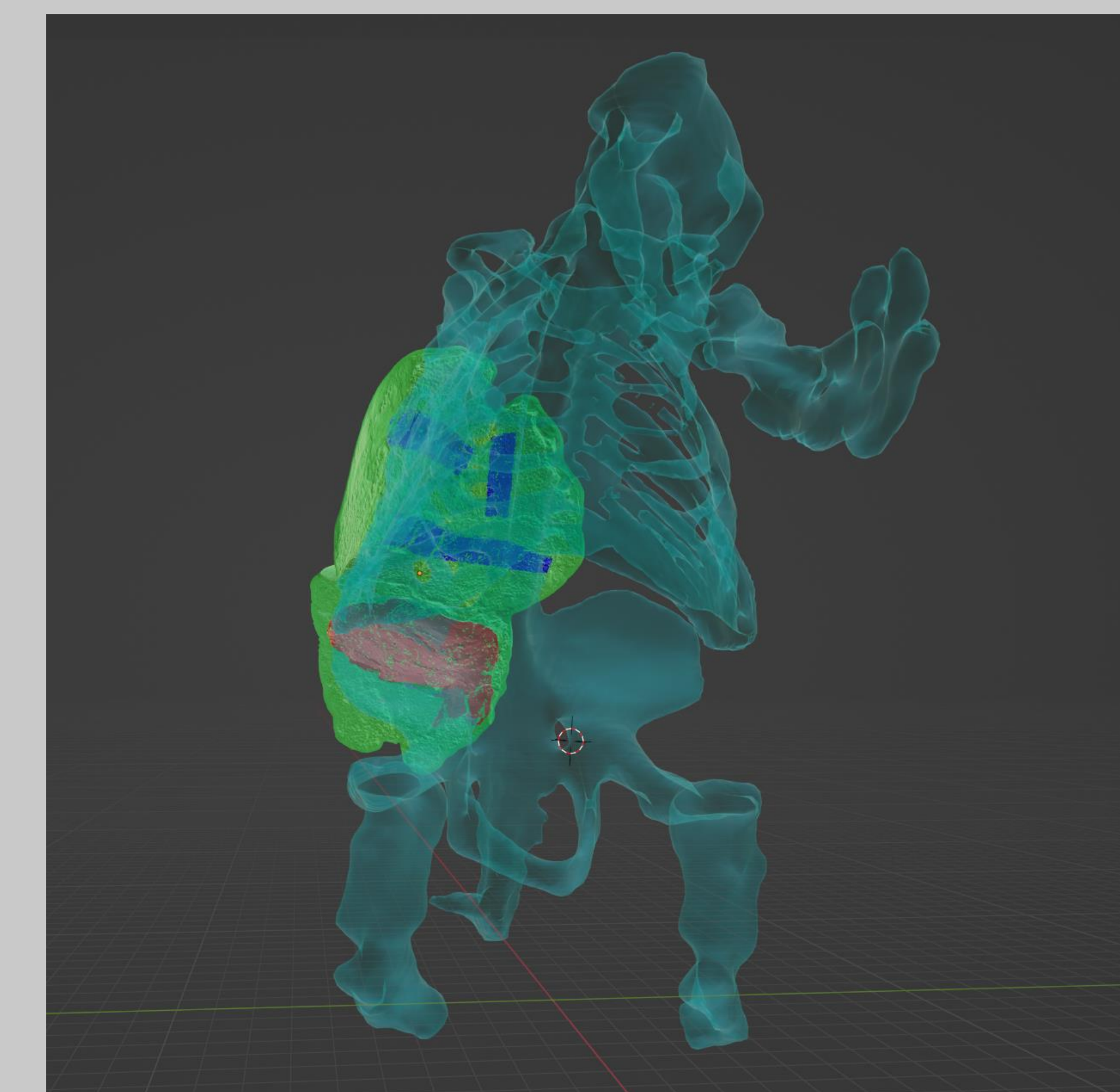


- Specimen model and full skeleton model imported into 3D modeling software Blender.
- Specimen aligned to skeleton using reference points (ilium margin and acetabulum).
- Ossicle bed wrapped to full skeleton using lattice deformation.

Results & Discussion



- Rows formed mostly from ovoid, elongate ossicles.
- Two rows fit loosely with ribs.
- One row fits closely with the spine.
- Mosaics formed mostly of rounder ossicles.
- Ossicles under innominate demonstrate more mosaics.
- Other mosaics scattered throughout ossicle bed.



- Patterns in ossicles do appear more often near pelvis, ribs, and spine.
- Differences could be due to method used to fit ossicles to skeleton (deformation).
- Differences could also be due to postmortem disturbance of ossicles.
- Model could be improved by more advanced use of Blender.

References: Collins, R. Lee. "Mylodont (Ground Sloth) dermal ossicles from Colombia, South America." *Journal of the Washington Academy of Sciences*, vol. 23, no. 9, 15 Sept. 1933, pp. 426–429, <https://www.jstor.org/stable/24530110>.
 Sinclair, William J. "Dermal Bones of Paramylodon from the Asphaltum Deposits of Rancho la Brea, near Los Angeles, California." *Proceedings of the American Philosophical Society*, vol. 49, no. 195, July 1910, pp. 191–195. *JSTOR*, <https://www.jstor.org/stable/983894>.
 Toledo, Néstor, et al. "The dermal armor of mylodontid sloths (mammalia, Xenarthra) from Cueva del Milodón (última Esperanza, Chile)." *Journal of Morphology*, vol. 282, no. 4, 22 Feb. 2021, pp. 612–627, <https://doi.org/10.1002/jmor.21333>.