

Supplementary Information 1

Shiny by Design: Establishing Diagnostic Criteria for Intentional Burnishing on Prehistoric Bone Artifacts

Justyna Orłowska^{1*}, Grzegorz Osipowicz¹, Emanuela Cristiani², Ilga Zagorska³

* Corresponding author: e-mail: justyna.orlowska@umk.pl

¹Institute of Archaeology, Nicolaus Copernicus University, Szosa Bydgoska st. 44/48, 87-100 Toruń, Poland

² DANTE-Diet and Ancient Technology Laboratory, Department of Oral and Maxillo Facial Sciences, Sapienza University of Rome, Rome, Italy

³Institute of Latvian History, University of Latvia, Kalpaka Bulvāris 4, Rīga, LV-1050, Latvia

The PDF file includes:

Table S1. List of the performed experimental works.

Fig. S1. General morphology of traces created on natural bone surfaces after 5 minutes of burnishing using various methods (photo: J. Orłowska). Images acquired with a low-power stereomicroscope at a zoom setting of $\sim 2\times$ (ca. $20\times$ total magnification).

Fig. S2. General morphology of traces created on natural bone surfaces after 5 minutes of burnishing using various methods (photo: J. Orłowska). Images acquired with a low-power stereomicroscope at a zoom setting of $\sim 2\times$ (ca. $20\times$ total magnification).

Fig. S3. General morphology of traces created on scraped bone surfaces after 5 minutes of burnishing using various methods (photo: J. Orłowska). Images acquired with a low-power stereomicroscope at a zoom setting of $\sim 2\times$ (ca. $20\times$ total magnification).

Fig. S4. General morphology of traces created on scraped bone surfaces after 5 minutes of burnishing using various methods (photo: J. Orłowska). Images acquired with a low-power stereomicroscope at a zoom setting of $\sim 2\times$ (ca. $20\times$ total magnification).

Fig. S5. General morphology of burnishing traces on natural bone surfaces after 5 minutes of burnishing using different materials (photo: J. Orłowska). Microphotographs a–c, g–i and m–o ($10\times$ objective; ca. $100\times$ total magnification) and d–f, j–l and p–s ($20\times$ objective; ca. $200\times$) were acquired using reflected light.

Fig. S6. General morphology of burnishing traces on natural bone surfaces after 5 minutes of burnishing using different materials (photo: J. Orłowska). Microphotographs a–c, g–i and m–o ($10\times$ objective; ca. $100\times$ total magnification) and d–f, j–l and p–s ($20\times$ objective; ca. $200\times$) were acquired using reflected light.

Fig. S7. General morphology of burnishing traces on natural bone surfaces after 5 minutes of burnishing using different materials (photo: J. Orłowska). Microphotographs a–c, g–i and m–o ($10\times$ objective; ca. $100\times$ total magnification) and d–f, j–l and p–s ($20\times$ objective; ca. $200\times$) were acquired using reflected light.

Fig. S8. General morphology of burnishing traces on scraped bone surfaces after 5 minutes of burnishing using different materials (photo: J. Orłowska). Microphotographs a–c, g–i and m–o ($10\times$ objective; ca. $100\times$ total magnification) and d–f, j–l and p–s ($20\times$ objective; ca. $200\times$) were acquired using reflected light.

Fig. S9. General morphology of burnishing traces on scraped bone surfaces after 5 minutes of burnishing using different materials (photo: J. Orłowska). Microphotographs a–c, g–i and m–o ($10\times$ objective; ca. $100\times$ total magnification) and d–f, j–l and p–s ($20\times$ objective; ca. $200\times$) were acquired using reflected light.

Fig. S10. General morphology of burnishing traces on scraped bone surfaces after 5 minutes of burnishing using different materials (photo: J. Orłowska). Microphotographs a–c, g–i and m–o (10× objective; ca. 100× total magnification) and d–f, j–l and p–s (20× objective; ca. 200×) were acquired using reflected light.

Fig. S11. General morphology of traces created on natural bone surfaces after 10 minutes of burnishing using various methods (photo: J. Orłowska). Images acquired with a low-power stereomicroscope at a zoom setting of ~2× (ca. 20× total magnification).

Fig. S12. General morphology of traces created on natural bone surfaces after 10 minutes of burnishing using various methods (photo: J. Orłowska). Images acquired with a low-power stereomicroscope at a zoom setting of ~2× (ca. 20× total magnification).

Fig. S13. General morphology of traces created on scraped bone surfaces after 10 minutes of burnishing using various methods (photo: J. Orłowska). Images acquired with a low-power stereomicroscope at a zoom setting of ~2× (ca. 20× total magnification).

Fig. S14. General morphology of traces created on scraped bone surfaces after 10 minutes of burnishing using various methods (photo: J. Orłowska). Images acquired with a low-power stereomicroscope at a zoom setting of ~2× (ca. 20× total magnification).

Fig. S15. General morphology of burnishing traces on natural bone surfaces after 10 minutes of burnishing using different materials (photo: J. Orłowska). Microphotographs a–c, g–i and m–o (10× objective; ca. 100× total magnification) and d–f, j–l and p–s (20× objective; ca. 200×) were acquired using reflected light.

Fig. S16. General morphology of burnishing traces on natural bone surfaces after 10 minutes of burnishing using different materials (photo: J. Orłowska). Microphotographs a–c, g–i and m–o (10× objective; ca. 100× total magnification) and d–f, j–l and p–s (20× objective; ca. 200×) were acquired using reflected light.

Fig. S17. General morphology of burnishing traces on natural bone surfaces after 10 minutes of burnishing using different materials (photo: J. Orłowska). Microphotographs a–c, g–i and m–o (10× objective; ca. 100× total magnification) and d–f, j–l and p–s (20× objective; ca. 200×) were acquired using reflected light.

Fig. S18. General morphology of burnishing traces on scraped bone surfaces after 10 minutes of burnishing using different materials (photo: J. Orłowska). Microphotographs a–c, g–i and m–o (10× objective; ca. 100× total magnification) and d–f, j–l and p–s (20× objective; ca. 200×) were acquired using reflected light.

Fig. S19. General morphology of burnishing traces on scraped bone surfaces after 10 minutes of burnishing using different materials (photo: J. Orłowska). Microphotographs a–c, g–i and m–o (10× objective; ca. 100× total magnification) and d–f, j–l and p–s (20× objective; ca. 200×) were acquired using reflected light.

Fig. S20. General morphology of burnishing traces on scraped bone surfaces after 10 minutes of burnishing using different materials (photo: J. Orłowska). Microphotographs a–c, g–i and m–o (10× objective; ca. 100× total magnification) and d–f, j–l and p–s (20× objective; ca. 200×) were acquired using reflected light.

Table S1. List of the performed experimental works.

Method of burnishing	State of the bone	No. of experimental group	State of bone surface	Work time	Number of samples
Method 1 — Sheep wool (<i>Ovis aries</i> , Polish Heath breed)	Dry	1.2	Natural	10	2
	Dry	2.2	Scraped	10	2
	Dry	3.2	Natural	5	2
	Dry	4.2	Scraped	5	2
Method 2 — Dry field horsetail (<i>Equisetum arvense</i>) stems	Dry	1.3	Natural	10	2
	Dry	2.3	Scraped	10	2
	Dry	3.3	Natural	5	2
	Dry	4.3	Scraped	5	2
Method 3 — Soft tanned leather	Dry	1.4	Natural	10	2
	Dry	2.4	Scraped	10	2
	Dry	3.4	Natural	5	2
	Dry	4.4	Scraped	5	2
Method 4 — Fine quartz sand spread on dry tanned leather	Dry	1.5	Natural	10	2
	Dry	2.5	Scraped	10	2
	Dry	3.5	Natural	5	2
	Dry	4.5	Scraped	5	2
Method 5 — Coniferous wood ash spread on tanned deerskin	Dry	1.6	Natural	10	2
	Dry	2.6	Scraped	10	2
	Dry	3.6	Natural	5	2
	Dry	4.6	Scraped	5	2
Method 6 — Flint dust spread on tanned deerskin	Dry	1.7	Natural	10	2
	Dry	2.7	Scraped	10	2
	Dry	3.7	Natural	5	2
	Dry	4.7	Scraped	5	2
Method 7 — Cockle shell (<i>Cerastoderma glaucum</i>) placed on a hard surface	Dry	1.8	Natural	10	2
	Dry	2.8	Scraped	10	2
	Dry	3.8	Natural	5	2
	Dry	4.8	Scraped	5	2
Method 8 — Pebble (Natural Pomeranian flint nodule, so-called “swallow-egg” pebble)	Dry	1.9	Natural	10	2
	Dry	2.9	Scraped	10	2
	Dry	3.9	Natural	5	2
	Dry	4.9	Scraped	5	2
Method 9 — Natural white pumice	Dry	1.10	Natural	10	2
	Dry	2.10	Scraped	10	2
	Dry	3.10	Natural	5	2
	Dry	4.10	Scraped	5	2

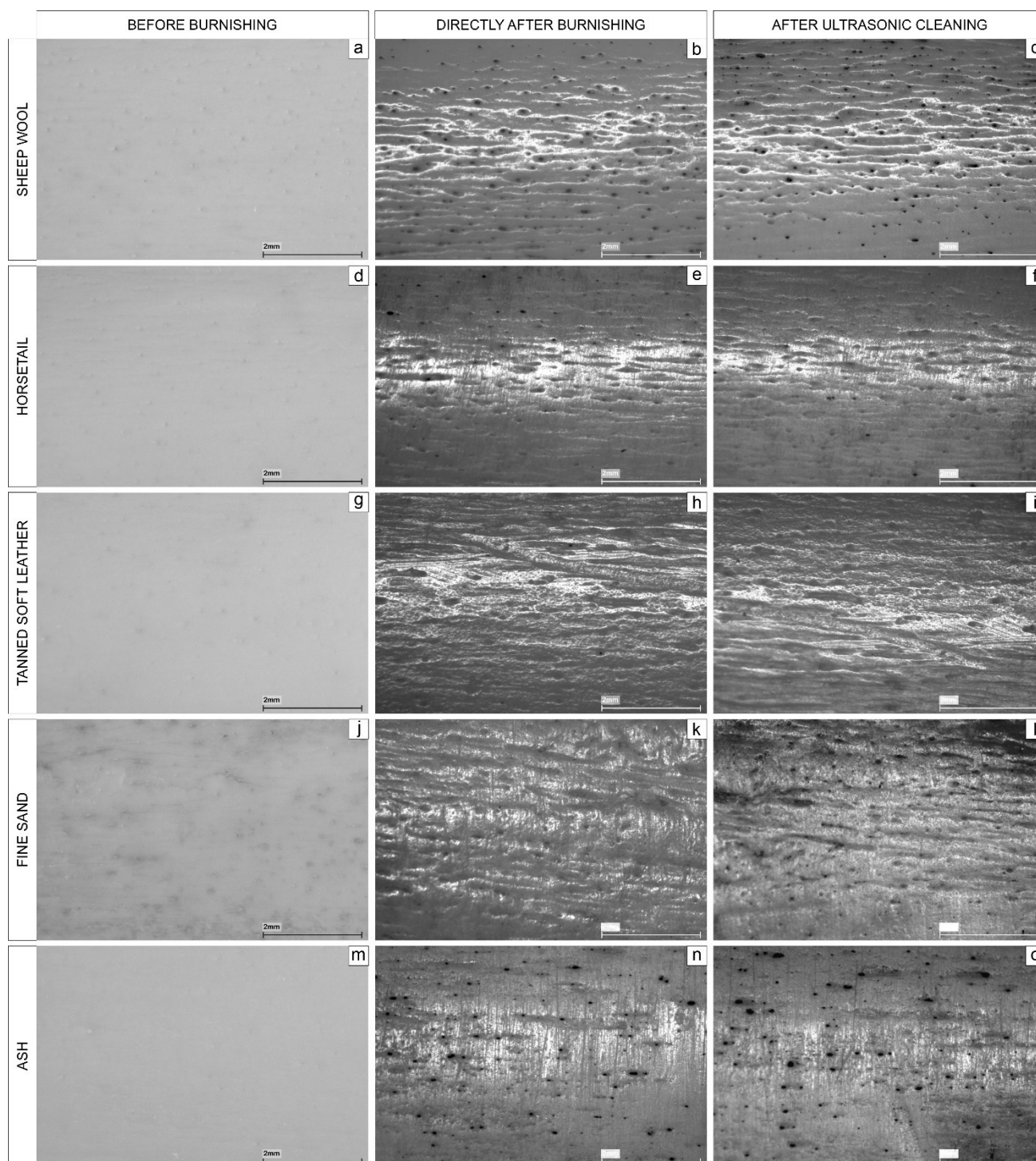


Fig. S1. General morphology of traces created on natural bone surfaces after 5 minutes of burnishing using various methods (photo: J. Orłowska). Images acquired with a low-power stereomicroscope at a zoom setting of $\sim 2\times$ (ca. $20\times$ total magnification).

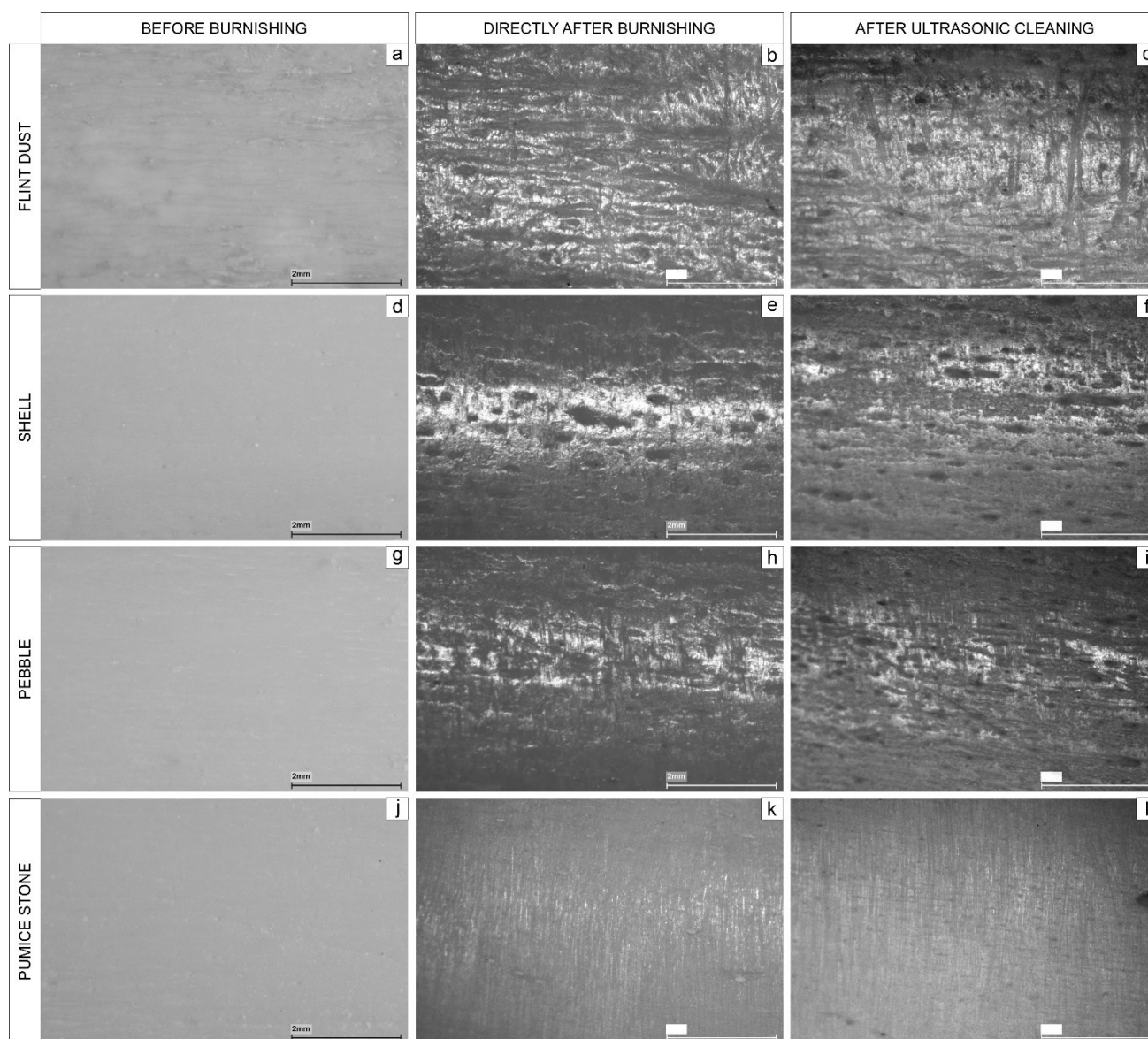


Fig. S2. General morphology of traces created on natural bone surfaces after 5 minutes of burnishing using various methods (photo: J. Orłowska). Images acquired with a low-power stereomicroscope at a zoom setting of $\sim 2\times$ (ca. $20\times$ total magnification).

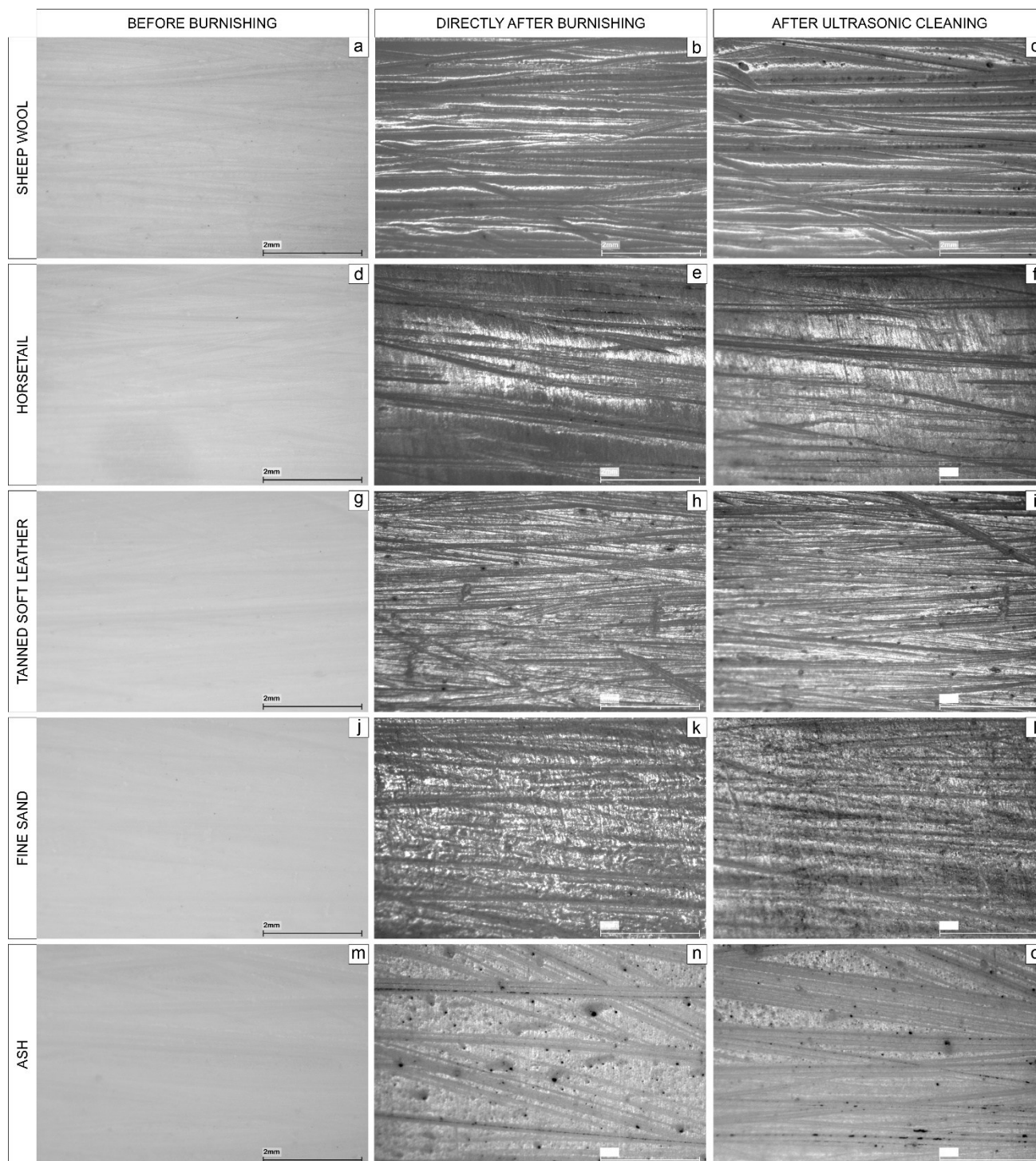


Fig. S3. General morphology of traces created on scraped bone surfaces after 5 minutes of burnishing using various methods (photo: J. Orłowska). Images acquired with a low-power stereomicroscope at a zoom setting of $\sim 2\times$ (ca. $20\times$ total magnification).

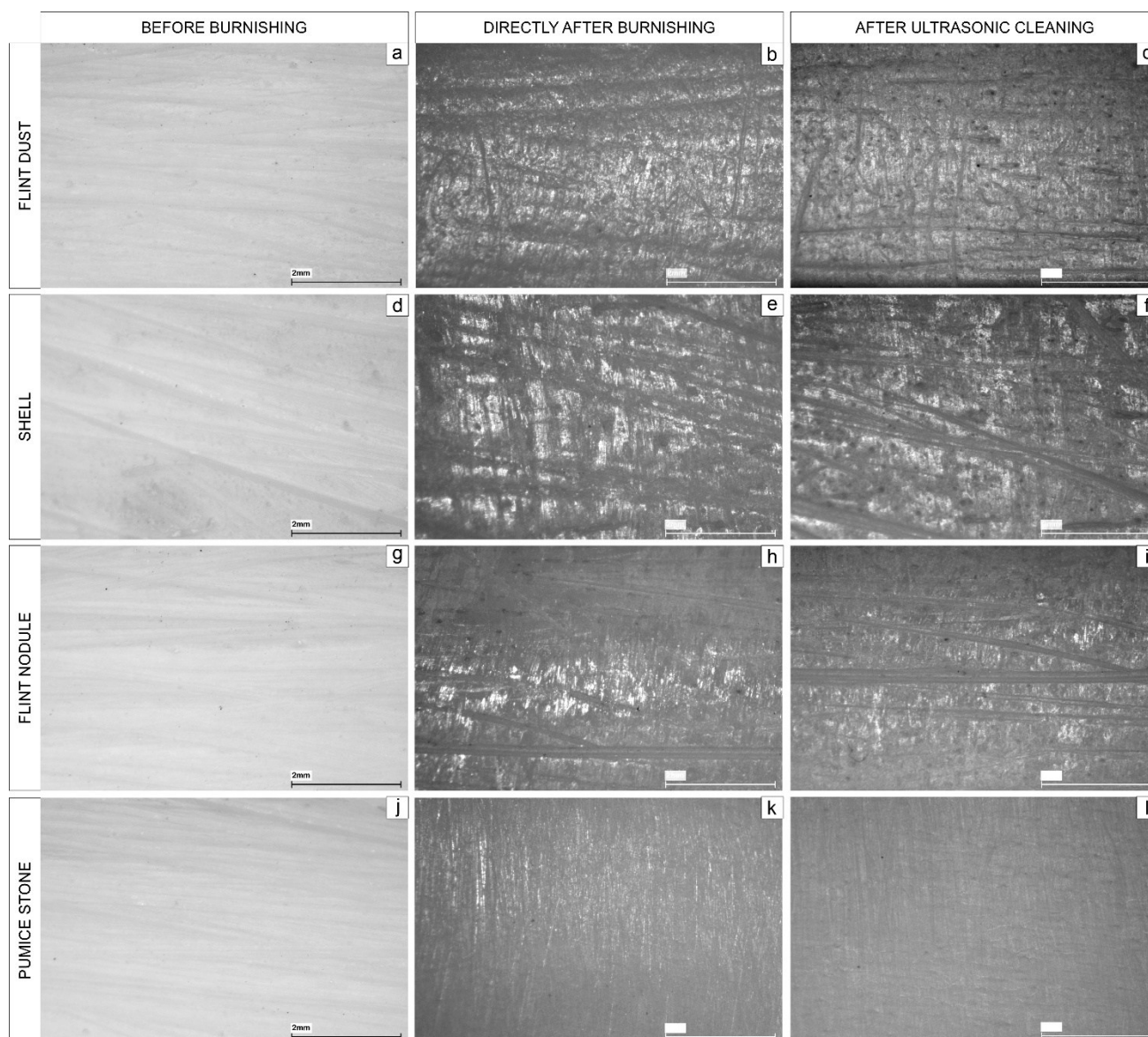


Fig. S4. General morphology of traces created on scraped bone surfaces after 5 minutes of burnishing using various methods (photo: J. Orłowska). Images acquired with a low-power stereomicroscope at a zoom setting of $\sim 2\times$ (ca. $20\times$ total magnification).

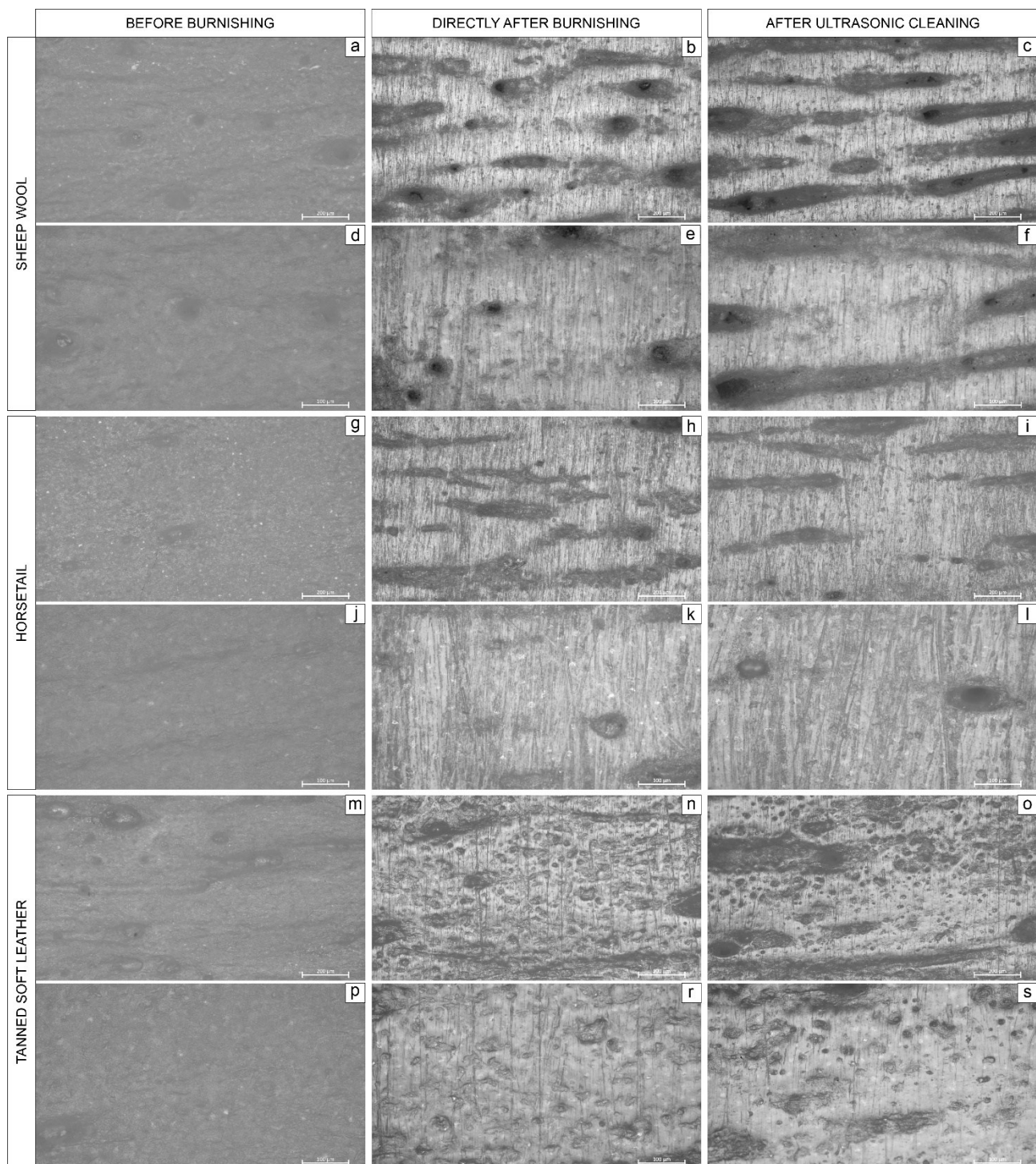


Fig. S5. General morphology of burnishing traces on natural bone surfaces after 5 minutes of burnishing using different materials (photo: J. Orłowska). Microphotographs a–c, g–i and m–o (10× objective; ca. 100× total magnification) and d–f, j–l and p–s (20× objective; ca. 200×) were acquired using reflected light.

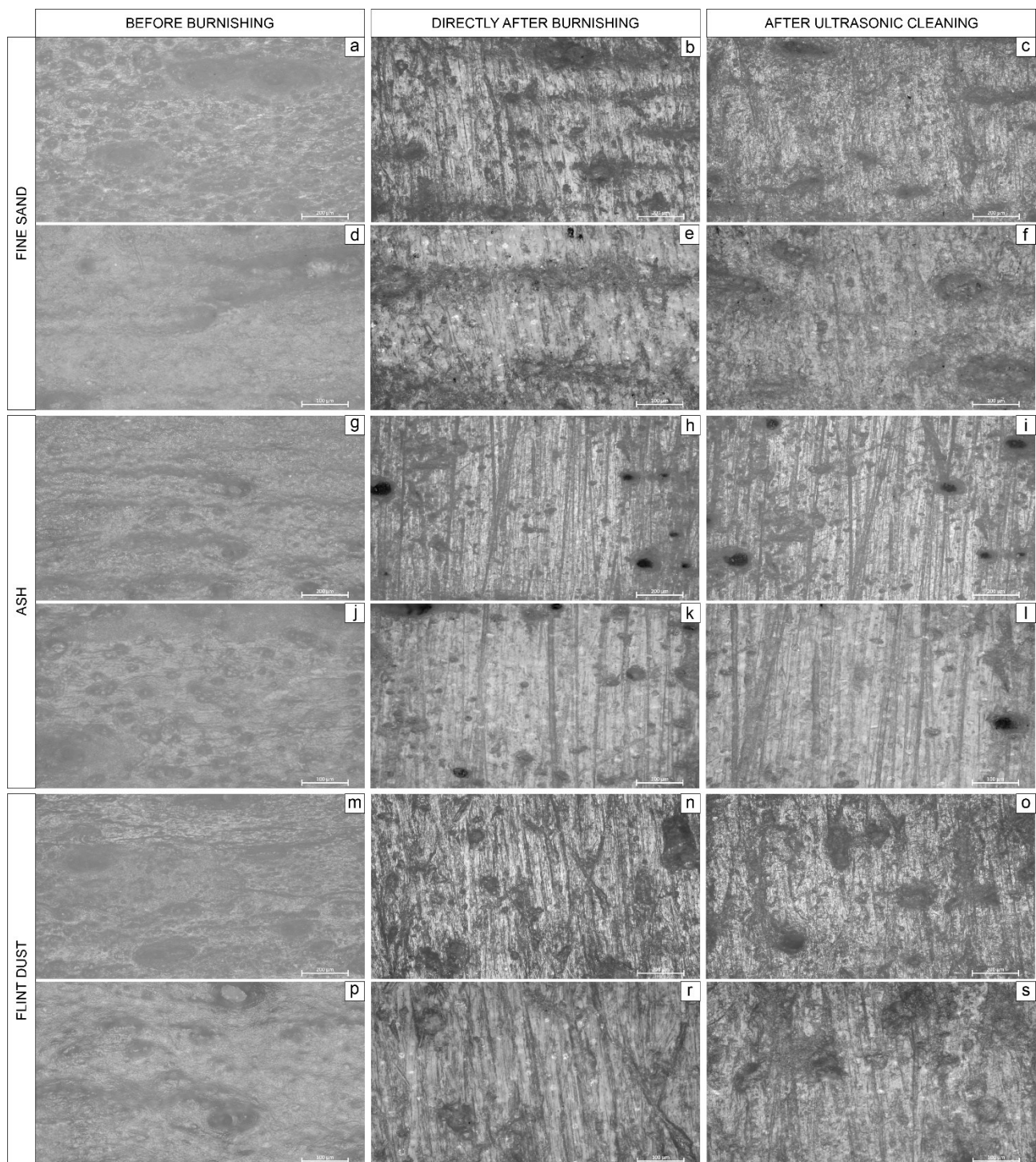


Fig. S6. General morphology of burnishing traces on natural bone surfaces after 5 minutes of burnishing using different materials (photo: J. Orłowska). Microphotographs a–c, g–i and m–o (10× objective; ca. 100× total magnification) and d–f, j–l and p–s (20× objective; ca. 200×) were acquired using reflected light.

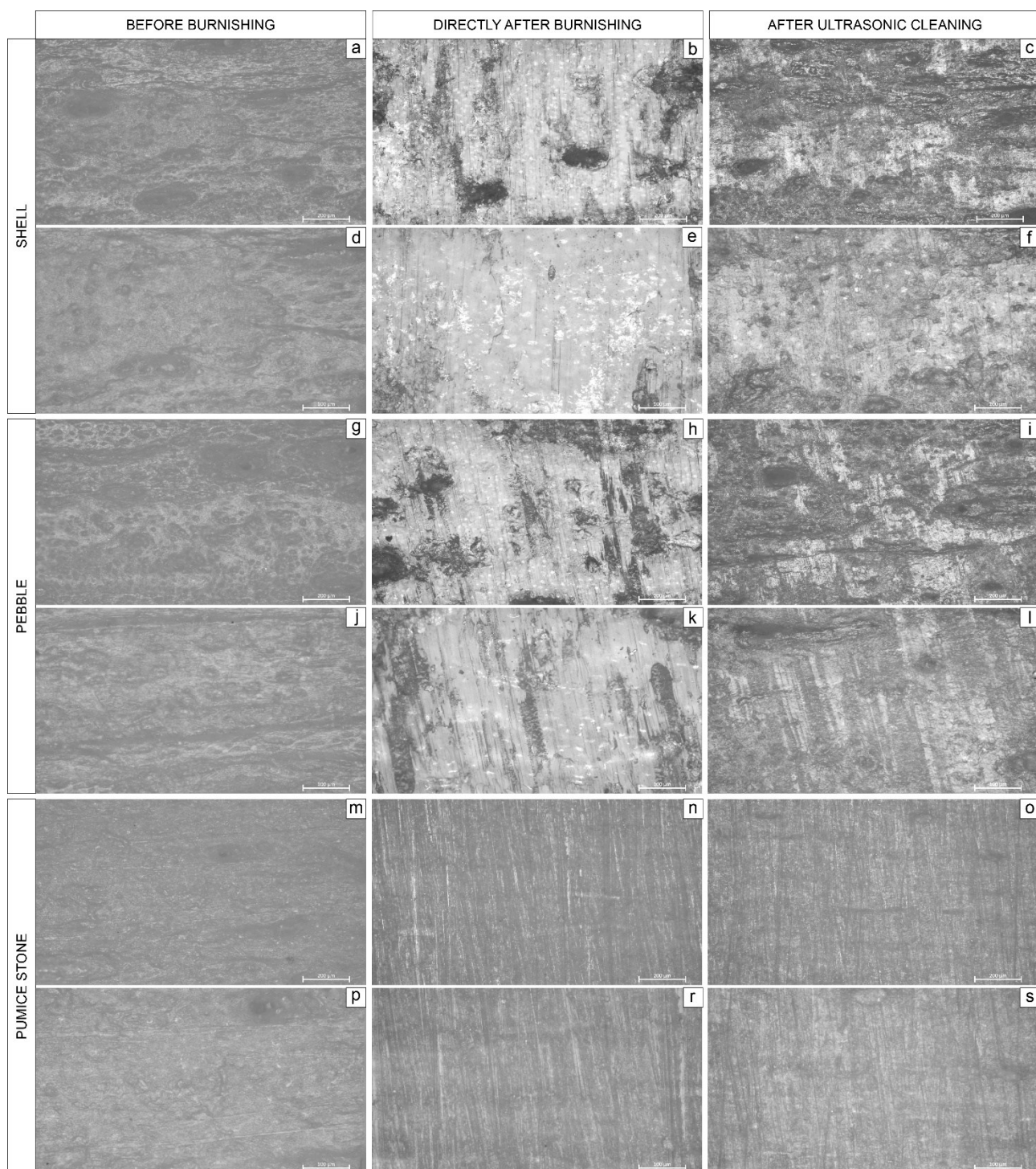


Fig. S7. General morphology of burnishing traces on natural bone surfaces after 5 minutes of burnishing using different materials (photo: J. Orłowska). Microphotographs a–c, g–i and m–o (10× objective; ca. 100× total magnification) and d–f, j–l and p–s (20× objective; ca. 200×) were acquired using reflected light.

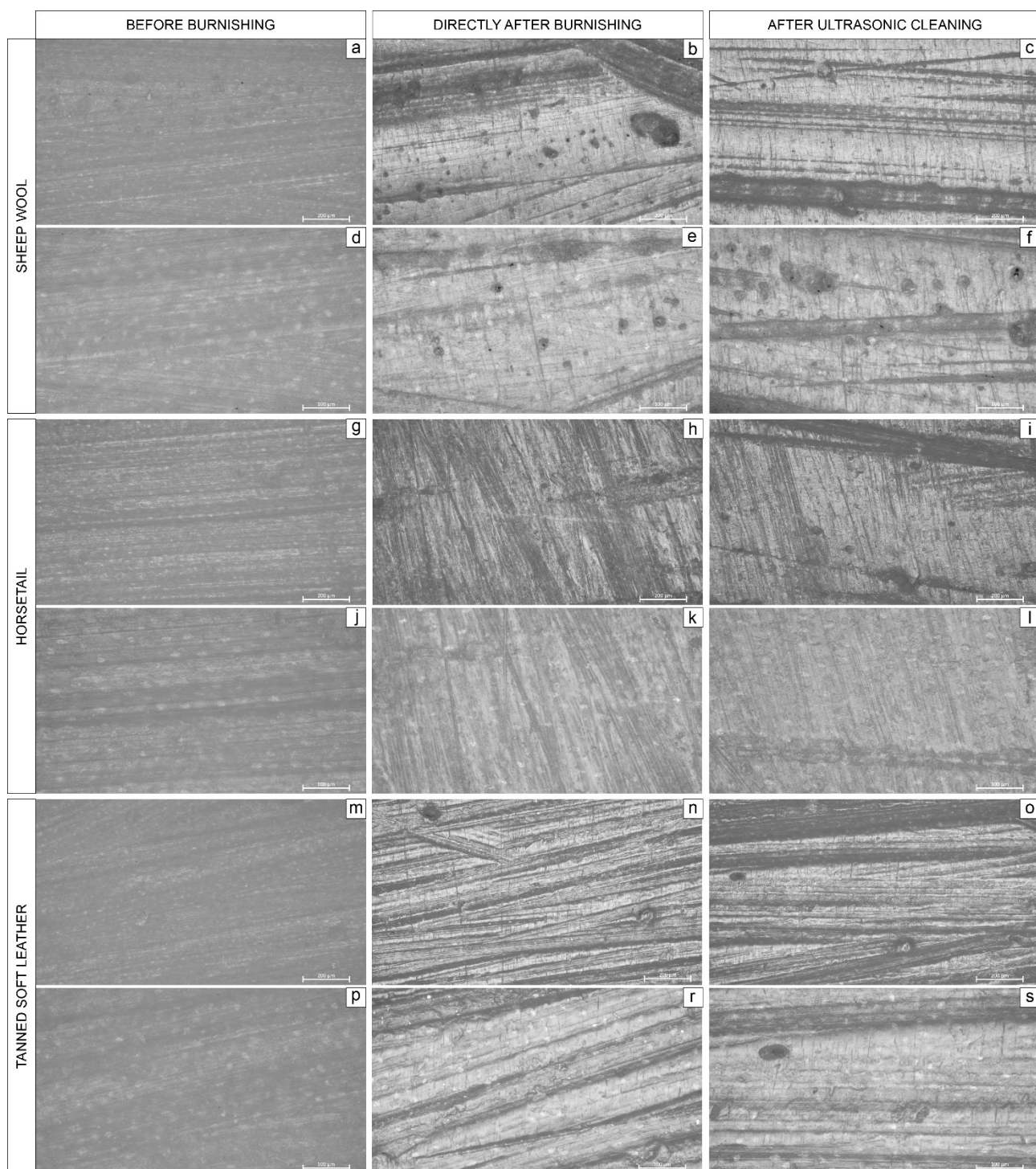


Fig. S8. General morphology of burnishing traces on scraped bone surfaces after 5 minutes of burnishing using different materials (photo: J. Orłowska). Microphotographs a–c, g–i and m–o (10× objective; ca. 100× total magnification) and d–f, j–l and p–s (20× objective; ca. 200×) were acquired using reflected light.

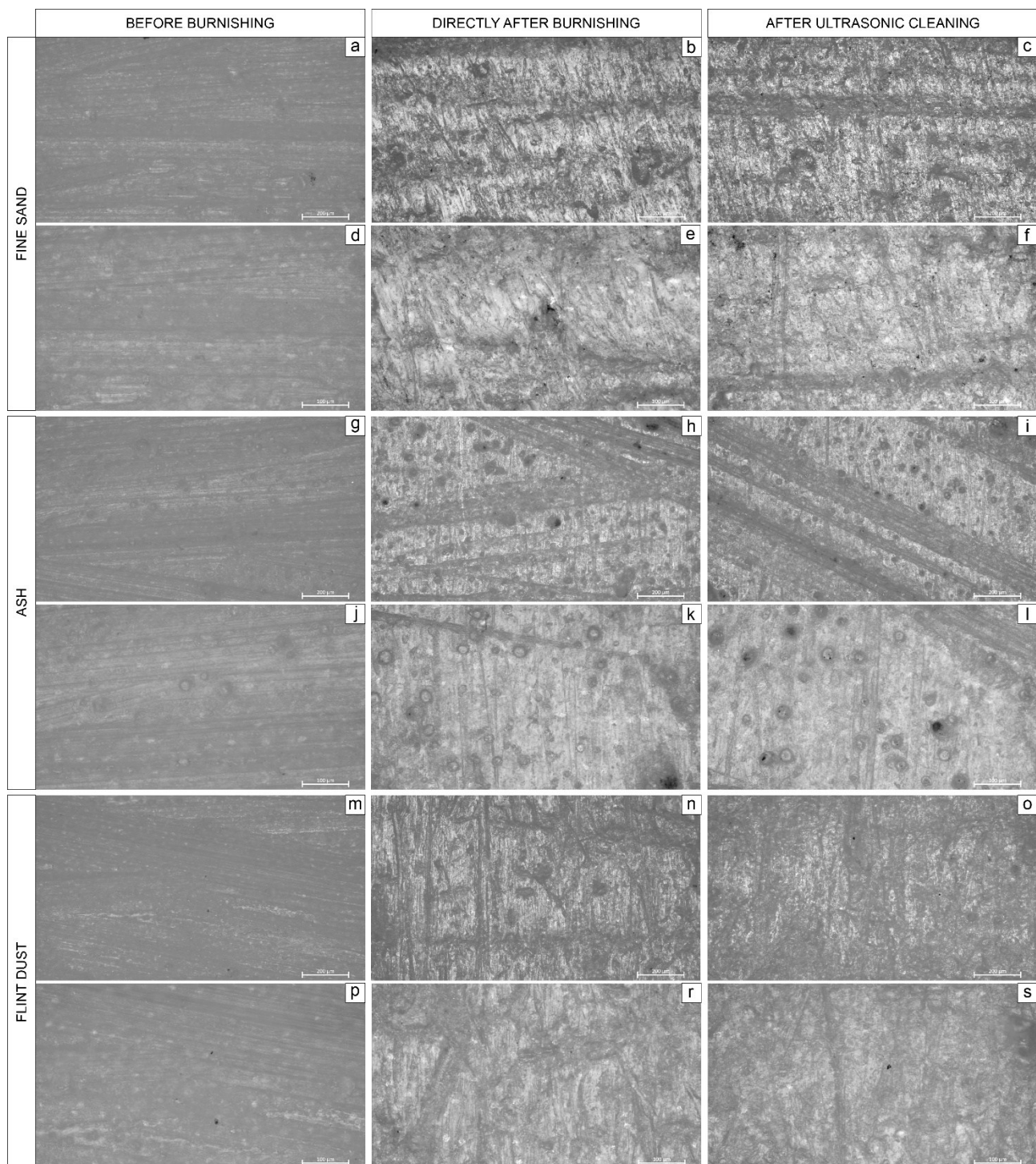


Fig. S9. General morphology of burnishing traces on scraped bone surfaces after 5 minutes of burnishing using different materials (photo: J. Orłowska). Microphotographs a–c, g–i and m–o (10× objective; ca. 100× total magnification) and d–f, j–l and p–s (20× objective; ca. 200×) were acquired using reflected light.

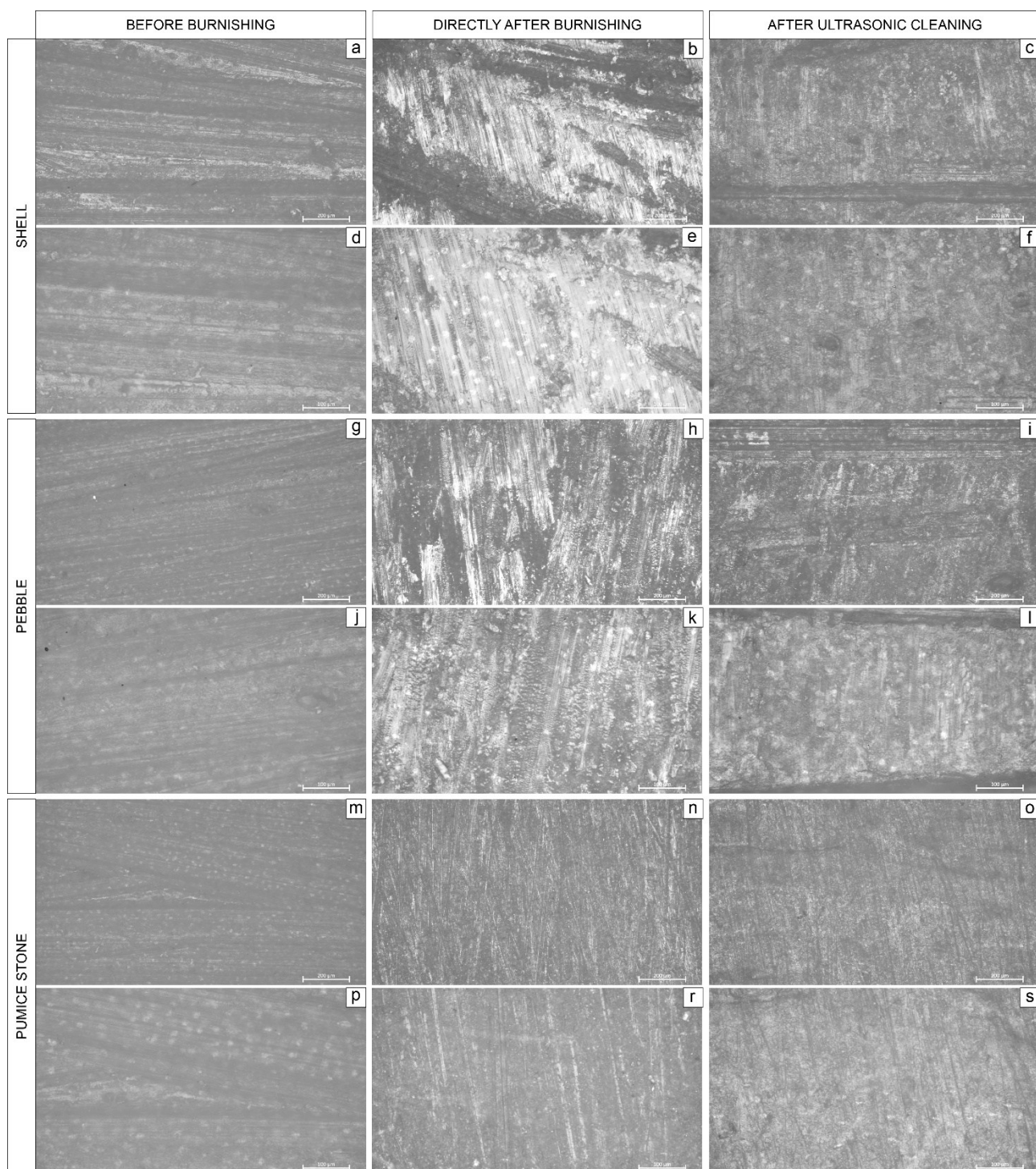


Fig. S10. General morphology of burnishing traces on scraped bone surfaces after 5 minutes of burnishing using different materials (photo: J. Orłowska). Microphotographs a–c, g–i and m–o (10× objective; ca. 100× total magnification) and d–f, j–l and p–s (20× objective; ca. 200×) were acquired using reflected light.

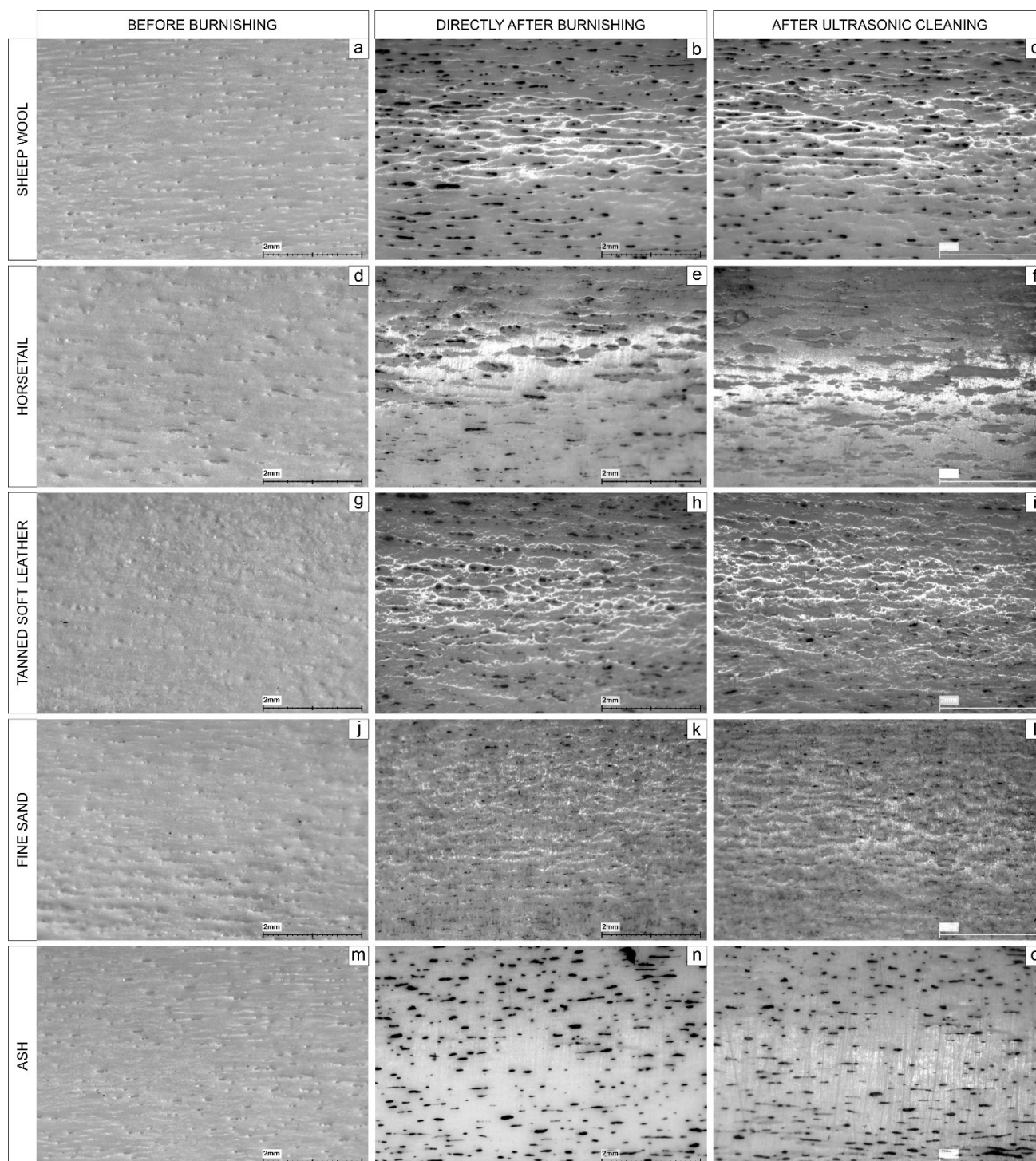


Fig. S11. General morphology of traces created on natural bone surfaces after 10 minutes of burnishing using various methods (photo: J. Orłowska). Images acquired with a low-power stereomicroscope at a zoom setting of $\sim 2\times$ (ca. $20\times$ total magnification).

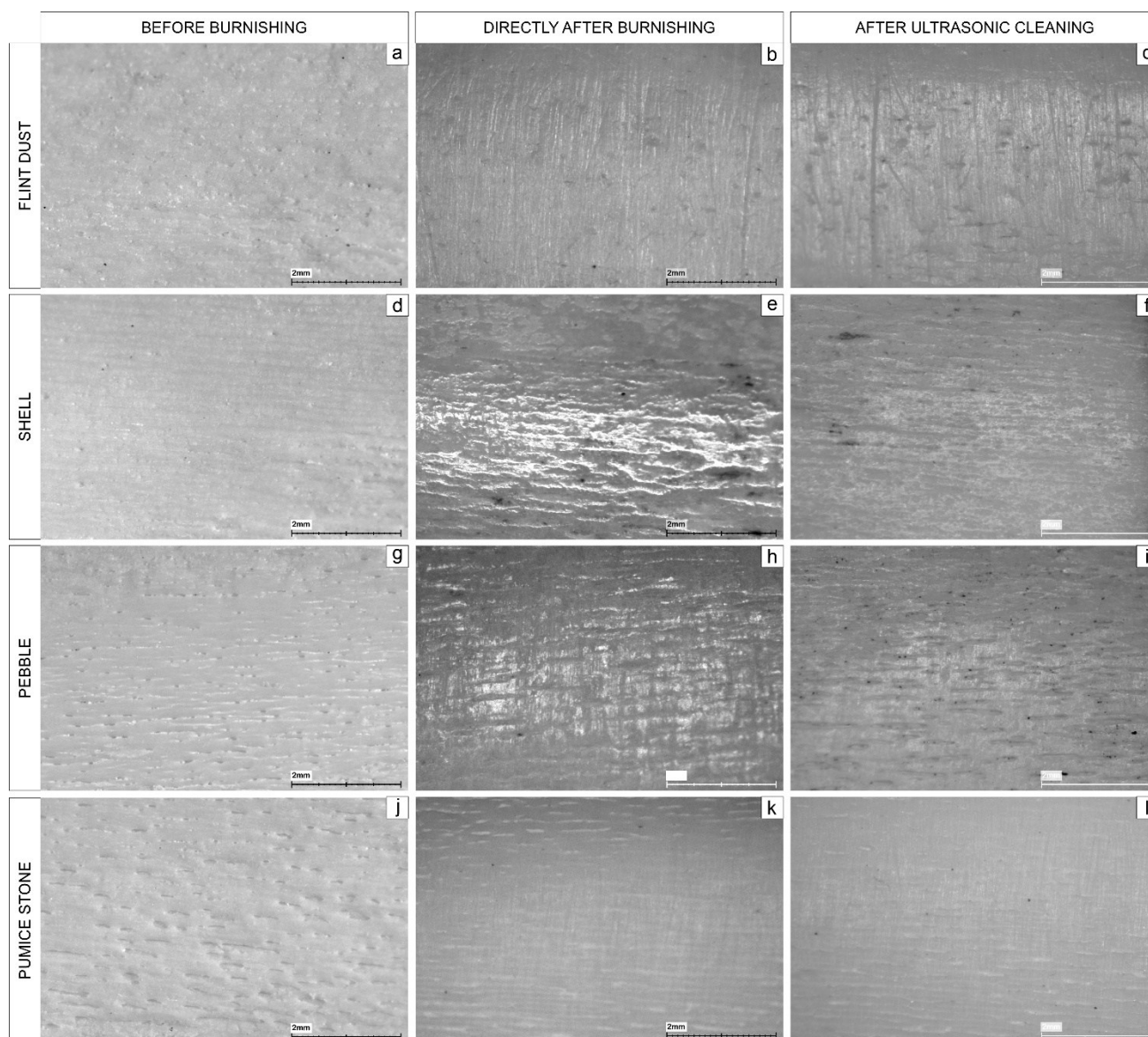


Fig. S12. General morphology of traces created on natural bone surfaces after 10 minutes of burnishing using various methods (photo: J. Orłowska). Images acquired with a low-power stereomicroscope at a zoom setting of $\sim 2\times$ (ca. $20\times$ total magnification).

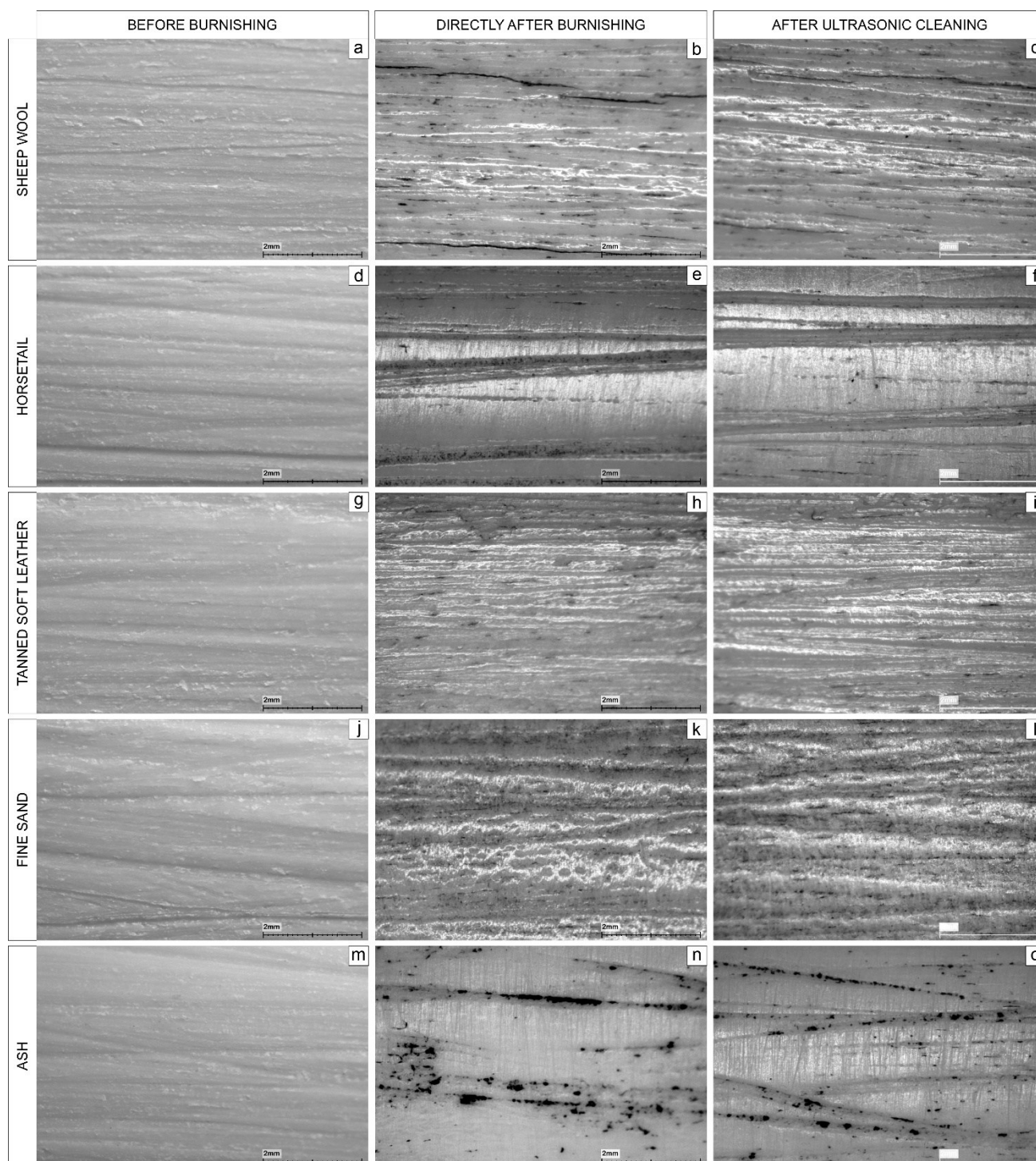


Fig. S13. General morphology of traces created on scraped bone surfaces after 10 minutes of burnishing using various methods (photo: J. Orłowska). Images acquired with a low-power stereomicroscope at a zoom setting of $\sim 2\times$ (ca. $20\times$ total magnification).

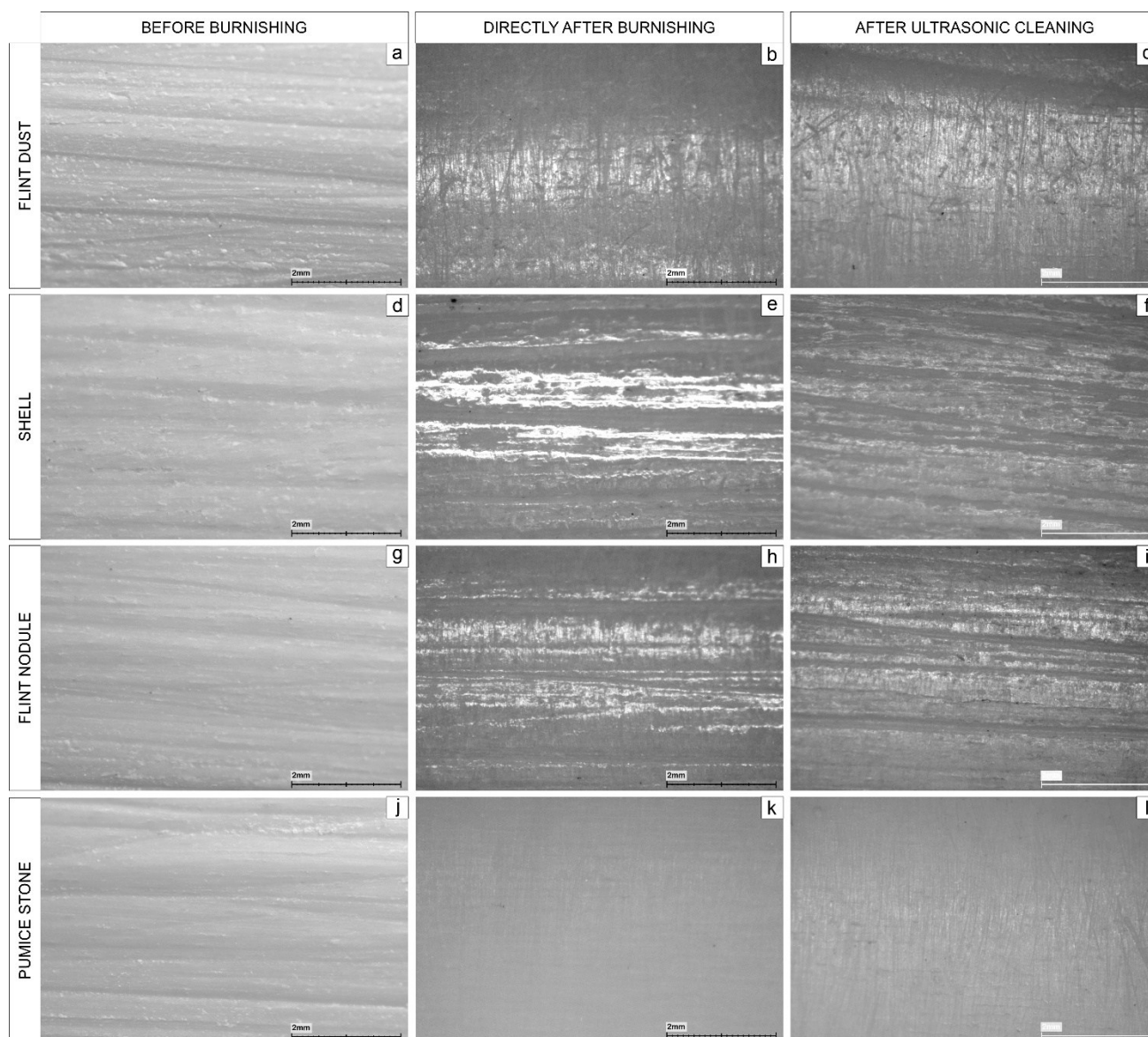


Fig. S14. General morphology of traces created on scraped bone surfaces after 10 minutes of burnishing using various methods (photo: J. Orłowska). Images acquired with a low-power stereomicroscope at a zoom setting of $\sim 2\times$ (ca. $20\times$ total magnification).

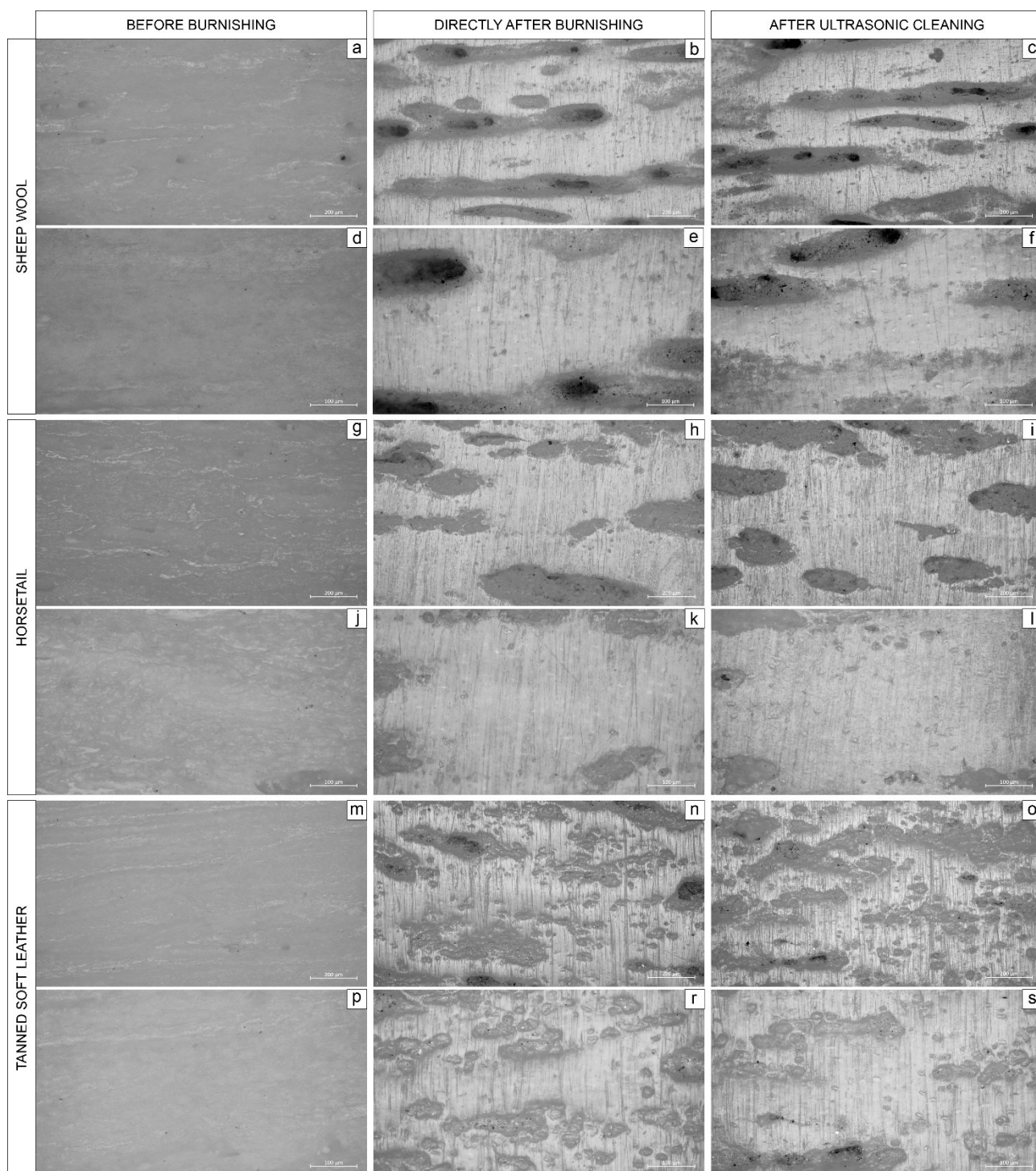


Fig. S15. General morphology of burnishing traces on natural bone surfaces after 10 minutes of burnishing using different materials (photo: J. Orłowska). Microphotographs a–c, g–i and m–o (10× objective; ca. 100× total magnification) and d–f, j–l and p–s (20× objective; ca. 200×) were acquired using reflected light.

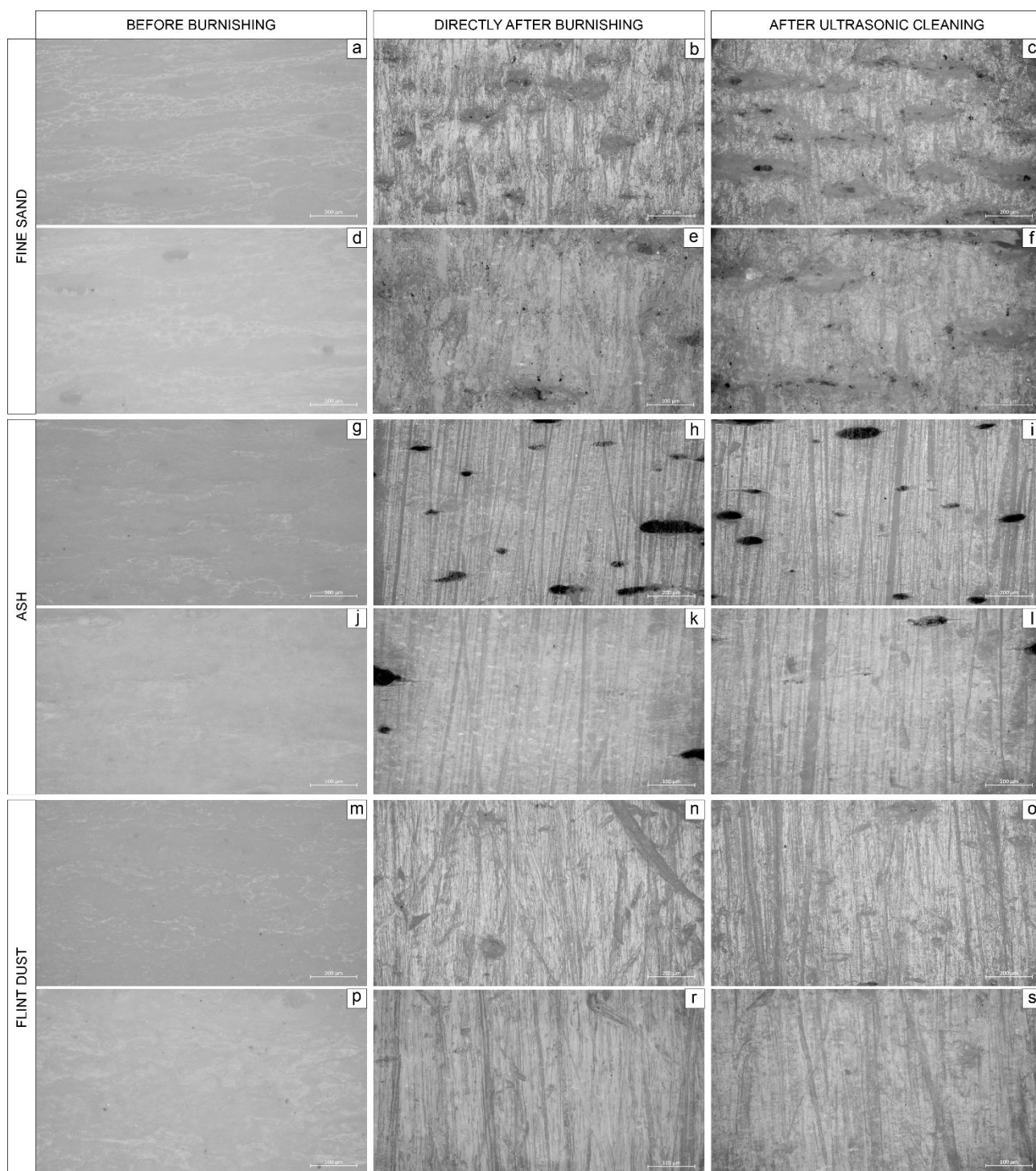


Fig. S16. General morphology of burnishing traces on natural bone surfaces after 10 minutes of burnishing using different materials (photo: J. Orłowska). Microphotographs a–c, g–i and m–o (10× objective; ca. 100× total magnification) and d–f, j–l and p–s (20× objective; ca. 200×) were acquired using reflected light.

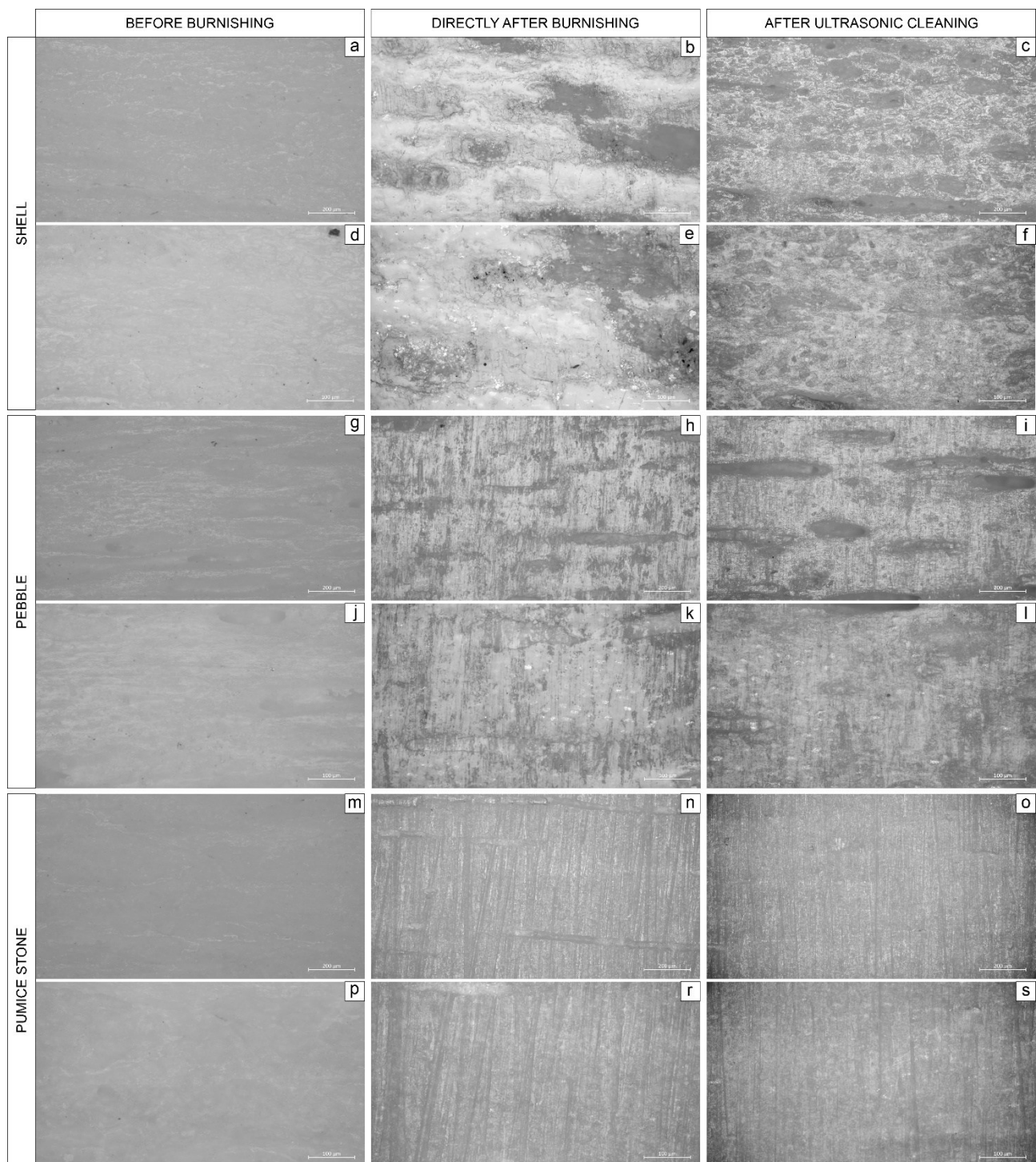


Fig. S17. General morphology of burnishing traces on natural bone surfaces after 10 minutes of burnishing using different materials (photo: J. Orłowska). Microphotographs a–c, g–i and m–o (10× objective; ca. 100× total magnification) and d–f, j–l and p–s (20× objective; ca. 200×) were acquired using reflected light.

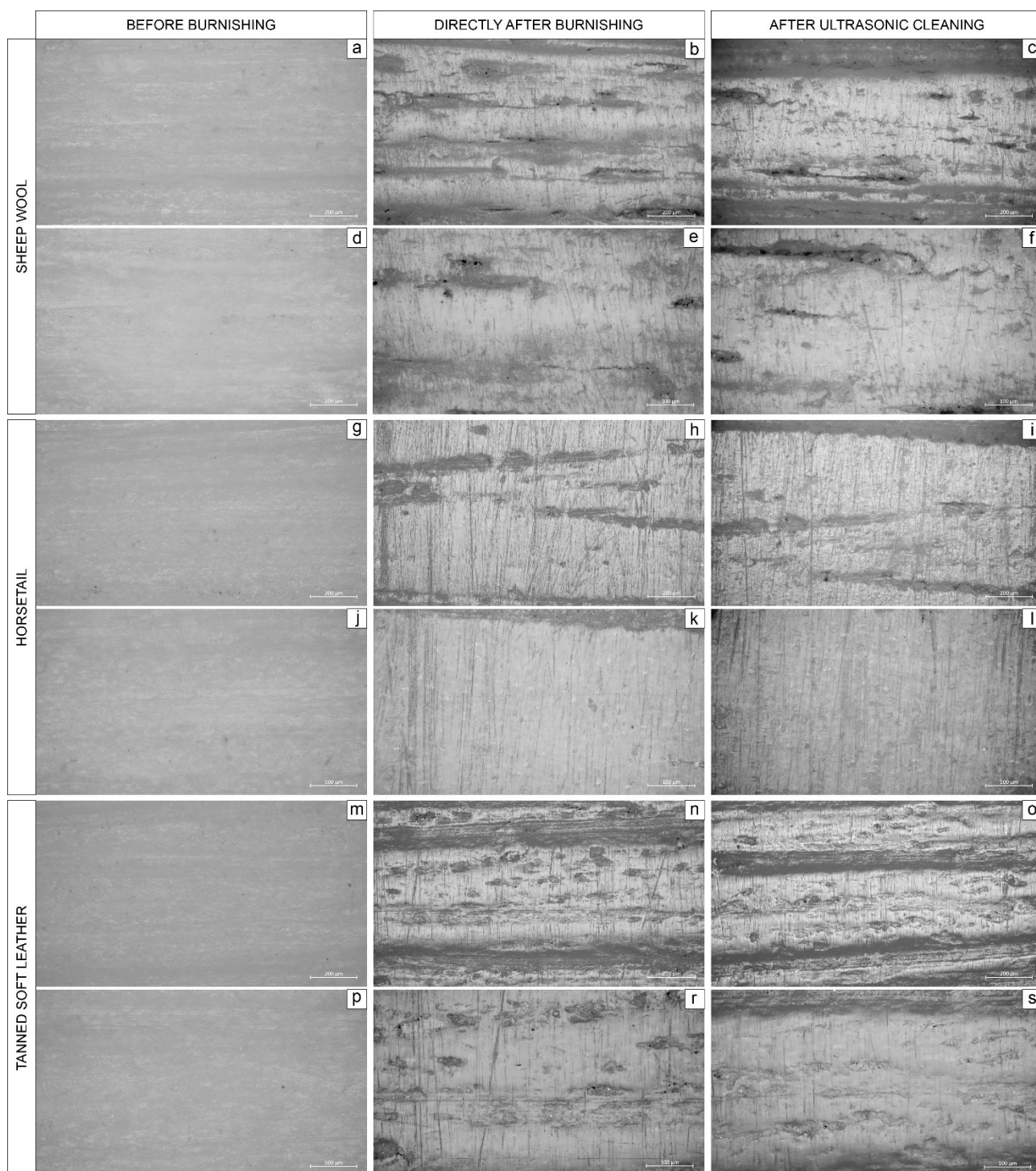


Fig. S18. General morphology of burnishing traces on scraped bone surfaces after 10 minutes of burnishing using different materials (photo: J. Orłowska). Microphotographs a–c, g–i and m–o (10× objective; ca. 100× total magnification) and d–f, j–l and p–s (20× objective; ca. 200×) were acquired using reflected light.

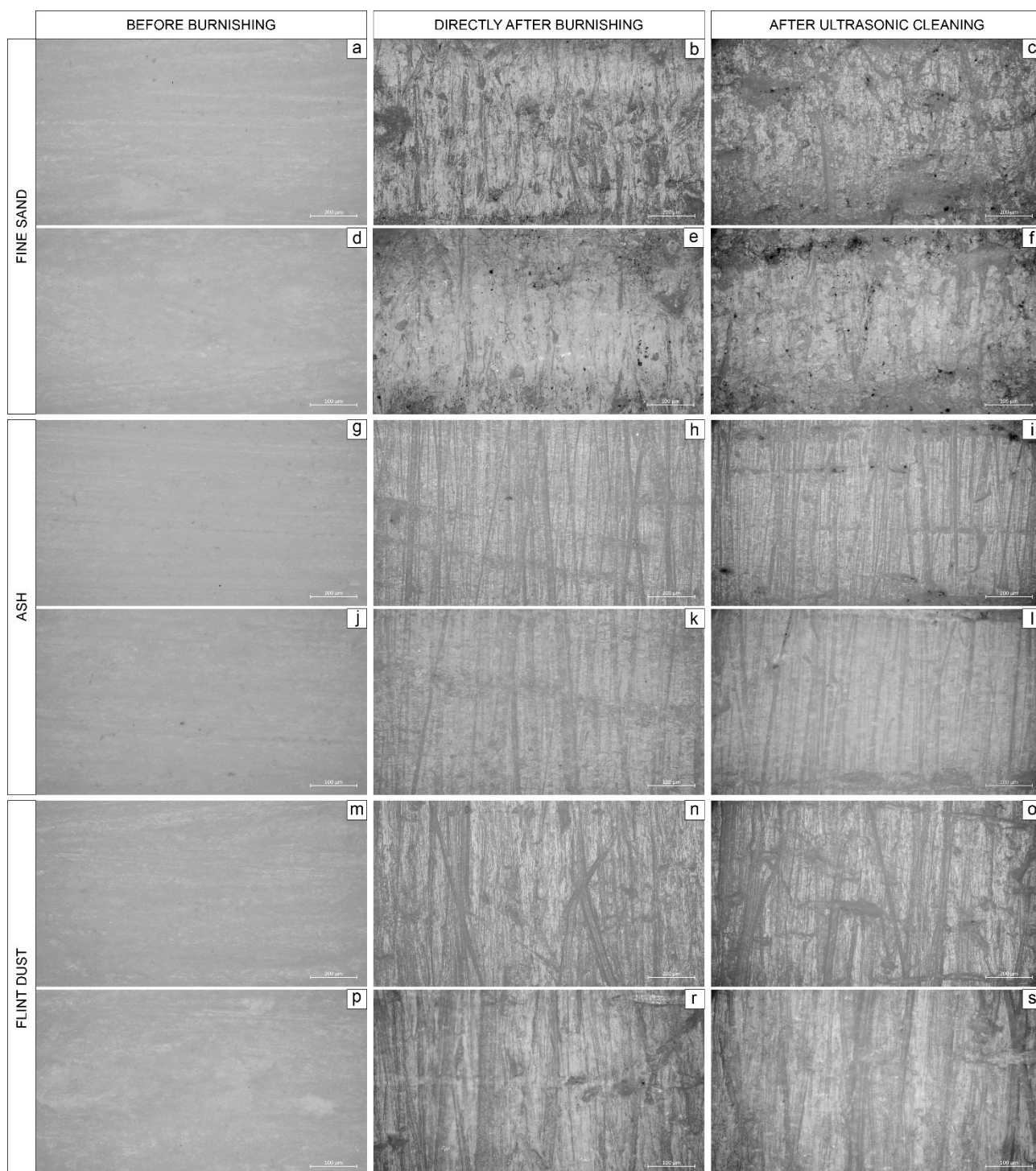


Fig. S19. General morphology of burnishing traces on scraped bone surfaces after 10 minutes of burnishing using different materials (photo: J. Orłowska). Microphotographs a–c, g–i and m–o (10× objective; ca. 100× total magnification) and d–f, j–l and p–s (20× objective; ca. 200×) were acquired using reflected light.

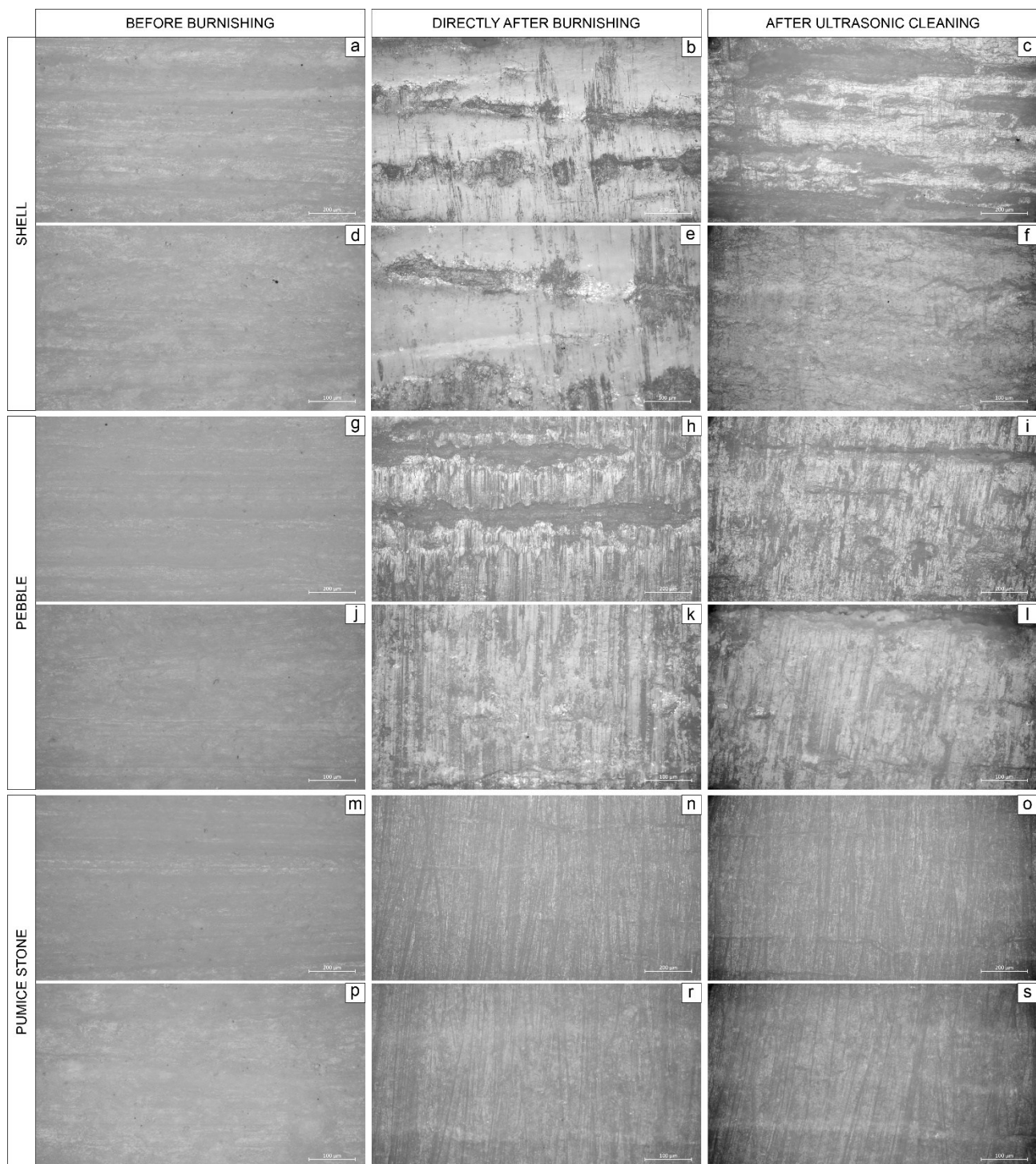


Fig. S20. General morphology of burnishing traces on scraped bone surfaces after 10 minutes of burnishing using different materials (photo: J. Orłowska). Microphotographs a–c, g–i and m–o (10× objective; ca. 100× total magnification) and d–f, j–l and p–s (20× objective; ca. 200×) were acquired using reflected light.