УДК 903.01/.09 903.02 https://doi.org/10.24411/2587-6112-2020-1-0017

USE OF MACRO - LITHICS IN THE POTTERY PRODUCTION DURING THE LATE NEOLITHIC OF THE CENTRAL BALKANS

© 2020 г. Vesna Vučković

Data on the implementation of macro-lithic tools in pottery production during the Late Neolithic of the central Balkans are very rare. This paper presents experiments in smoothing, polishing pottery surface in order to examine several topics. Fourteen vessels were made of various tempered clay and different moisture levels. Their surfaces were processed by smoothers made of shells and the experimentally made stone axe. Polishing has been performed by pebbles and a boar task. The experimental tests resulted in a comparative collection of micro-wear traces considering the objects originating from an archaeological context. This can reveal pottery workshops and possible technological varieties in pottery production within the settlement or between settlements. At the same time, it has been documented that types of use-wear traces on stone polishers appeared and developed in various time, depending on pottery temper. Observations also show a correlation between the productivity and morphology of stone polishers, the shape of the vessels and decoration. It has been also concluded that to the working efficiency of the implemented artefacts made of various materials such as stone and the boar tusk depends on technology implemented in pottery production. These experiments can assist in completing an economic picture of the Neolithic settlements on the Central Balkans. It encourages further examinations of wear resistance, mechanical property, efficiency of the pottery smoothers and polishers made of various materials such as stone, bone and shells.

Keywords: archaeology, prehistoric skills, macro-lithic tools, shells, boar task, polishers, smoothers, experiments, pottery.

Introduction

In this part we will shed light on the implementation of smoothers and polishers used in pottery production during the Late Neolithic of the central Balkans (The results of the experimental tests were presented at OpenArch Conference, Viminacium, Kostolac, Serbia.). This is an unusual topic, and the data on stone pottery polisher come only from the settlement of Vinča – Belo Brdo (Oral announcement provided by Dr. D. Antonović from the Institute of Archaeology in Belgrade. The objects were found during the excavations in 1998. According to the stratigraphic position those finds belong to the Viča-Pločnik II cultural layer). This tool is a small river pebble, with natural shape, unaffected by the employment, which made this object invisible and unattractive to the researchers.

Records from archaeological and ethnographic context show that the surface of a shaped vessel was covered by an extra layer before decoration, drying and firing. This process generates irregularities on the surface that should be eliminated by smoothing. Ethnographic evidences indicate that a flexible wood artefact (walnut or willow) so called "knife" was used for surface smoothing (Милосављевић, 1976; Zlatunić, 2005). This process reduces permeability to liquids through the vessel, enables better resistance against thermal shock cracking, and increases the thermal strength of the vessel, improving the heating efficiency of cooking pottery (Schiffer et al., 1994).

Data from Franchti cave indicate that four basalt and serpentinite polished edge tools show faceted working edges associated with scratches, suggesting that these objects were employed as smoothers for the pottery surface (Stroulia, 2003, fig. 14: 39, 42, 46, 47). It has been also indicated that fragments of fine-tempered pottery might be used as smoothers as well as polishers (Vuković, 2013).

Polishing can be applied after smoothing. Ethnographic and archeological data show that leather, felt, and geology such as sandstone, quartzite, secondary used gabbro and micro-gabbro objects were used in this operation. The results of analysis suggest that geology structure has a particular role. A high roughness resistance and a large degree of compositional homogeneity prevent the development of pronounced irregularities which can damage the smoothed surface. (Милосављевић, 1976; Valado, 2008; Delgado-Raack, 2008; Delgado-Raack at all., 2009; Ionescu, 2014)

The record from the Franchti cave (Stroulia, 2003) has given us an idea for an experimental test concerning to an employment of the polished edge tools in pottery production. An aim of this experiment was to examine different technical and technological aspects of the objects used in smoothing and polishing processes:

• to accumulate empirical dataset and analyze use-wear traces on smoothers and polishers, made of various materials, aiming is to establish a comparative collection of use-wear patterns;

• to define a link between the type and level of changes and time necessary for their development on the active surfaces of the stone polishers;

• to define morphology of use traces generated by the smoothing depending on clay temper and a level of moisture in the clay.

Data and presentation

Aiming to examine the hypothesis of A. Stroulia (Stroulia, 2003), elongated, fine-grained sandstone pebble (fig. 1: 1), measuring 60×24×14 mm in dimensions, was transformed into an axe by grinding associated with constant use of water. Ethnographic evidences confirm the implementation of this technique in a production of polished edge tools (Hampton, 1999). Square-shaped sandstone (fig. 1: 2), measuring 9×67×24 mm in dimensions, had a role of an abrader, while the quartzite pebble (fig. 1: 3) was implemented for re-pecking the working surface of the abrader (fig. 3: 2, 3).

Furthermore, 14 handmade vessels, different in size and shape were made of clay different in origin and temper. Several pebbles with different morphometry, two shells, and a boar's tusk (fig. 2: 1–3) were also included as polishers and smoothers in the experiment* (one part of the experiment was conducted in assistance with Dejan Jovanović, graduated ceramist).

The experiment was recorded by a Canon Power Shot 12 digital camera and USB microscope Micro Capture, Version 2.0: for (2M). 20x–200x, and all surface alternations were observed under the low power magnification, not larger than 50x.

The sandstone pebble was transformed into the axe in 3 h and 33 min (fig. 3: 1). The working edge on the widest transversal side of the item has been shaped by grinding alternately the obverse, reverse and top sides. This process took 3 h and 23 min while the shape correction and polishing of the rest of the axe followed in the next 10 min. At macroscopical level, the light smoothed surface of the axe shows shallow scratches and the light and smoothed working surface of the abrader, which microscopically presents leveling. The concavity of the working surface reached a depth of c. 1 mm (fig. 3: 2). As by – product of grinding, fine sandy dust fulfilled irregularities of the working surface of the abrader. This has impacted negatively on the productivity of the tool. Therefore, the surfaces of both objects were constantly washed by water.

In following lines, we will present first the results of the surface processing of vessels 1–3. Vessel 1 and 2 were made of fine tempered clay (fig. 4, 8, 15), and were dried for c. 72 h. Their dimensions are 88×83×35 mm and 56×76×42 mm. The dark brown vessel 3 with two tongue-like handles, measuring 55×88×56 mm in dimensions (fig. 12), was made of coarse-grained clay collected at the Neolithic site of Slatina – Turska česma, Drenovac.

The surfaces of objects 1 and 2 were smoothed by the axe. At microscopical level smoothed surface of vessels show pits and scratches different in both the depth and length (fig. 5).

The edge of the axe shows scratches and grain-extractions after 10 min of use of the item. No morphological change of use traces has been detected after an additional 50 minutes of use of the object (fig. 6–7).

The conical, fine tempered, brown vessels 4 (fig. 16) and 5 (fig. 17), which dimensions are 106×98×50 mm and 111×101×53 mm, have been dried for c. 70 h, or 2 hours less than the vessels 1–3. Therefore, vessels 4 and 5 contained a higher level of moisture than the vessels 1–3. Their surfaces were smoothed by two Unio sp. shells (fig. 2: 1, 3), which measure 157×102 mm and 70×40 mm in dimensions. The large shell was broken into two pieces and the breakage at the widest part of the tool was employed to smooth the outer surfaces of the vessels. Their inner sides were smoothed by the complete, small shell. This resulted in more stressed irregularities, than those detected on the surface of the better dried objects (fig. 16, 18).

The active parts of the shells preset short scratches, perpendicular to the working edge of the tool as well as disordered scratches and micro-scratches in the area above the working edge (fig. 8–9).

Having been smoothed, the surfaces of vessels 1–4 were polished by two pebbles, which are 41×25×19 mm and 39×28×18 mm in dimensions, while vessel 5 was polished by a boar tusk.

Small or elongated stone polishers processed the inner surface of the small vessels with less opened shape or some specific parts of the item such as the handle of vessel 2 (fig. 10).

Polisher with one flat surface polished the surface of vessel 1 (fig. 4). Such morphology of the active side allows good contact with processed surface and impacts on productivity. Peripheral active parts of the tool present shine and differently orientated shallow scratches after 16 minutes of use (fig. 19: a, c, d). Additional 14 minutes of polishing produced scratches all over the working surface of the tool (fig. 19: a, e). In the next step, narrow, shiny side of another polisher decorated the inner surface of the recipient. The tool was impressed slightly into the surface of the bowl, producing polished ornament which was shinier than polished surrounding (fig. 14).

Microscopically, the final result of polishing the surfaces of vessels 1 and 2 is leveling (fig. 11). Unlike this, overlapped, wide strips (fig. 16) have been documented on the polished surface of the fine-tempered vessel 4 (fig. 16), with high level of moister. Additional drying of the objects for 19 hours and re-polishing resulted in more uniform and shiny surface.

Polished surfaces of the sandy tempered vessel 3 (fig. 12) shows leveling associated with shallow scratches (fig. 13). Deep, disordered scratches appeared on the surface of the stone polisher after c. 12 min of the activity. Additionally, we have decorated this object by channeling, the ornamental technique typical for the Vinča culture. This has been done by narrow, smoothed and shiny side of the polisher. We assume that the same effect could also be. The coarse tempered vessel 5 (fig. 17) was primarily polished by boar tusk, which produced high topography due to the high moisture level (fig. 18), and then by pebble. The results show that the stone polisher produced more uniform surface than the boar task.

Observations and conclusion

The objective of this experiment is to examine several topics related to smoothing and polishing the pottery surface. Aiming to achieve the goal, 14 vessels were made of various tempered clay and different moisture levels. Their surfaces were processed by smoother made of shells and the experimentally made stone axe. Polishing has been performed by pebbles and boar task.

The implementation of axe in smoothing of the industrial, fine-tempered pottery caused scratches and grain extractions on the working edge, while leveling has not been observed. It seems that it is not far from the truth that process of grain extraction would be continued, and could have a negative impact of smoothing. However, we would take this conclusion with a consideration, due to the fact that total time consumed in the use of the axe was 60 min.

The results of the experiment resulted in a comparative collection, considering the objects originating from an archaeological context. This will reveal pottery workshops and possible technological varieties in pottery production within the settlement or between settlements.

Parallel to this, the time necessary for the appearance and the development of certain types of use-wear traces on stone polishers was measured. We believe that this can define the wear level of the working surfaces of the objects from the archaeological context more accurately.

The obtained record suggests a correlation between the productivity and morphology of stone polishers, the shape of the vessels and their decoration. This suggests that the wide and flat sides of the polishers were more efficient, while the concave and narrow parts of the object polished the specific parts of the vessel and were applied in decoration of the items. When it comes to the working efficiency of different materials, polishing of the coarse vessel 5 with high moisture level has indicated that stone polishers were more productive than the boar tusk.

Different pottery temper affected the type of use-wear traces and pottery surface processing. Polishing with fine tempered vessels generated shine on the surface of the stone polishers very soon as the activity has begun. The shine has been followed by micro-scratches. The contact with coarse-grained clay made scratches deeper. Furthermore, the low moisture level allows leveling and removing irregularities, that was not the case with the pottery with high level of moisture.

Speaking in general, these experiments can assist in completing an economic picture of the Neolithic settlements on the Central Balkans. It encourages further examinations of wear resistance, mechanical property, efficiency of the pottery smoothers and polishers made of various materials such as stone, bone and shells, which are usually associated with human dietary in the Neolithic context of the central Balkans (Lazić, 1988; Greenfield, 1994). Parallel to this, further examinations can reveal the place the tools in the chaîne opératoire as well as the link between pottery technology and type of material used in surface processing.

REFERENCES

Delgado – Raack, S., 2008. *Practicas econimcas y gestion social de recursos (Macro) lithicos en la Prehistoria reciente (III – I milenios AC) del Mediteraneo occidental*, Departament de Prehistòria Facultat de Lletres Universitat Autònoma de Barcelona. Unpublishd PhD thesis. Barcelona

Delgado-Raack, S. Go´mez-Gras, D., Risch, R. 2009. The mechanical properties of macrolithic artifacts: a methodological background for functional analysis. *Journal of Archaeological Science*, (36), 1823–1831.

Greenfield H. 1994. Faunal Remains from the Early Neolithic Starčevo Settlement at Bukovačka Česma. *Starinar*, (43 – 44), 103–113.

Hampton, W. O. 1999. *Culture of Stone, Sacred and Profane Uses of Stone among the Dani*. Anthropology Series. College Station: Texas A&M University Press. pp. 246, 247, 272.

Lazić, M. 1988. Fauna of Mammles from the Neolithic settlement in Serbia. In Srejović, D. (ed) *The Neolithic of Serbia*. Belgrade, 24−39.

Милосављевић, М. 1976. Развој грнчарског заната и израда глиненог посуђа на подручију северног Баната. *Гласник Етнографског музеја*, 39/40, 85−117.

Schiffer, M. B., Skibo, J. M., Boelke, T. C., Neupert, M. A. and Aronson, M. 1994. New perspectives on experimental archaeology: surface treatments and thermal response of the clay cooking pot. *American Antiquity*, 59(2), 197–217.

Strouli, A. 2003. Ground stone celts from Franchthi cave. *Hesperia*, 72(1), 1−30 .

Valado, T. 2008. Identifying Lightly Used Polishing Stones: Experiments and Implication. In Rowan Y.M., Jennie R.E. (eds.) *New Approaches to Old Stones, Recent Studies of Ground Stone Artefacts*. London, 173−181.

Vuković, J. 2003. Pottery sherd as tools in late Neolithic Vinča, *Starinar*, 63, 191−207.

Zlatunić, R. 2005. The development of clay; technology an minereralogy of ceramics. *Histria archaeologica*, 36, 61−114.

About the Author:

Vesna Vučković, MA, senior custodian - archaeologists, Hometown Museum ’’Paraćin’’. Paraćin, 35250 Serbia; vesna.p.vuckovic@gmail.com

ПРИМЕНЕНИЕ МАКРОЛИТОВ В ГОНЧАРНОМ ПРОИЗВОДСТВЕ ЭПОХИ ПОЗДНЕГО НЕОЛИТА В ЦЕНТРАЛЬНЫХ БАЛКАНАХ

Весна Вукович

Сведения об использовании макролитов в гончарном производстве эпохи позднего неолита в Центральных Балканах крайне редки. В данной работе представлены результаты экспериментов по выравниванию и полировке поверхностей керамики в целях изучения нескольких аспектов технологии. Были изготовлены четырнадцать сосудов из разных видов закаленной глины с различными показателями влагосодержания. Их поверхности были обработаны выравнивающими инструментами из ракушек и изготовленным в результате экспериментов каменным топором. Полировка выполнялась при помощи гальки и клыков кабана. Экспериментальные исследования обеспечили получение коллекции для сравнительного анализа, содержащей микроскопические следы износа, полученные в результате воздействия обусловленных археологическим контекстом факторов. Таким образом могут быть выявлены гончарные мастерские и возможные технологические различия гончарного производства в рамках отдельных поселений или взаимодействия между ними. В то же время, было документально зафиксировано, что отдельные виды следов износа на каменных инструментах для полировки появлялись и развивались в течение разных периодов времени в зависимости от вида обработки керамики. В процессе наблюдений также была продемонстрирована взаимосвязь между производительностью и морфологией каменных инструментов для полировки, формой сосудов и декоративным оформлением. Был также сделан вывод о том, что на эффективность применяемых артефактов из различных материалов, таких как камень и клыки кабана, влияет используемая технология гончарного производства. Данные эксперименты могут поспособствовать составлению описания хозяйственного уклада неолитических поселений в Центральных Балканах. В результате получат развитие дальнейшие исследования в области износостойкости, механических свойств и эффективности инструментов для выравнивания поверхности и полировки керамических изделий из различных материалов, таких как камень, кости и раковины.

Ключевые слова: археология, доисторическое производство, макролиты, раковины, клыки кабана, инструменты для полировки и выравнивания поверхности, эксперимент, гончарное дело.

Информация об авторе:

Вукович Весна, магистр гуманитарных наук, старший хранитель - археолог. Муниципальный музей «Парачин» (г. Парачин, Сербия); vesna.p.vuckovic@gmail.com

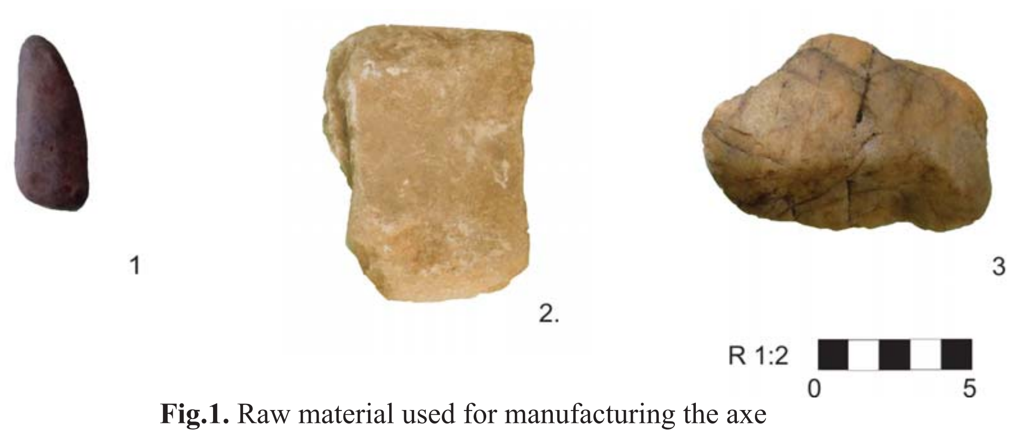

Fig.1. Raw material used for manufacturing the axe

Fig. 2. Vessels, smoothers and polishers made of various materials (1-3).

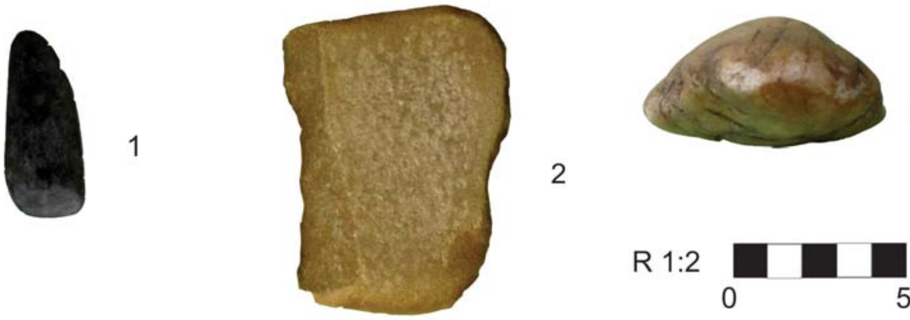

Fig.3. Finished axe (1.)and tools implemented in its manufacturing (2.abrader; 3. hammer-stone).

Fig. 4. Vessel 1:a. irregular, not smoothed surface; b. smoothed surface.

Fig. 5. Vessel1: smoothed surface at microscopical level.

Fig. 6. Axe: scratches on the working edge, occurred after 10 min of the use.

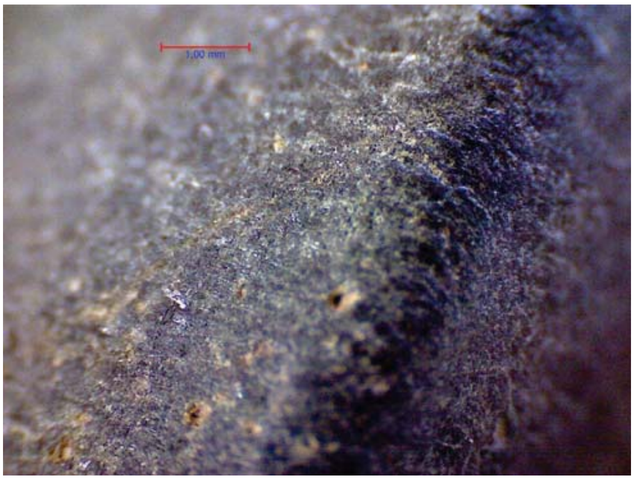

Fig. 7. Axe: scratches on the working edge, occurred after 50 min of the use.

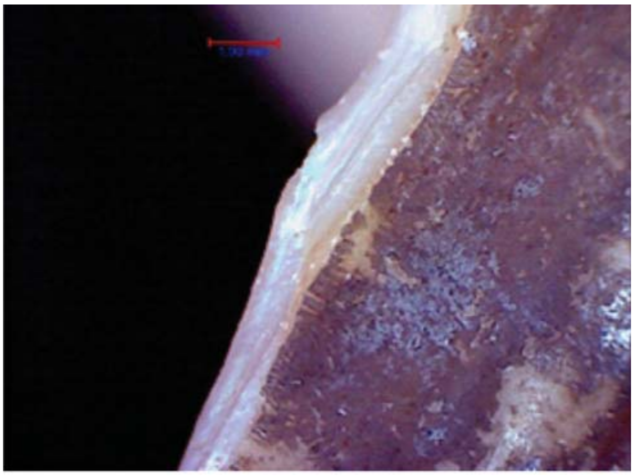

Fig. 8 Shell: scratches visible on the working edge

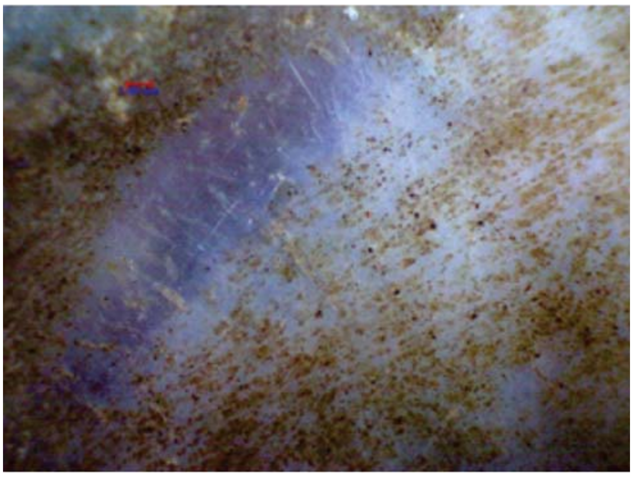

Fig. 9. Shell: scratches visible on the working edge.

Fig. 10. Vessel 2:surface polishing.

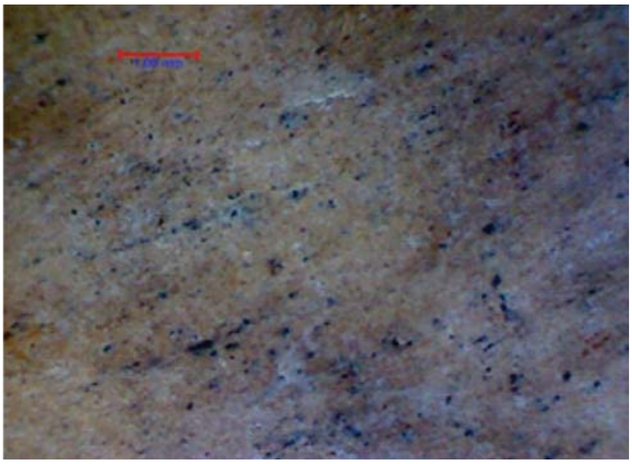

Fig. 11. Vessel 2: leveling of the polished surface.

Fig. 12. Vessel 3: polished and ornamented surface.

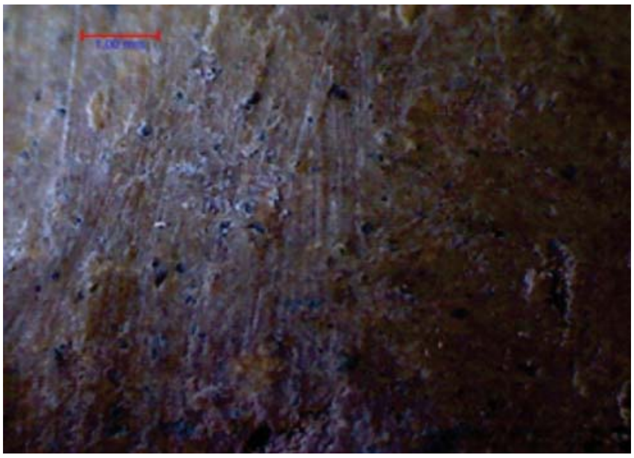

Fig. 13. Vessel 5: irregularities on the polished surface at microscopical level.

Fig. 14. Vessel 1:polished ornament. in the inner surface of the item.

Fig. 15. Vessel 4:polished surface.

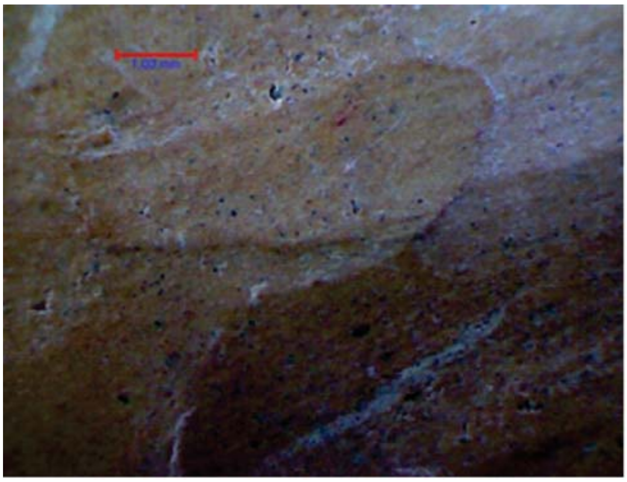

Fig. 16. Vessel 4:irregularities and leveling on the polished surface.

Fig. 17. Vessel 5: scratches on the smoothed inner wall.

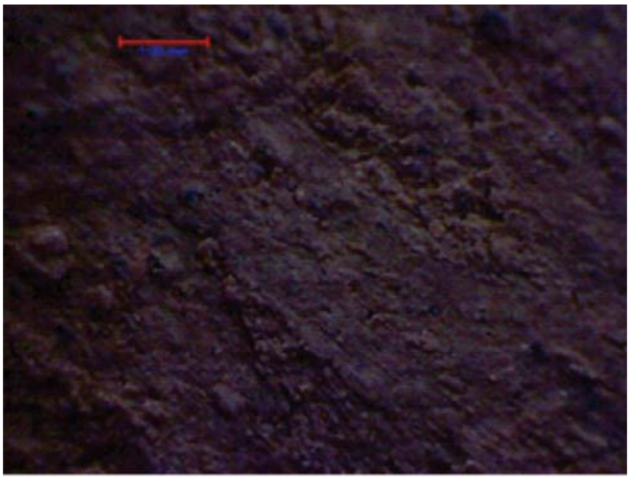

Fig. 18. Vessel 5: irregularities on the polished surface at microscopical level.

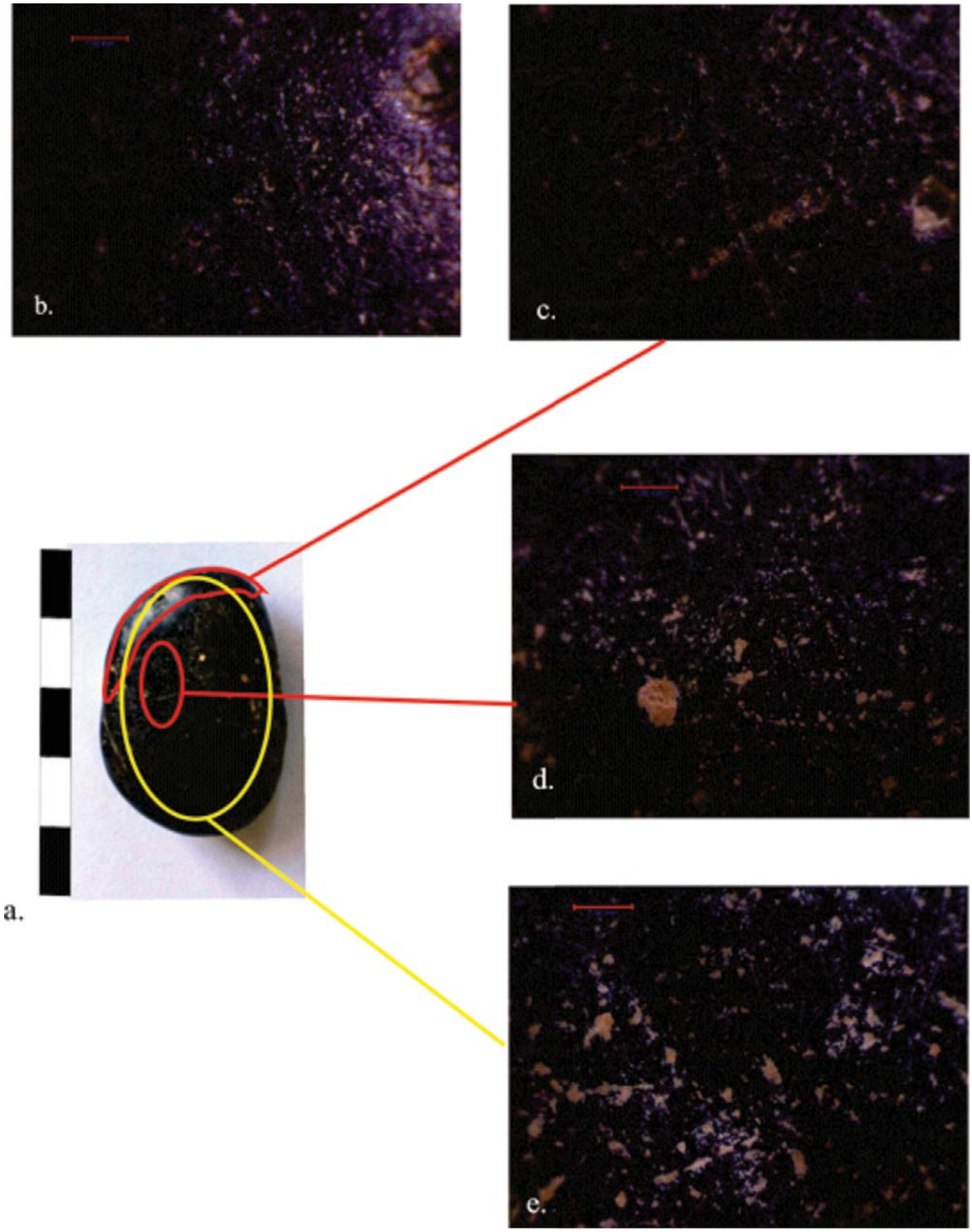

Fig.19. Stone polisher: development and distribution of use wear traces on the working edge of stone polisher (a.),unused surface (b.), use traces developed after 16 min of the tool implementation (c.-d.), use traces developed after 30 min of the tool implementation (e.).