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MAMMOTH REMAINS FROM THE OPOLE AREA, SOUTHWEST POLAND

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ABSTRACT: Isolated skeletal remains of woolly mammoths, found in the Opole region, are described and illustrated. Most of these were recovered in the first half of the twentieth century; they are now deposited in several museum collections but have not yet been described in detail, nor illustrated. Recent discoveries in the area were the prime trigger for the present review of previously collected material. A summary of current knowledge of all finds of mammoth remains from the Opole area is the main aim of this note, inclusive of a brief history of research. In addition, a single radiocarbon dating has been performed. All skeletal elements, i.e., molars, pelvis, femur, scapula, jaw, tusks and cement with enamel have been identified. The morphology of these is described, inclusive of biometric characteristics and photographic documentation.

KEY WORDS: Pleistocene, bones, teeth, tusks, *Mammuthus primigenius*, Proboscidea

Introduction

The woolly mammoth [*Mammuthus primigenius* (Blumenbach, 1799)] is a proboscidean in the family Elephantidae and arguably the best known of all mammoth species (e.g., Ward 2002). It attained a shoulder height of 2.75–3.40 m and a weight of about 4–6 tonnes; the contour of the back was slanting. Mammoth fur was thick and provided with an undercoat. The head was a tall, single dome, while the ears were small, the tusks curved and twisted and the tail short. The tip of the trunk consisted of two parts, one short, the other long (Ward 2002).

The area inhabited by woolly mammoths included North America, Asia, Europe and the Arctic region. The species first appeared about 250 000 years ago in Siberia (Orlova et al. 2000, 2001). From there, it migrated into North America and Europe and populated extensive areas. In North America, it reached far south to the coasts of the Gulf of Mexico (e.g., Agenbroad 2005) and its geographic range in Europe included Scandinavia in the north to northern Spain in the south (Stuart et al. 2002). The start of the decline of woolly mammoths is dated at 19 000 years ago; the species disappeared in Europe about 13 000 years ago, 3 000 years later in Asia and North America (Stuart et al. 2002; Agenbroad 2005). Wrangler Island (Siberia) may have been the last place where woolly mammoths persisted. AMS radiocarbon dates on mammoth molars have demonstrated that some individuals lived around 4,000 years ago (Stuart et al. 2002).

In Poland, numerous remains of mammoths have been found (Pawłowska 2015), mainly in places where sand and gravel are excavated, as well as during road construction and cartographic works and regulatory river works etc. Most of these (about 100 specimens) have been recorded from southern Poland, especially from Podkarpacie (e.g., Kubiak 1965a, 1980; Kozłowski et al. 1970; West 1996; Wojtal 2007), from the foreland of the Sudetes Mountains (e.g., Wiśniewski et al. 2009a, b) and from Upper Silesia (e.g., Dąbrowa). Moreover, mammoth remains are also known from caves in the Carpathians (Kubiak 2003) and in the Kraków-Częstochowa Upland (Nadachowski et al. 2009).

In the Opole area, skeletal remains of woolly mammoths have been found in a few places (Fig. 1), but these have never been described. Only a few bones have been radiocarbon dated (Nadachowski et al. 2009; from the locality Dzierżysław). In view of this, our knowledge of mammoths in the Opole area is still incomplete and patchy, which is why we here summarise current data that have been obtained by morphological research during recent years.

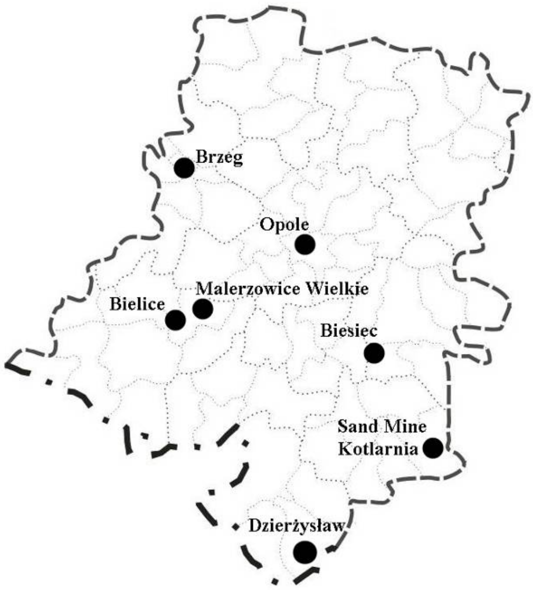

Fig. 1. Mammoth-bearing localities in the Opole area, southwest Poland.

Materials and methods

All skeletal remains of woolly mammoths described here are listed in Table 1. The oldest finds are housed in the collections of the Department of Wildlife at the Museum of

Opole Silesia (MŚO). These comprise four molars, catalogued as a post-German collection, but information on date and place of provenance is lacking, nor is the name of the collector known. These specimens were handled in 1964 by Stanisław Michalak. Material collected by Karl Białucha in 1927 includes three specimens from the Odra River valley near Groszowice (Opole). These were preliminary determinated those bones (samples) and cataloged by S. Michalak in 1966, and interpreted as femur, scapula and pelvis.

The Department of Wildlife at the Museum of Opole Silesia also holds eight molars originally from the museum at Brzeg (1967). These were recovered somewhere in the Brzeg area, but information as to the precise locality, the date of collection and name of collector is lacking. This material was numbered as a single lot by S. Michalak.

Some specimens are housed in the Department of Archaeology of the MŚO. These comprise three molars and a tusk, collected in the Bielice area in the 1990s. Previously, also an unnumbered long bone from the Sand Mine "Kotlarnia" S.A was held there, but this was later transferred to the Palaeontology Department of Wrocław University (E. Matuszczyk pers. comm. September 2015).

Specimens studied at the Palaeontology Department of Opole University originate from Sand Mine "Kotlarnia" S.A as well (Kardynał 2012). At present, these have been returned to the Sand Mine "Kotlarnia" S.A., having been given on loan for study at the Laboratory of Palaeobiology of Opole University, by engineer Krzysztof Kolczyk, President of the Board.

In 2012, a local collector from Opole, Olgierd Łukasiewicz, found molars at a sand pit in Malerzowice Wielkie. These were presented to the Laboratory of Palaeobiology of Opole University for study; they are currently stored there.

Finally, a single molar from Biesiec is contained in a private collection. This is from near Biesiec, where it was found during motorway construction in 2000 (B. Przybylski pers. comm. September 2014). It is uncertain whether it came originally from Biesiec or whether it was transported from the Sand Mine "Kotlarnia" S.A. together with sand used in motorway works. In addition, five teeth and one bone, found at Dzierżysław, are housed at the Institute of Systematics and Evolution of Animals, Polish Academy of Science, in Kraków (Nadachowski et al. 2011; Ukkonen et al. 2011). These include five molars and a femur (Nadachowski et al. 2011). The material from Biesiec and specimens held at the Institute of Systematics and Evolution of Animals PAS have not been studied by us.

The morphology of mammoth molars (M_3) was studied as outlined by Maglio (1973) (see Fig. 2). Assessment of the original position of teeth (right, left, mandible, dentary) and the age of the individual to which they belonged was based on Maglio (1973) and Maschenko (2002), respectively. The latter author is also referred to for measurement and descriptive terminology of tusk, femur and mandible (Figs 3, 4), as well as basic osteological descriptions and standard terminology. In the study of tusks in results in the Table 6 is not recorder dimension 'Pulp cavity depth'. Due to the poorly preserved material measurement was impossible. Lister (1996) was followed in descriptions, measurements and gender determination of the pelvis. Catalogue numbers of institute/museum collections were supplemented and new numbers were assigned to specimens studied at the Laboratory of Palaeobiology of Opole University. The single radiocarbon date was obtained at the Poznań Radiocarbon Laboratory.

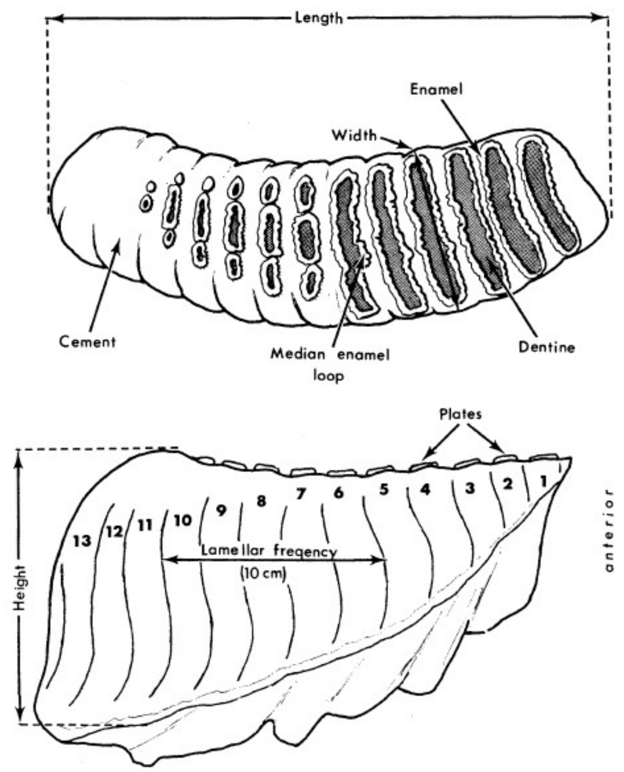

Fig. 2. Illustration of measurable parameters and structural characteristics of elephant teeth as discussed by Maglio (1973).

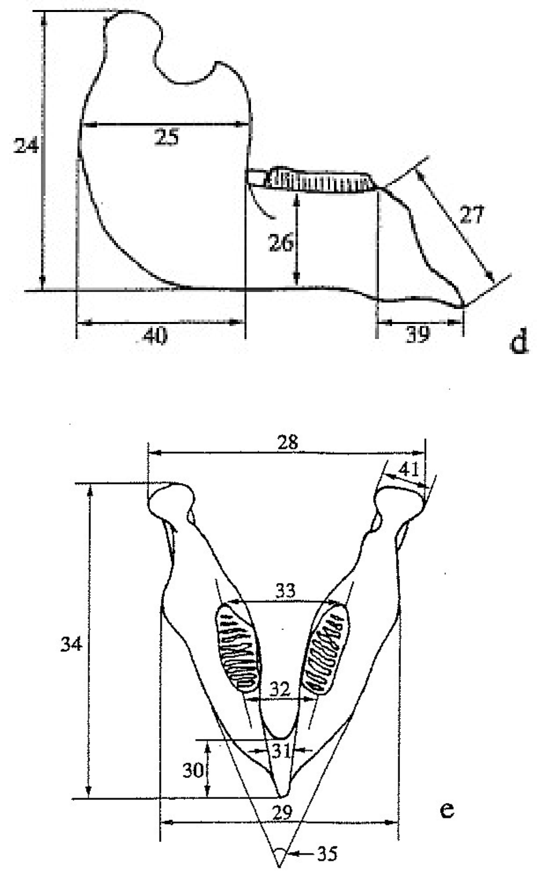

Fig. 4. Illustration of measurable parameters and structural characteristics of mammoth mandibles as discussed by Maschenko (2002).

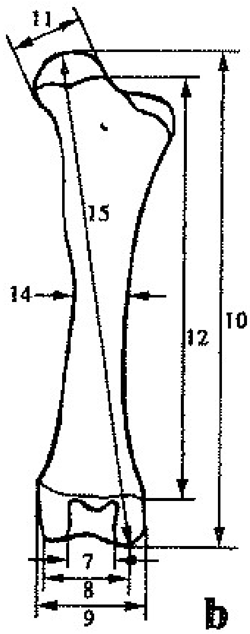

Fig. 3. Illustration of measurable parameters and structural characteristics of mammoth femurs as discussed by Maschenko (2002).

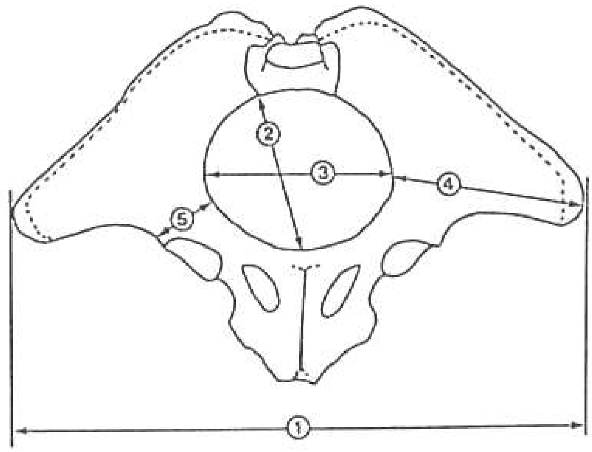

Fig. 5. Illustration of measurements taken on mammoth pelves as discussed by Lister (1996).

Results

Morphological descriptions, supplemented by simple measurements, are the main result of our study. Tables 2–8 list measurements (in millimetres) of molars, right pelvis, right femora, scapula, tusks, mandibles and cement with enamel, respectively, of *Mammuthus primigenius* studied. In three cases, specimens from the Museum of Opole Silesia have identical numbers because they were considered part of the same find. For the present paper, suffixes were added to these.

1. MŚO/P/4942 (Fig. 6): right M_3, adult individual. Incomplete molar revealing plates, root, enamel and pulp between plates. The enamel is cracked over the entire tooth surface and in the crown cement two parallel linear furrows (grooves) are visible of a length of 170 mm and a width of ~ 5.0 mm, on both lingual and buccal aspects. Defects of various types are relatively common in mammalian teeth, including developmental irregularities, caries, malformations and malocclusions (Niven and Wojtal 2002). Such dental defects were first discussed by Guenther (1955, 1956) and Kubiak (1965b), with much attention to deformities, tumours and malocclusion. According to Guenther (1955, 1956) such furrows could have been caused by physiological changes such as infectious disease of the intensine which inhibited metabolism of calcium and resulted in a persistent deficiency of this mineral; stress of pregnancy and associated metabolic changes; or general nutritional deficiency. Niven and Wojtal (2002) suggested other factors that might have had an impact on some cement deposition on molars. The first factor is related to diet, i.e., mainly the dependence of mammoth diet on macro- and microelement composition. This explains why mammoths suffered from occasional, probably seasonal, mineral deficiencies that could have led to the appearance of such furrows on the cement. Physiological stress of pregnancy could have affected cows and calves. Other reproductive factors that might have induced systematic stress are periods of musth, when male mammoths seek mates and often fight, as well as decline in physical conditions (Moss 1988). Seasonal fluctuations, severe cold or limited availability of water and food were likely factors behind periodic metabolic stress in mammoths (Niven and Wojtal 2002). An alternative explanation of the furrows might be cement decay from bacterial infection or impaction of material in the gums. Such demineralisation of tooth cement results in caries (Niven and Wojtal 2002). The furrows might have resulted from ingestion of grit or debris that was impacted along the gumline and caused erosion of the cement as well (Niven and Wojtal 2002). Furthermore, dietary additions during forage with a chemistry that resulted in gumline infections and tooth decay and cement resorption. With regard to previous studies of dentitions of other mammals that revealed that multiple dynamics could be involved in developmental defects, a combination of causal factors cannot be ruled out (Guenther 1955; Kubiak 1965b). In the absence of data on exact provenance, we cannot exclude any of the above hypotheses. Each of the factors listed might have led to furrow development in cement.
2. MŚO/P/4943 (Fig. 7): right dp_3, young individual. Complete molar with partially broken root and pulp between plates. The enamel is cracked over the entire surface and the tooth has a mineral coating.

3. MŚO/P/4944 (Fig. 8): right M^3, adult individual. Part of molar, damaged anteriorly and posteriorly and with mineral coating, root not preserved; pulp between plates.

4. MŚO/P/5069 (Fig. 9): probably left M_3, adult individual. Part of molar, markedly damaged anteriorly and posteriorly and with mineral coating, root not preserved; pulp between plates.

5. MŚO/P/5268 (Fig. 10): left M_3, adult individual. About three-quarters of molar, consisting of two parts, glued together. The enamel is heavily cracked and with mineral coating. Root partially preserved. Eleven dental plates retained anteriorly and posteriorly.

6. MŚO/P/8466/1 (Fig. 11): fragment of right pelvis, consisting of portions of ilium, pubis, ischium and acetabulum. Judging from size and shape, it is assumed to have belonged to a male individual. Only two dimensions could be measured of this fragment (see Table 3). The ilium features the wing, iliac crest, hip and body. The pubis consists of parts of the body and cranial branches, while the ischium consists of a fragmentary body, tabula and ischiatical spine. The acetabulum is made up of the fossa, lunate surface and notch. Besides, the thigh muscle area and greater ischiatic notch can be seen on the pelvis. This specimen is cracked and peeled; cancellous bone is seen in those places where compact bone is absent.

7. MŚO/P/8466/2 (Fig. 12): partial right femur, preserving only the distal end and shaft, probably of an adult individual. Anteriorly, the lateral surface, medial epicondyle and lateral epicondyle can be seen. More anatomic details are visible on the posterior side. Except for stem and knuckles, these comprise the nutrient foramen, popliteal surface, medial condyle and lateral condyle. Between the knuckles is the intercondylar fossa. Of the head of the tibia, the patellar surface is seen. This bone (measurements in Table 4) is heavily damaged.

8. MŚO/P/8466/3 (Fig. 13): a small part of a right scapula. In view of its small size and poor state of preservation, only the upper angle and border can be seen on the costal surface; this does not supply any precise data on dimensions (Table 5) or osteological features. The scapular spine is visible on the posterior surface. This specimen is badly cracked and peeled, but both cancellous and compact bone can still be seen.

9. MŚO/P/8841/1 (Fig. 14): left M_3, incomplete molar of an adult individual, revealing dental plates and pulp in between; root partially preserved. The enamel is cracked over the entire surface.

10. MŚO/P/8841/2 (Fig. 15): probably right M^3, adult individual, heavily damaged and broken distally; pulp visible between plates. The enamel is heavily cracked; the root not preserved.
11. MŚO/P/8841/3 (Fig. 16): probably right M^3, adult individual, fragmentary, albeit well preserved; pulp visible between plates. Root not preserved. The enamel is slightly cracked.

12. MŚO/P/8841/4 (Fig. 17): probably M_3, adult individual. Small fragment of molar, containing dental plates, enamel and pulp. Root not preserved. Enamel very well preserved.

13. MŚO/P/8841/5 (Fig. 18): right M_3, adult individual; root partially preserved, with

pulp between plates. The enamel is cracked over the entire surface.

14. MŚO/P/8841/6 (Fig. 19): left M_3, adult individual, consisting of dental plates and pulp in between; root partially preserved. The enamel is cracked over the entire surface. Fractured on proximal side.

15. MŚO/P/8841/7 (Fig. 20): dp_3, young individual; complete molar with a slightly broken root and pulp between plates. The enamel is cracked over the entire surface, yet overall preservation is good.

16. MŚO/P/8841/8 (Fig. 21): left M_3, adult individual. Part of molar, consisting of two portions; root not preserved. The enamel is heavily cracked. Dental plates retained on the both parts of crown.

17. MŚO-A-202-1 (Fig. 22): an incomplete, broken tusk of an adult individual (measurements in Table 6), in three parts that exhibit a large dent. Most probably these parts represent the median portion of the tusk. Enamel and cement can be seen and the crest on the lower surface. Neither lines, nor Schreger's angles are visible.

18. MŚO-A-202-2 (Fig. 23): right M_3, adult individual; incomplete molar with pulp between plates. Root partially preserved. The enamel is cracked over the entire surface.

19. MŚO-A-202-3 (Fig. 24): right M^3, adult individual. A molar containing dental plates, enamel and pulp. Root not preserved in its entirety; dental plates with pulp in between. The enamel is very heavily cracked.

20. MŚO-A-202-4 (Fig. 25): left M_3, individual adult. The enamel is very heavily cracked; root not preserved completely. Dental plates are visible, with pulp in between.

21. 1/KK/2013/UO (Fig. 26): part of a small mandible. Near the nutrient foramen, on the inner side, the alveolar part of the mandible with the alveolus of a molar is seen. The tooth in this mandible probably is a molar of the second or third generation (dp_3). In view of the small size and the mere presence of a single alveolus, this mandible could have belonged to a juvenile individual. The nutrient foramen and part of mental, but without mental protuberance, can be seen on the stem, as well as the base of the mandible. In some parts, cortical bone is lacking, but cancellous bone is present. Measurements are listed in Table 7.

22. 2/KK/2013/UO (Fig. 27): an unevenly broken distal end of a near-circular tusk. Based in size, this probably belonged to an adult individual (for measurements see Table 8); it is slightly twisted and convolute. Neither lines nor Schreger's angles are seen. Enamel and cement can be observed on the broken surface; the same goes for the crest.

23. 3/KK/2013/UO (Fig. 28): part of cement with enamel. The specimen is broken in half. Measurements are listed in Table 8.
24. 4/KK/2013/UO (Fig. 29): probably left M_3, adult individual. Part of a molar, containing dental plates, root, enamel and pulp; dental plates with pulp in between. Root partially preserved.
25. 3/KK/2014/UO (Fig. 30): left M_3, adult individual. A molar broken into three parts and enamel covered; dental plates with pulp in between. Root not preserved.

Cancellous and cortical bone are missing from all specimens, and heavy losses of enamel and roots are characteristic of molars. Only a single molar is well preserved.

Radiocarbon dating

Dates for Sand Mine "Kotlarnia" S.A and Dzierżysław are 29,270 BP (Laboratory of Palaeobiology of Opole University) and 14 633–16 863 BP, respectively (Nadachowski et al. 2011). These results are consistent with those presented by Ukkonen et al. (2011) and Pawłowska (2015) Other localities in Opole Voivodeship that have furnished remains of *Mammuthus primigenius* include Brzeg, Tarnowiec, Nysa, Otmuchów, Góra Św. Anny, Kąty Opolskie, Opole (vicinity) and Pawłowiczki (Pawłowska 2015). To date, finds from Malerzowice Wielkie and the Sand Mine "Kotlarnia" S.A are the youngest, documenting material from the last glaciation in the Opole area that have never been described previously.

Concluding remarks

Data presented here provide information on mammoth remains recovered from the Opole area. Most finds were made during the first half of the twentieth century; others are of a more recent date. Included are still undescribed remains of woolly mammoths from Malerzowice Wielkie, Sand Mine "Kotlarnia" S.A. and from collections of the Silesian Museum (Muzeum Śląska Opolskiego) on Góra Św. Anny. However, the present note is neither complete, nor exhaustive. Very probably, other remains are held in private hands that have not yet been reported to scientific institutions or museums. The Sand Mine "Kotlarnia" S.A. still is active, which is why we look forward to receiving news of additional remains of woolly mammoth.

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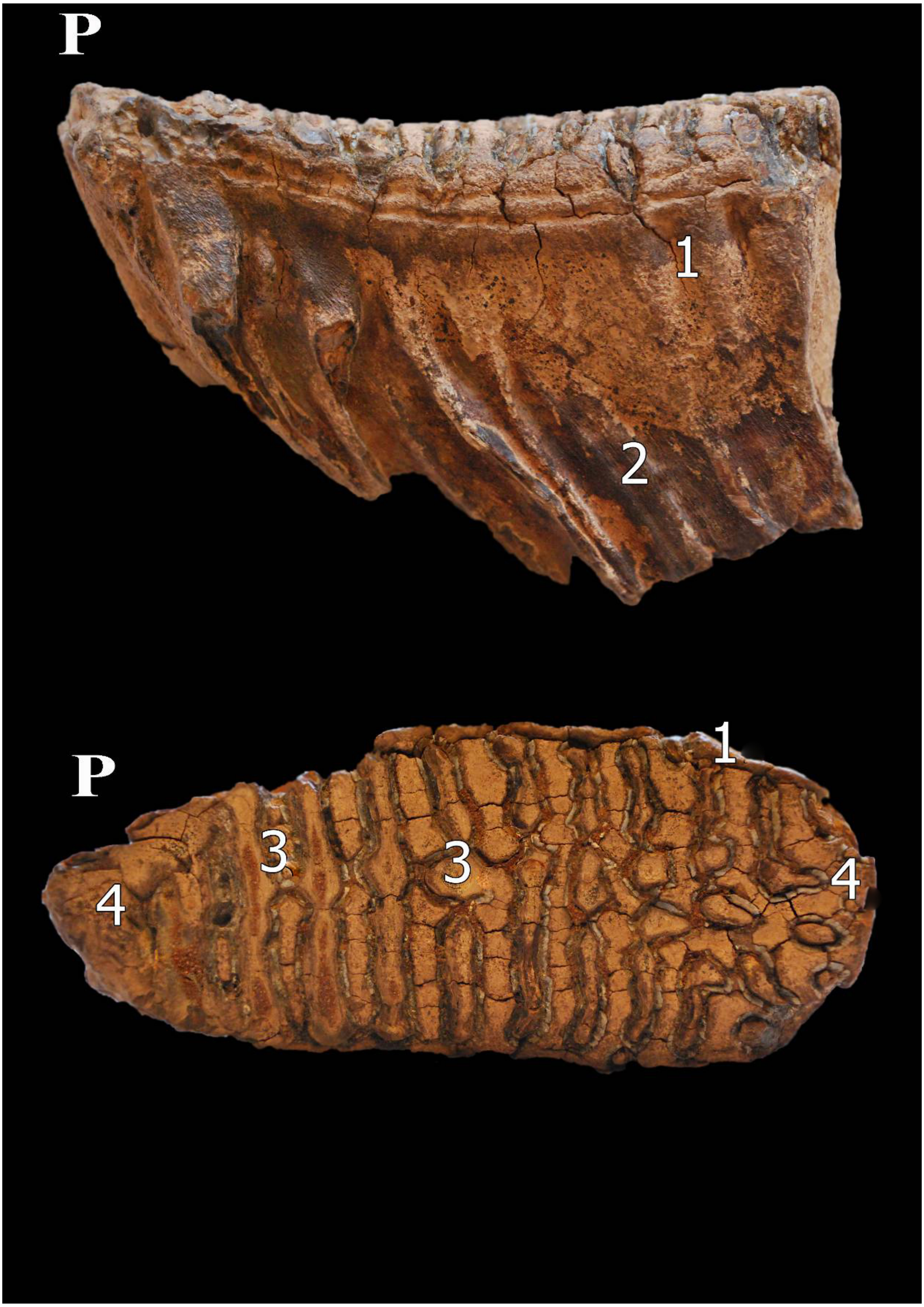

Fig. 6. Molar (MŚO/P/4942): 1 – enamel, 2 – root, 3 – dental plates, 4 – pulp, P – proximal end (photo by K. Kardynał).

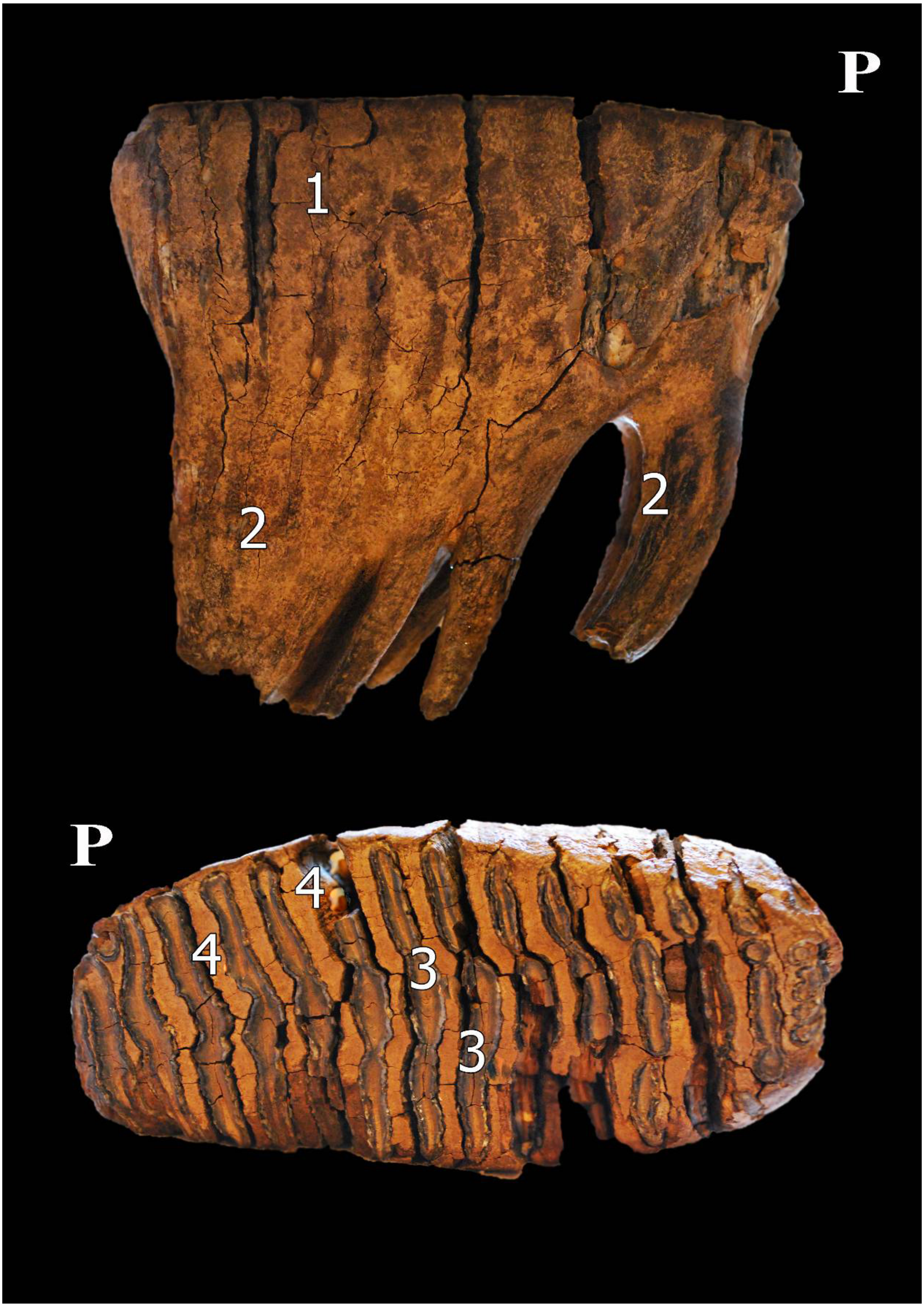

Fig. 7. Molar (MŚO/P/4943): 1 – enamel, 2 – root, 3 – dental plates, 4 – pulp, P – proximal end (photo by K. Kardynał).

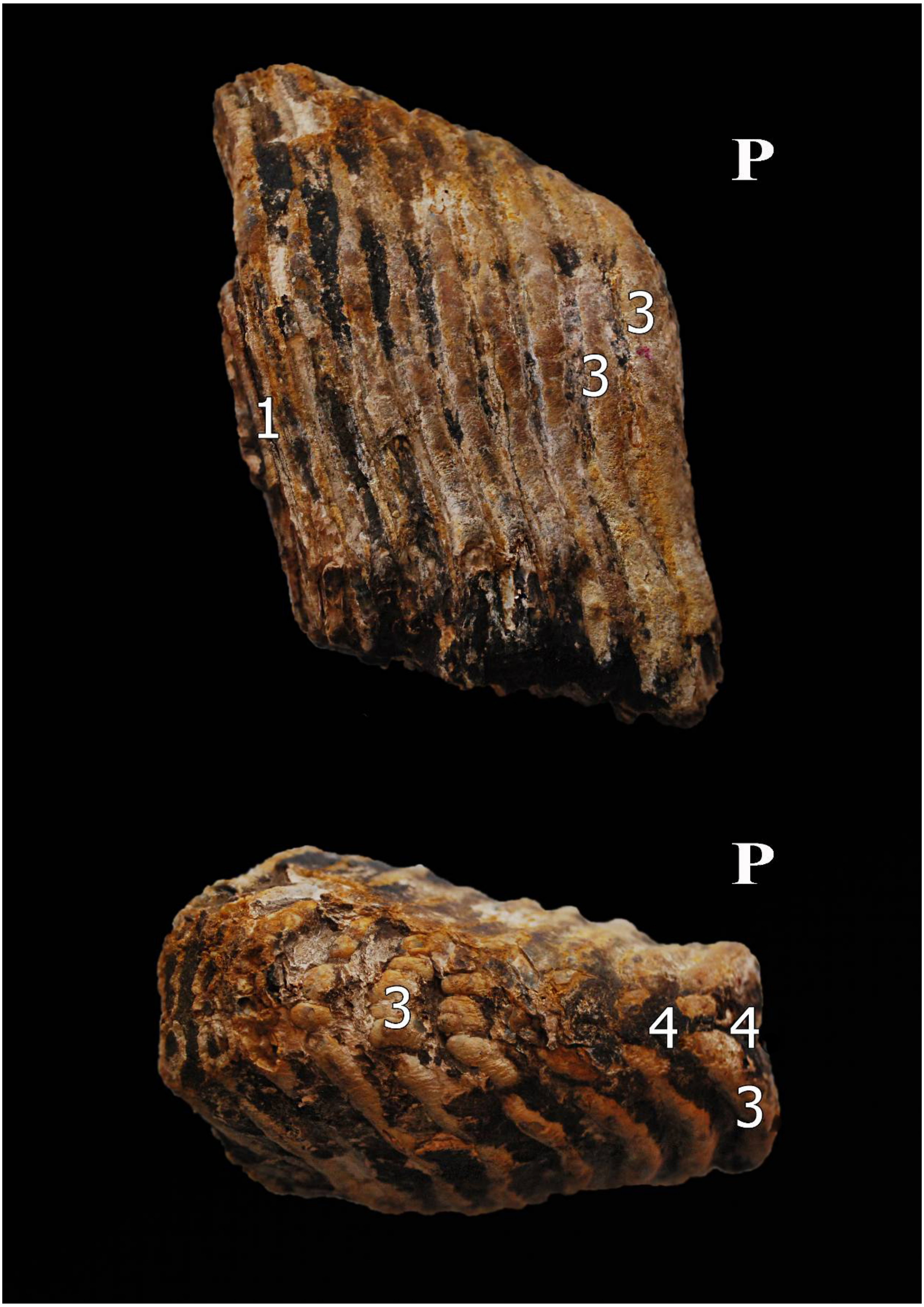

Fig. 8. Molar (MŚO/P/4944): 1 – enamel, 3 – dental plates, 4 – pulp, P – proximal end (photo by K. Kardynał).

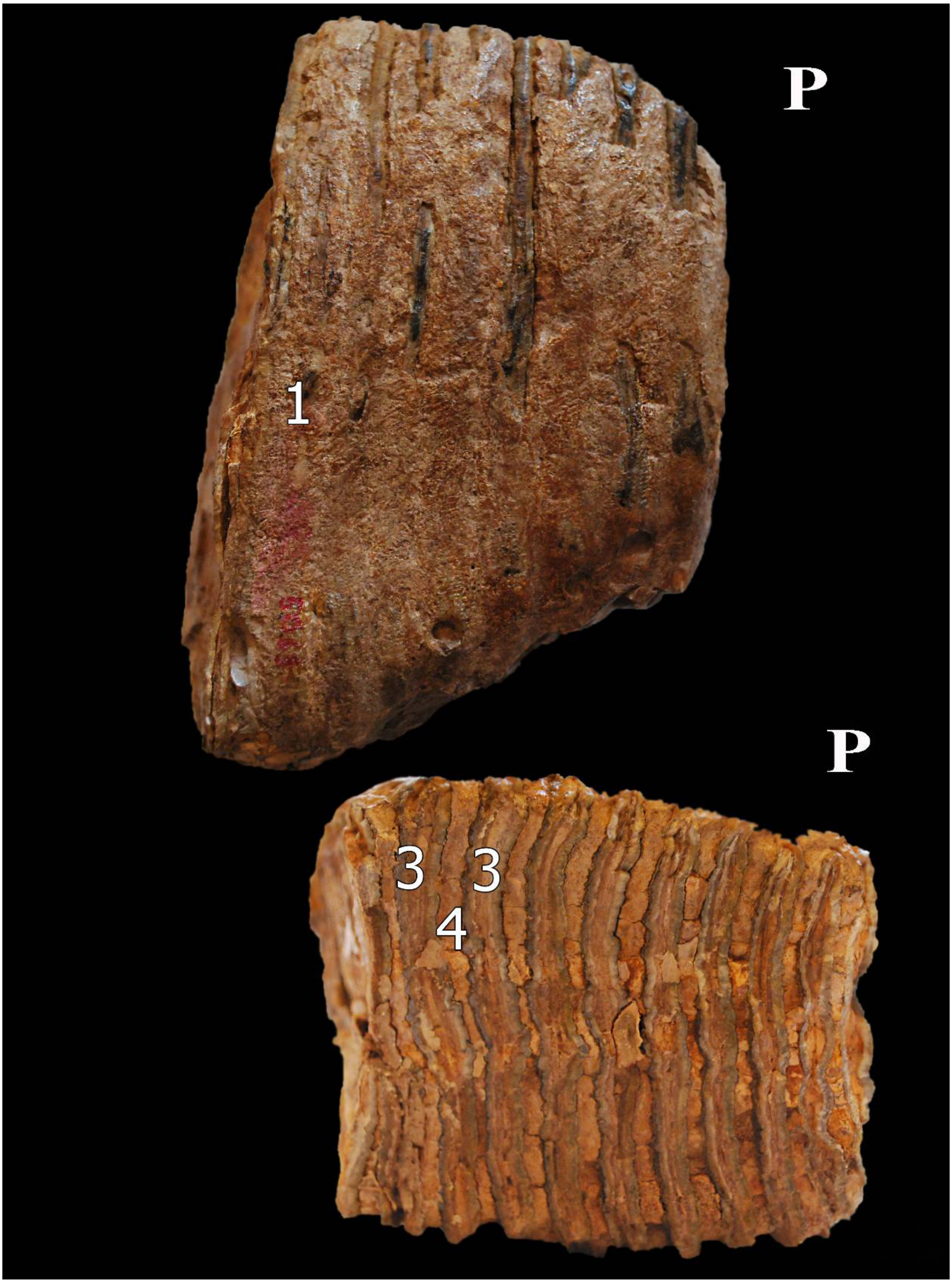

Fig. 9. Molar (MŚO/P/5069): 1 – enamel, 3 – dental plates, 4 – pulp, P – proximal end (photo by K. Kardynał).

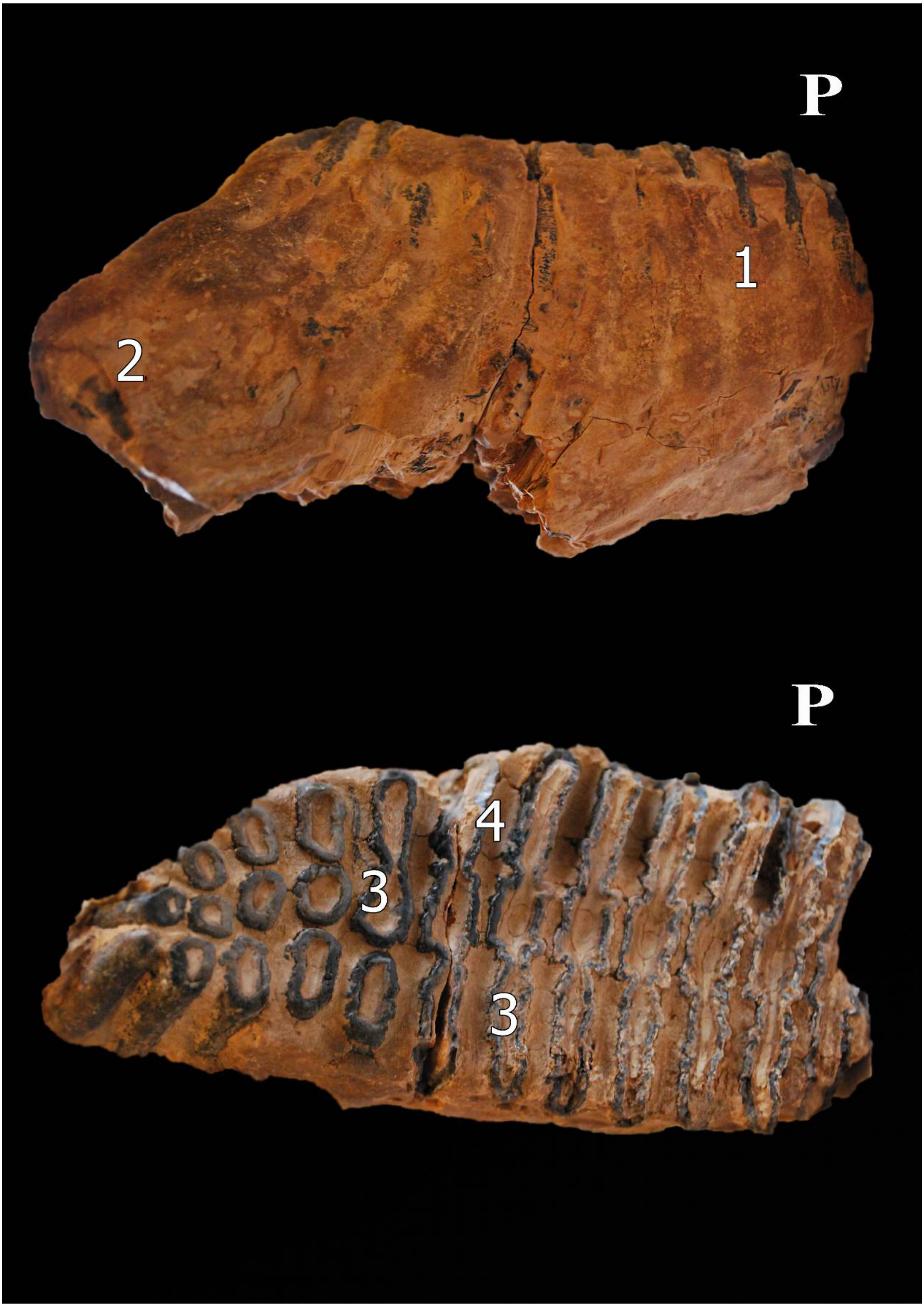

Fig. 10. Molar (MŚO/P/5268): 1 – enamel, 2 – root, 3 – dental plates, 4 – pulp, P – proximal end (photo by K. Kardynał).

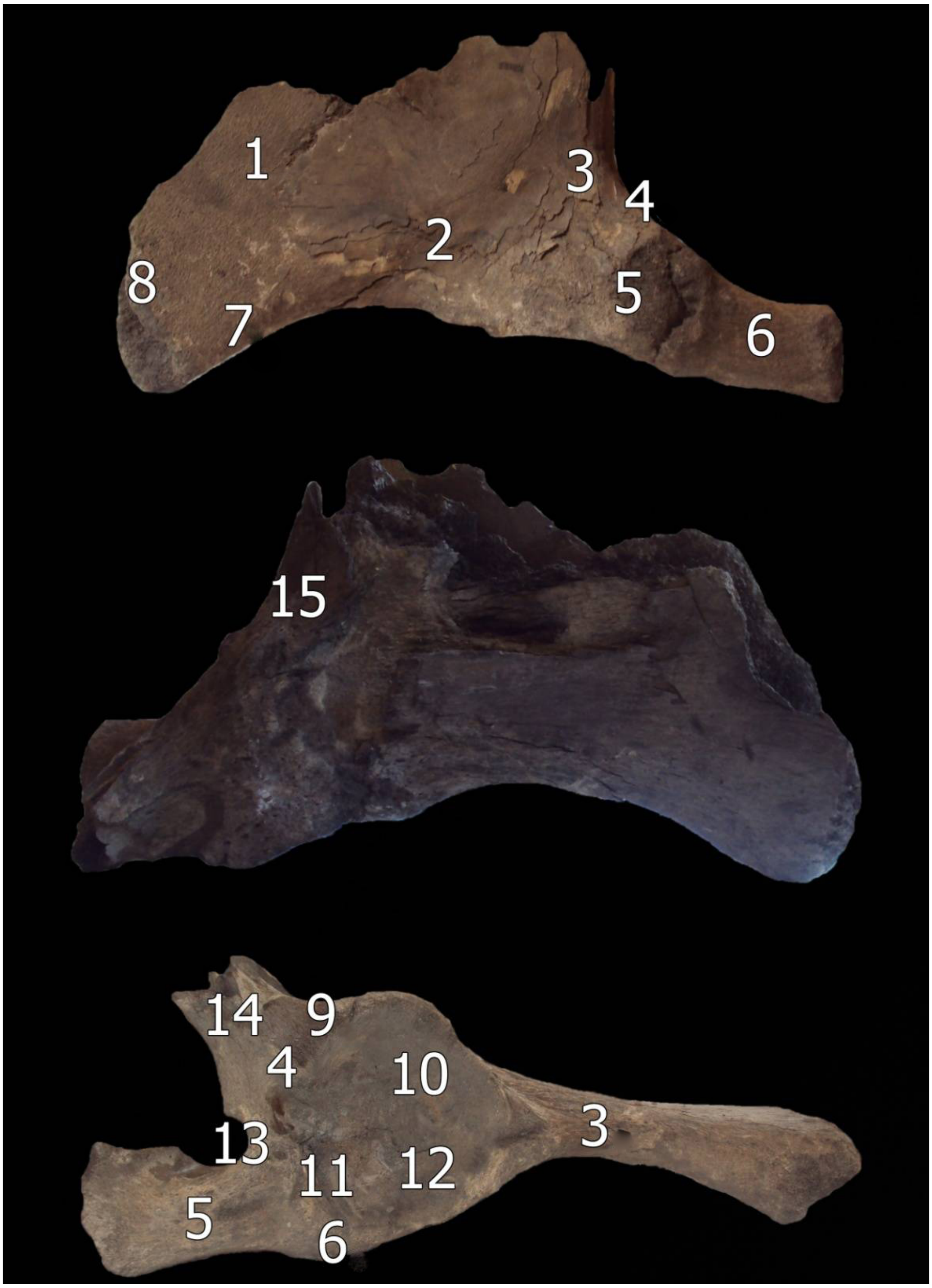

Fig. 11. Pelvis (MŚO/P/8466/1): 1 – wing of ilium, 2 – thigh muscle area, 3 – body of ilium, 4 – ischial spine, 5 – cranial branch of pubis , 6 – body of pubic bone, 7 – hip, 8 – iliac crest, 9 – body of ischium, 10 – acetabulum, 11 – lunate surface, 12 – acetabular fossa, 13 – acetabular notch, 14 – tabular of ischium, 15 – greater sciatic notch (photo by K. Kardynał).

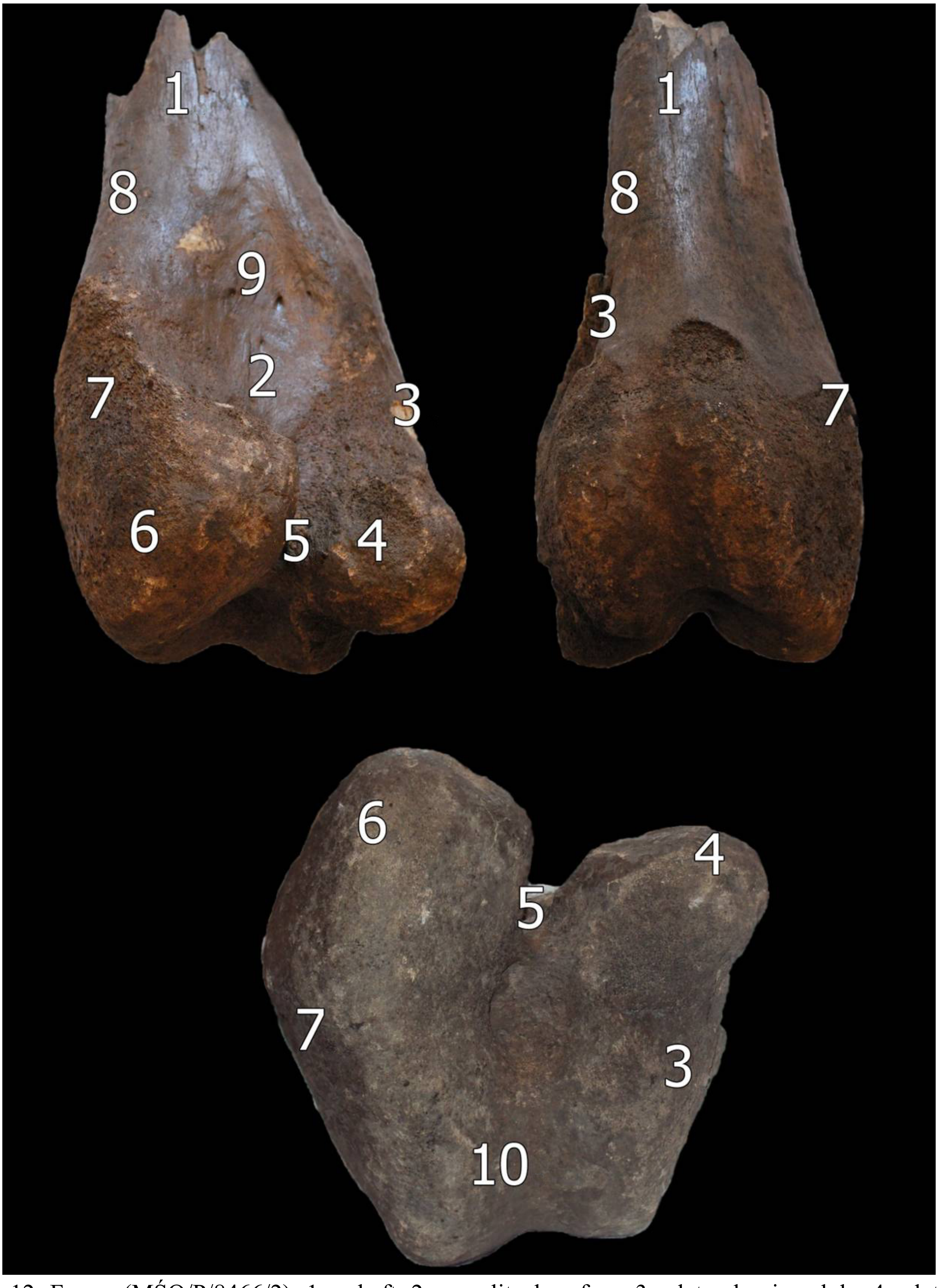

Fig. 12. Femur (MŚO/P/8466/2): 1 – shaft, 2 – popliteal surface, 3 – lateral epicondyle, 4 – lateral condyle, 5 – intercondylar fossa, 6 – medial condyle, 7 – medial epicondyle, 8 – lateral surface, 9 – nutrient foramen, 10 – patellar surface (photo by K. Kardynał).

Fig. 13. Scapula (MŚO/P/8466/3): 1 – superior angle, 2 – superior border, 3 – crest, 4 – costal surface (photo by K. Kardynał).

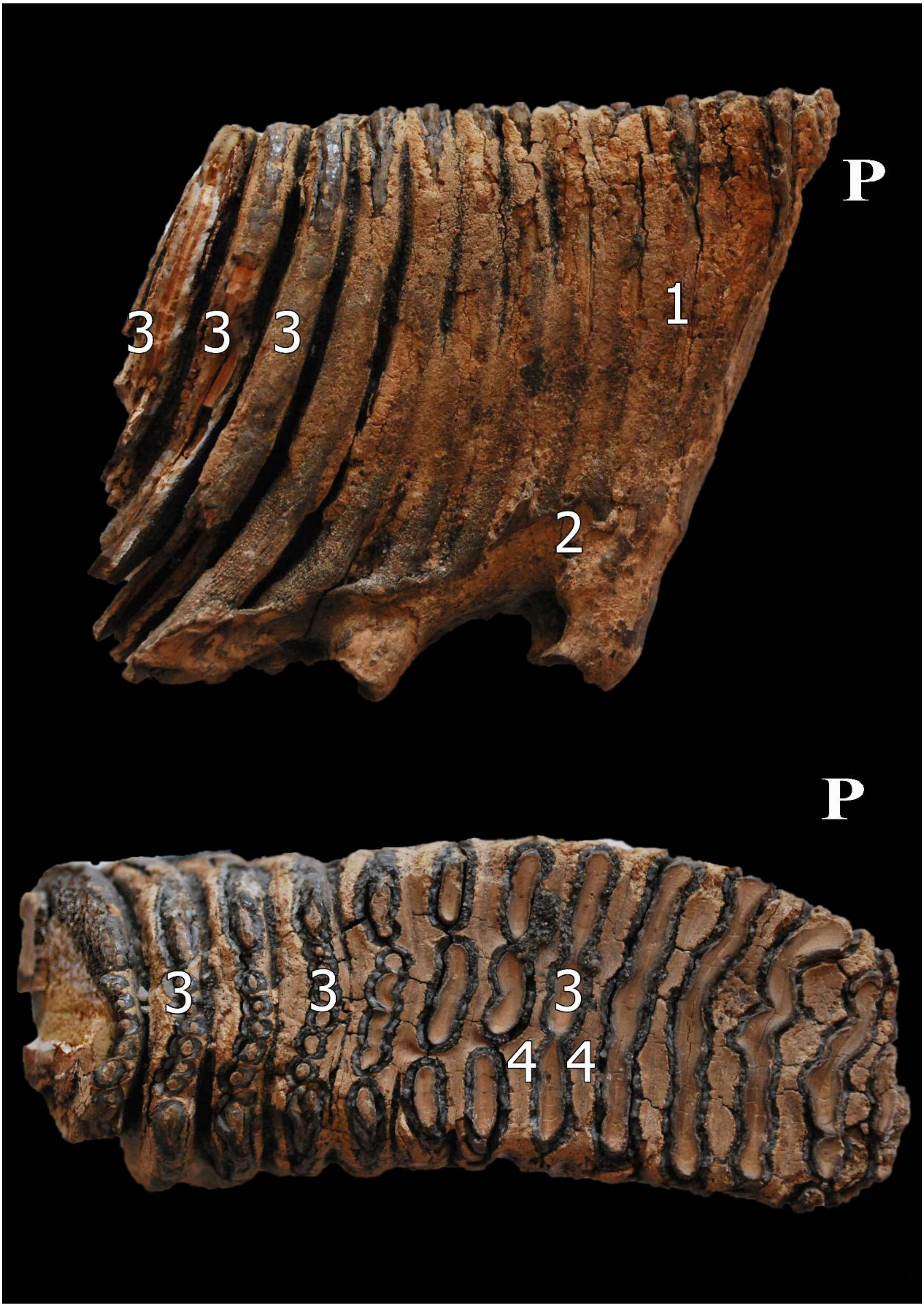

Fig. 14. Molar (MŚO/P/8841/1): 1 – enamel, 2 – root, 3 – dental plates, 4 – pulp, P – proximal end (photo by K. Kardynał).

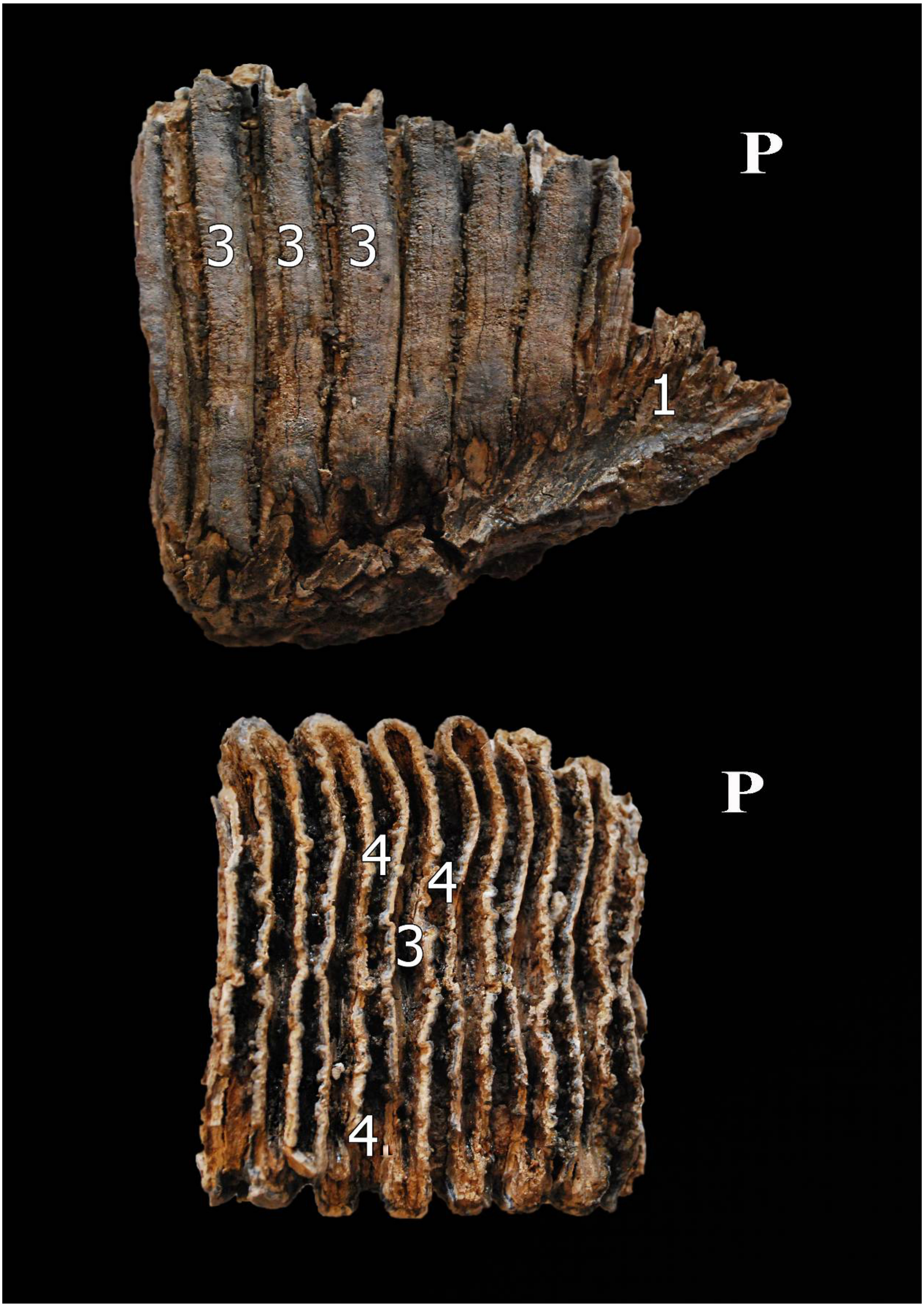

Fig. 15. Molar (MŚO/P/8841/2): 1 – enamel, 3 – dental plates, 4 – pulp, P – proximal end (photo by K. Kardynał).

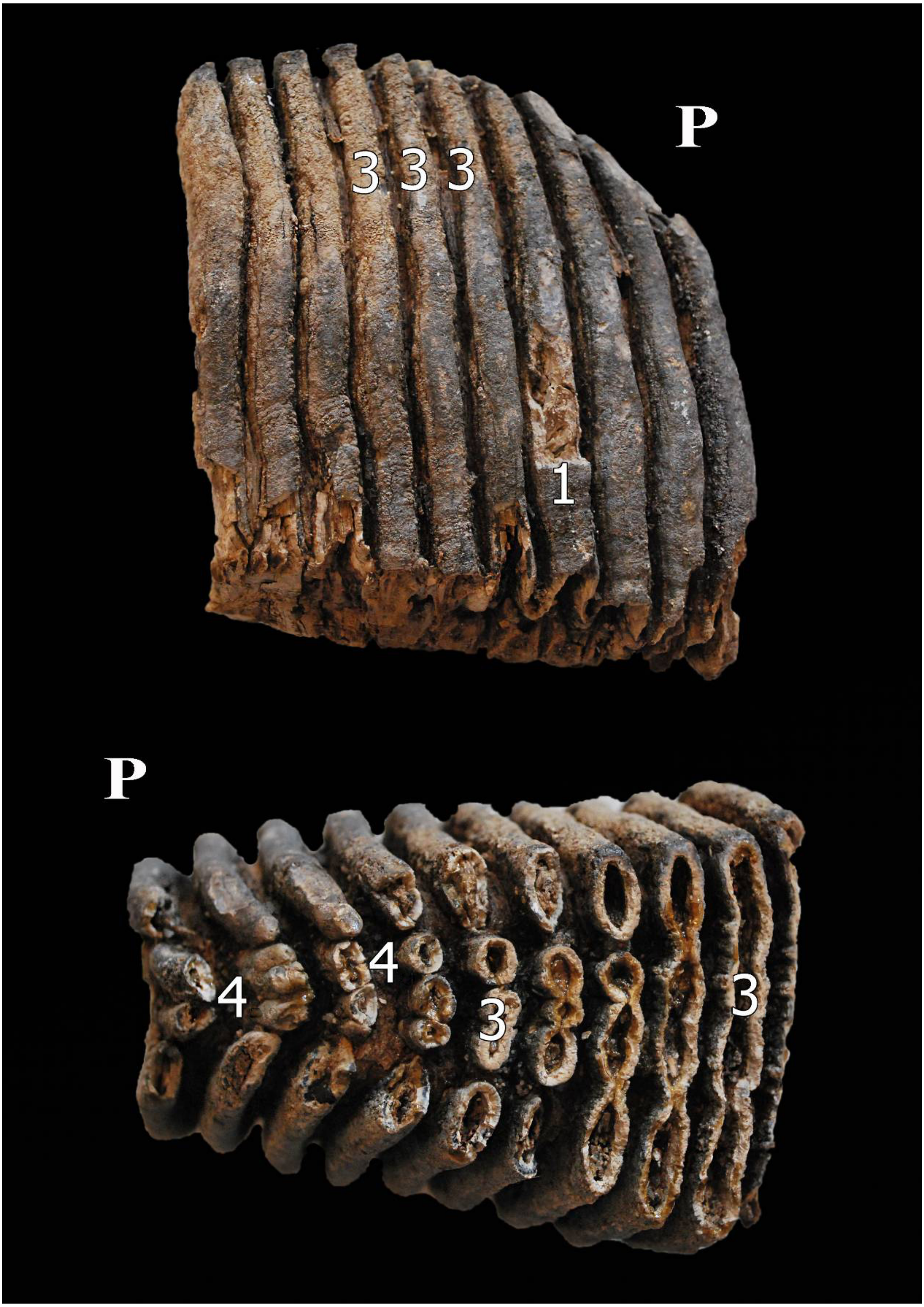

Fig. 16. Molar (MŚO/P/8841/3): 1 – enamel, 3 – dental plates, 4 – pulp, P – proximal end (photo by K. Kardynał).

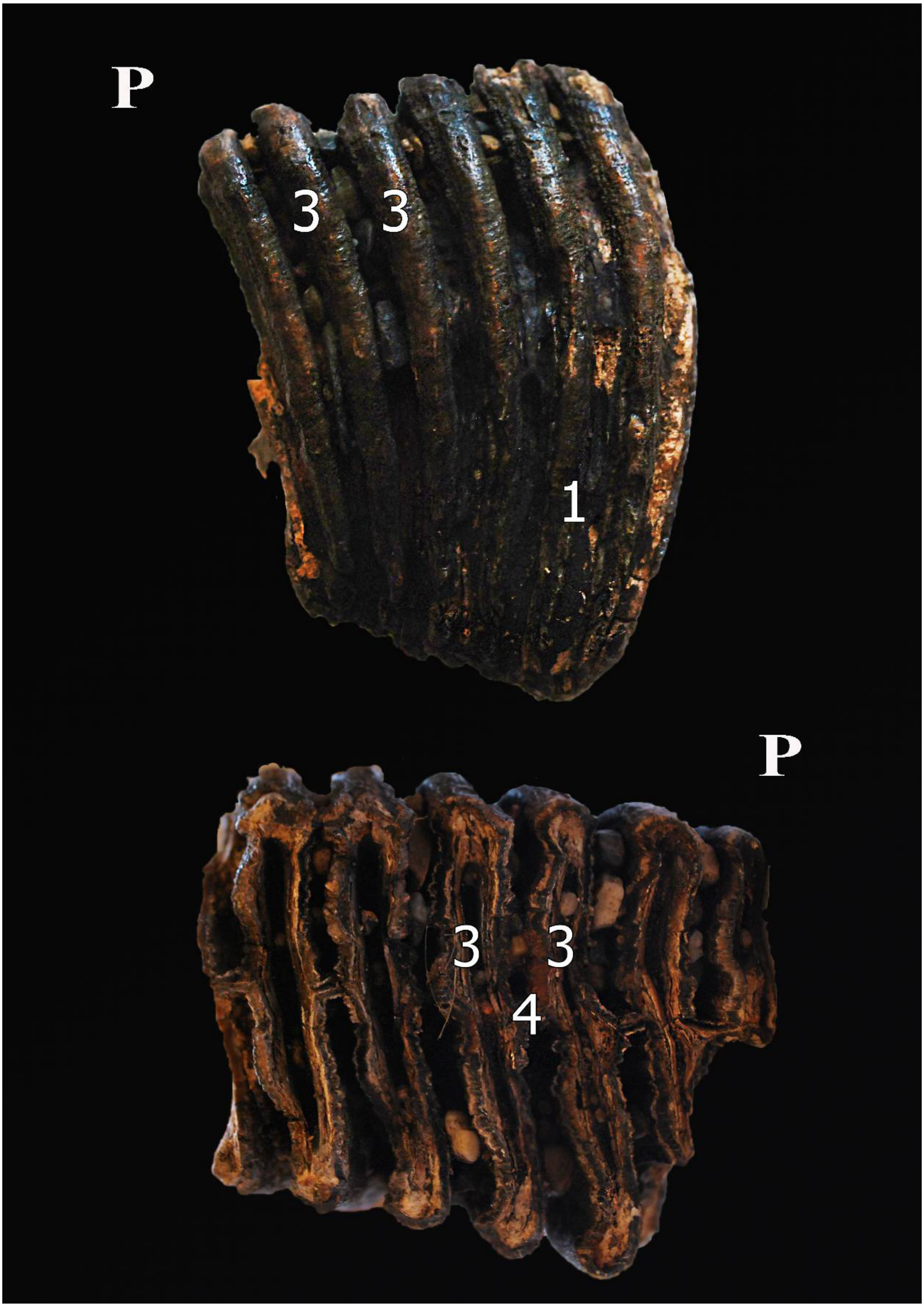

Fig. 17. Molar (MŚO/P/8841/4): 1 – enamel, 3 – dental plates, 4 – pulp, P – proximal end (photo by K. Kardynał).

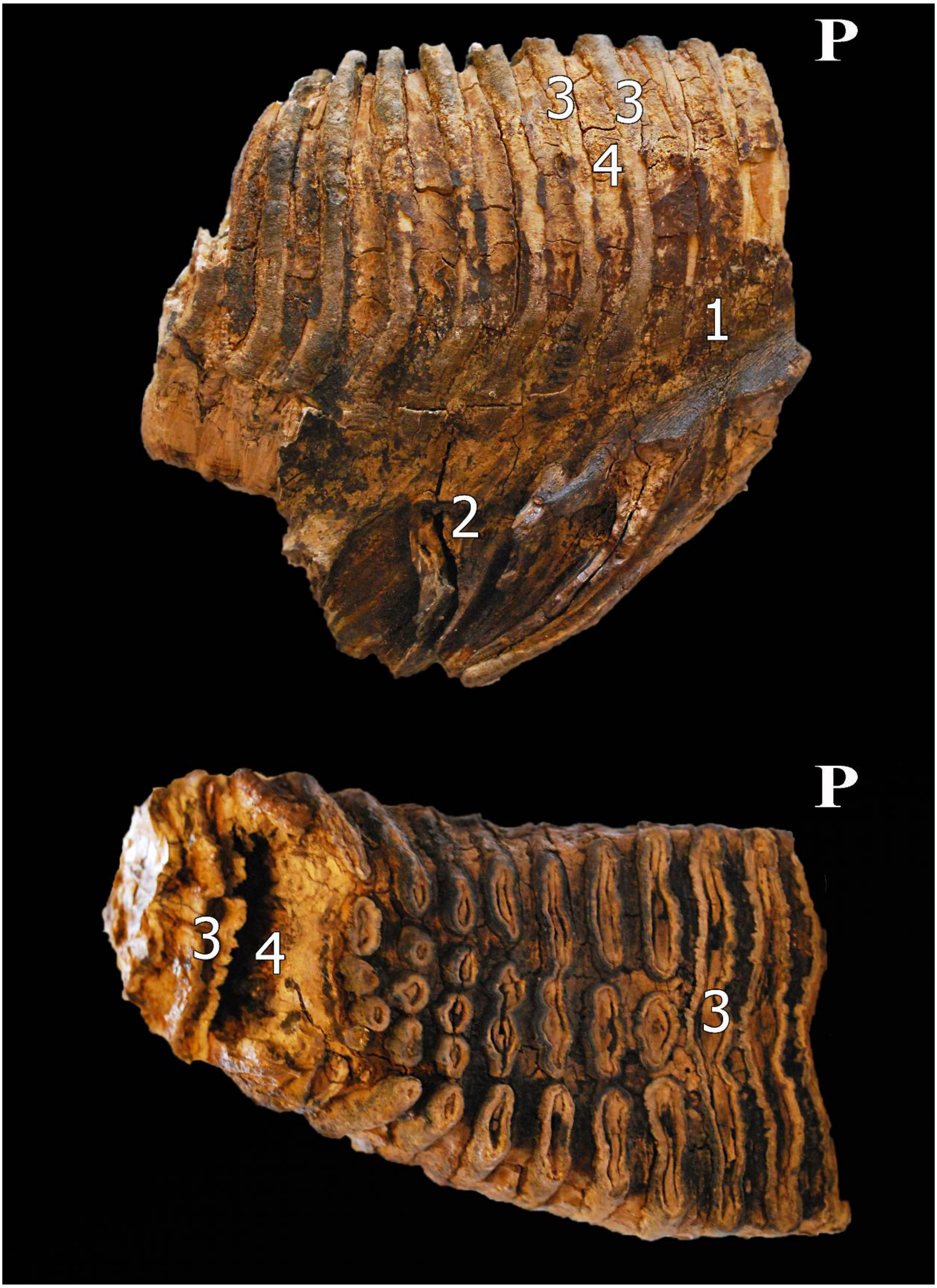

Fig. 18. Molar (MŚO/P/8841/5): 1 – enamel, 2 – root, 3 – dental plates, 4 – pulp, P – proximal end (photo by K. Kardynał).

Fig. 19. Molar (MŚO/P/8841/6): 1 – enamel, 2 – root, 3 – dental plates, 4 – pulp, P – proximal end (photo by K. Kardynał).

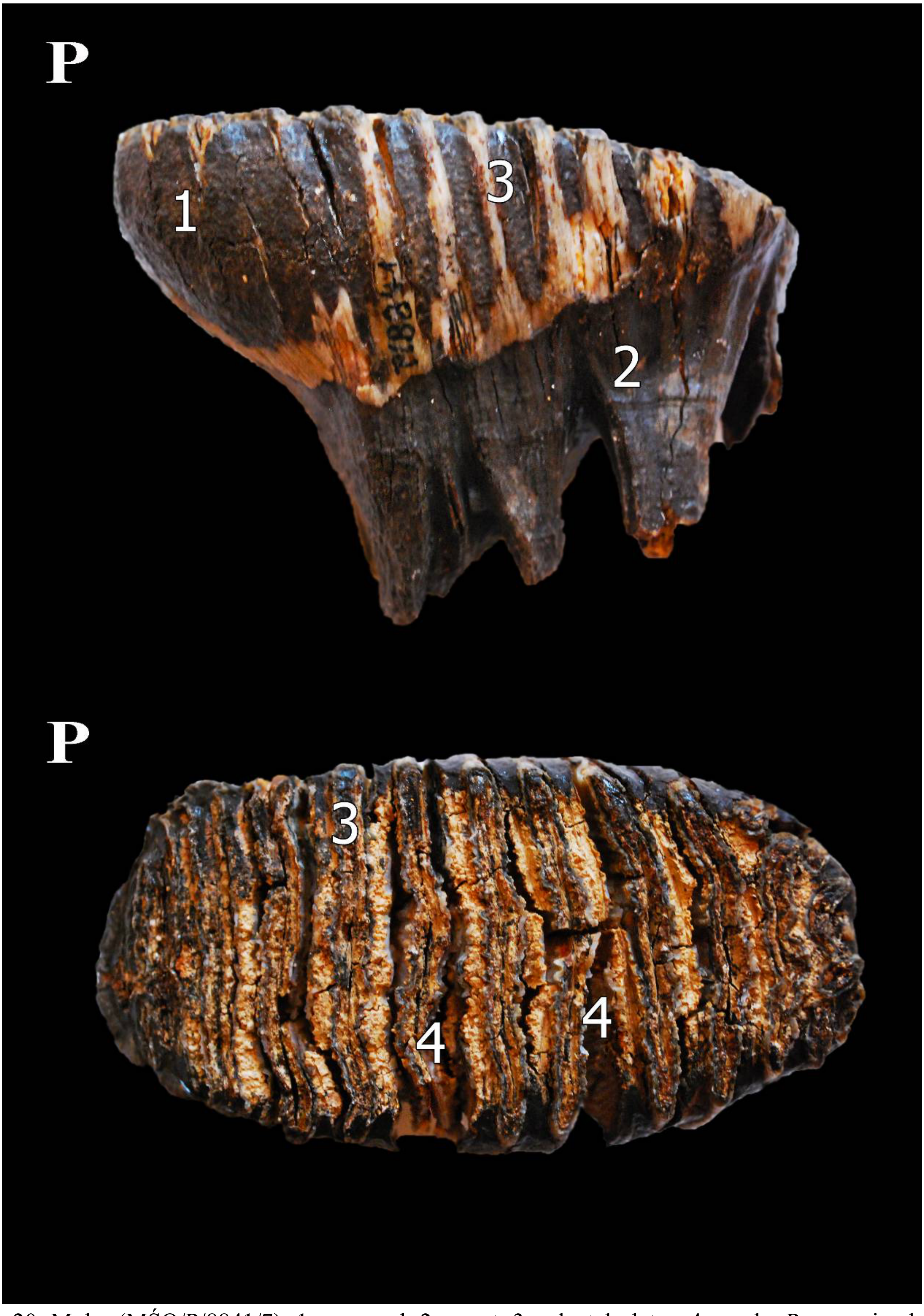

Fig. 20. Molar (MŚO/P/8841/7): 1 – enamel, 2 – root, 3 – dental plates, 4 – pulp, P – proximal end (photo by K. Kardynał).

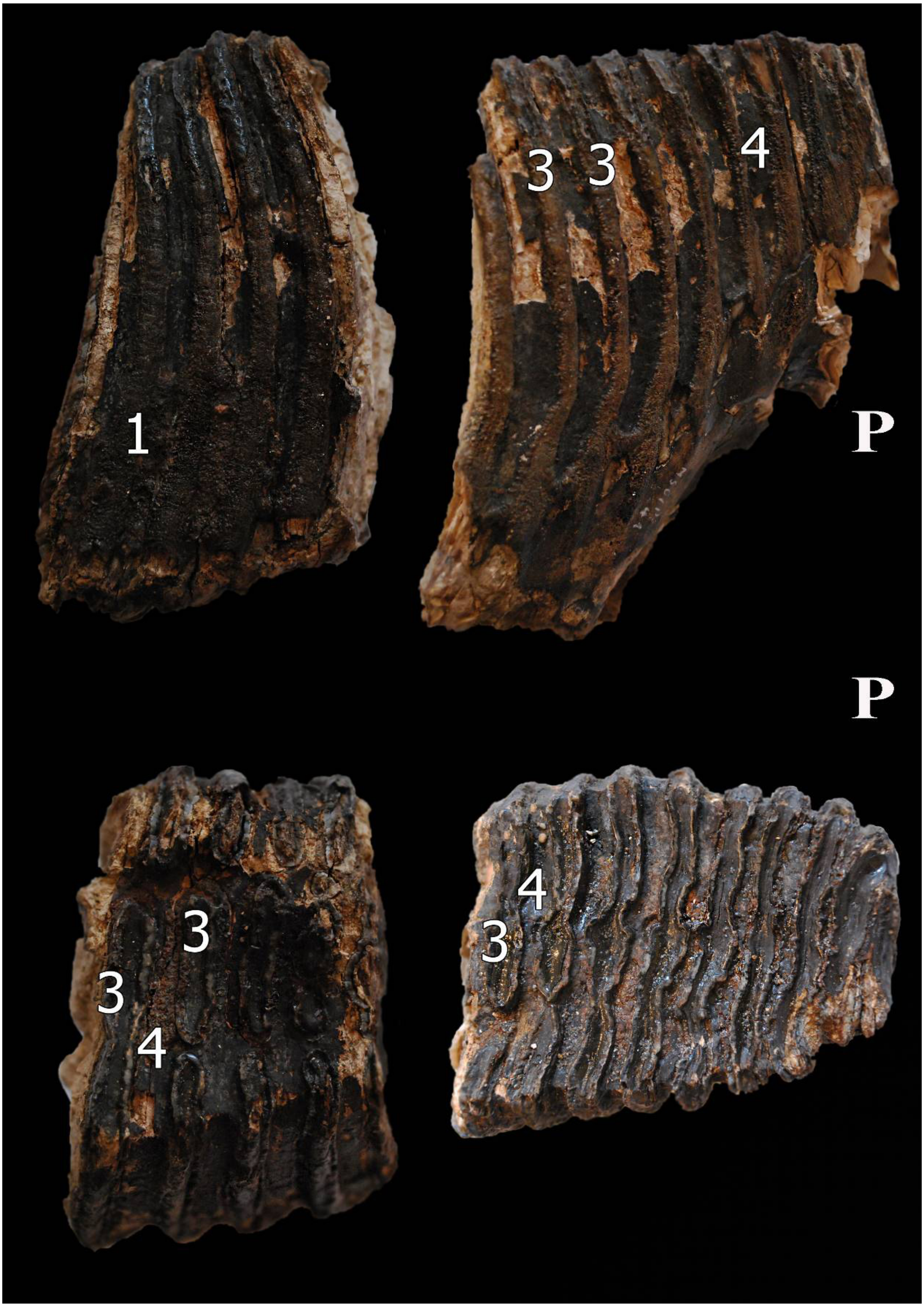

Fig. 21. Molar (MŚO/P/8841/8): 1 – enamel, 3 – dental plates, 4 – pulp, P – proximal end (photo by K. Kardynał).

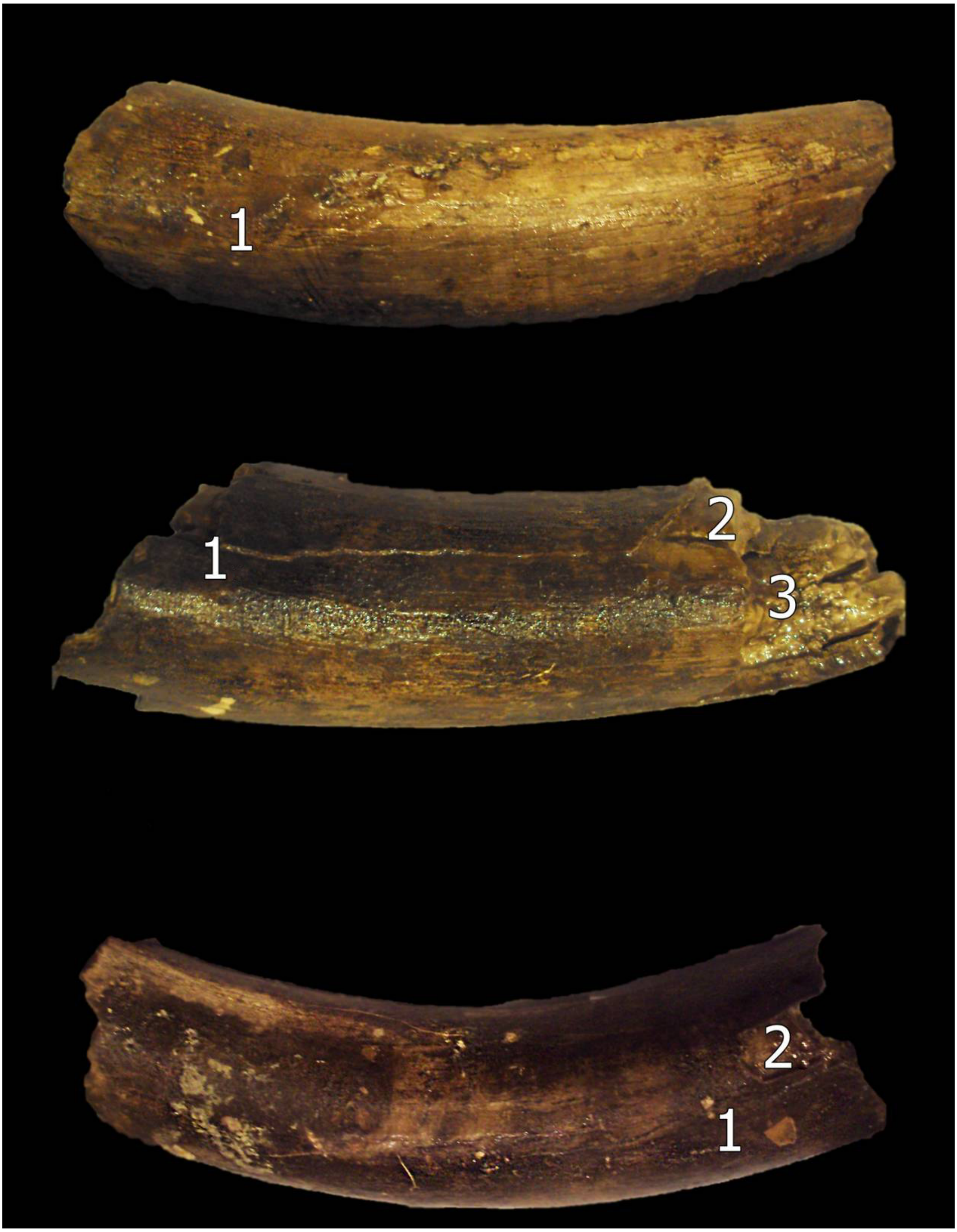

Fig. 22. Tusk (MŚO-A202-1): 1 – enamel, 2 – cement, 3 – crest (photo by K. Kardynał).

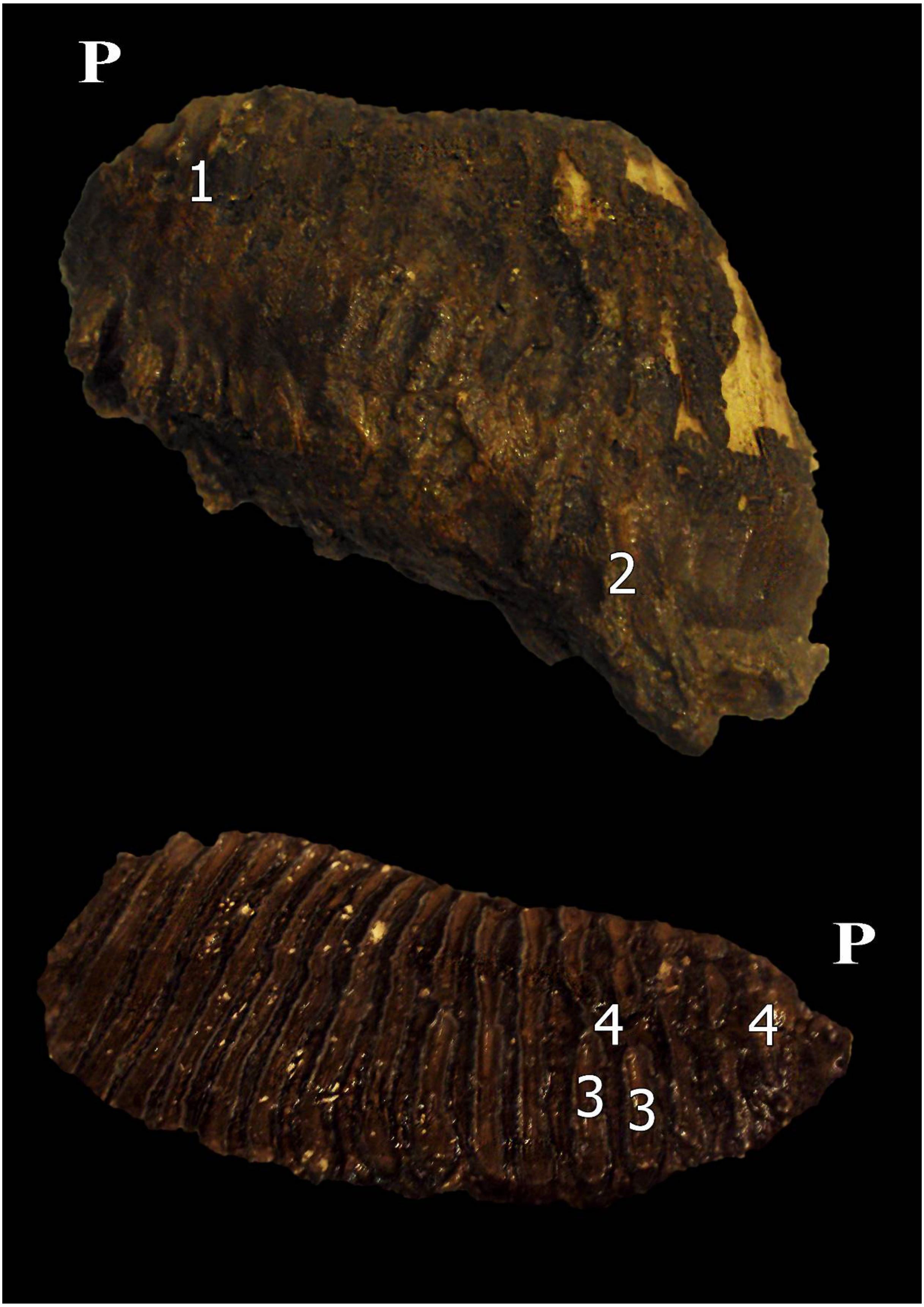

Fig. 23. Molar (MŚO-A-202-2): 1 – enamel, 2 – root, 3 – dental plates, 4 – pulp, P – proximal end (photo by K. Kardynał).

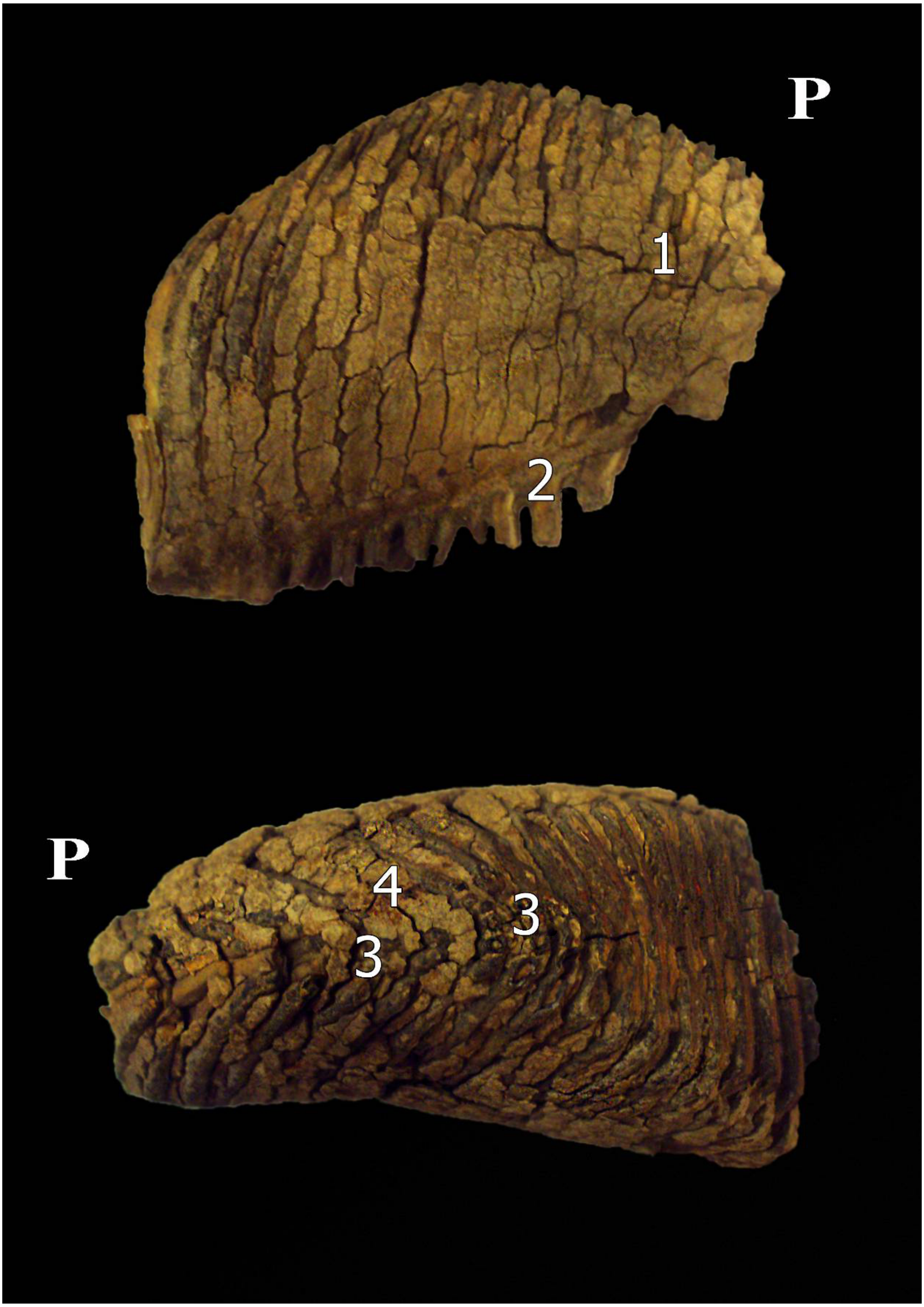

Fig. 24. Molar (MŚO-A-202-3): 1 – enamel, 2 – root, 3 – dental plates, 4 – pulp, P – proximal end (photo by K. Kardynał).

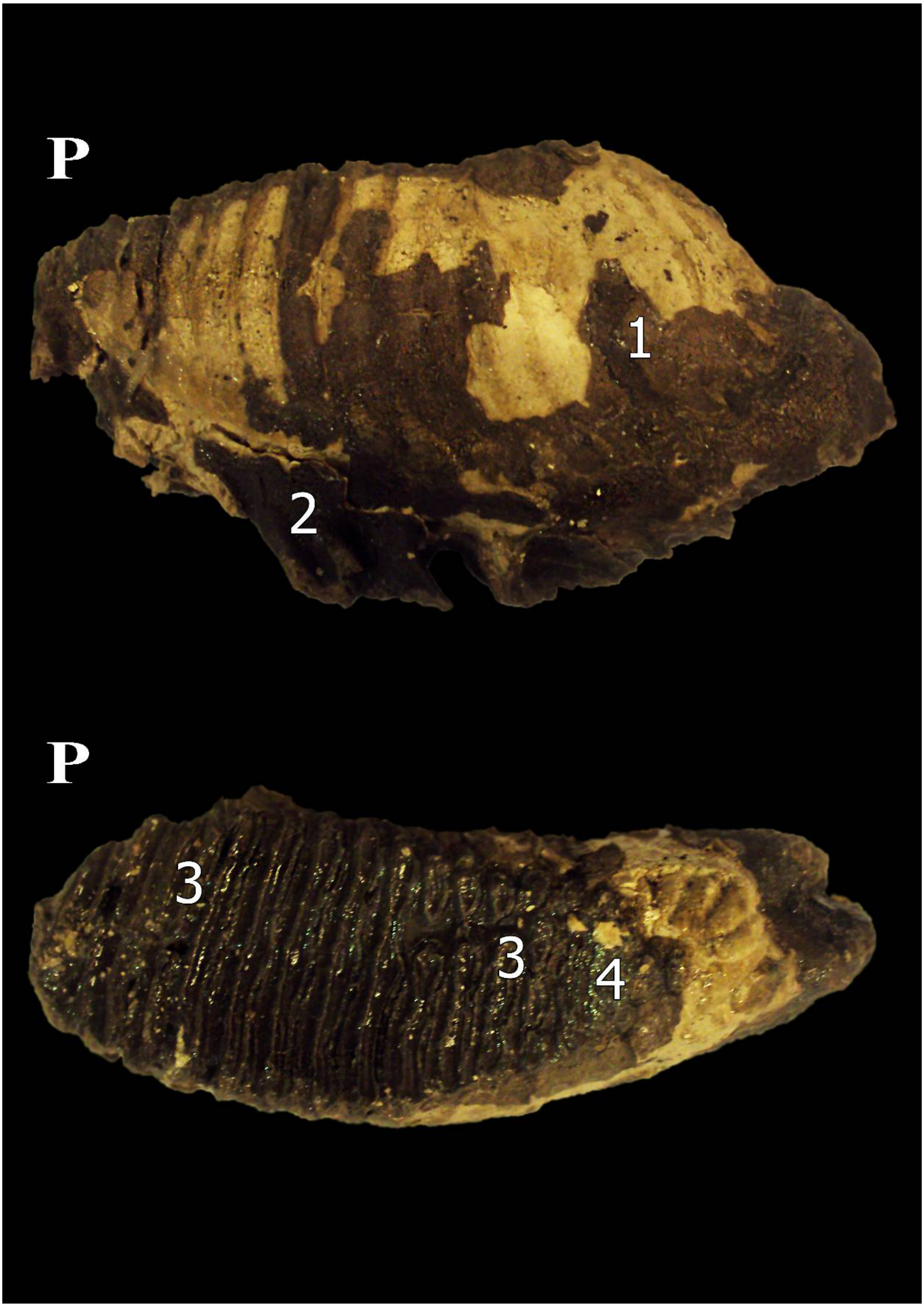

Fig. 25. Molar (MŚO-A-202-4): 1 – enamel, 2 – root, 3 – dental plates, 4 – pulp, P – proximal end (photo by K. Kardynał).

Fig. 26. Mandible (1/KK/2013/UO) (A: dorsal; B: ventral): 1 – base of mandible, 2 – nutrient foramen, 3 – nutrient foramen (probably 2nd), 4 – alveolar part of mandible, 5 – alveolus, 6 – body of mandible, 7 – part of mental, 8 – absence of mental protuberance (photo by Tomasz Ciesielczuk).

Fig. 27. Part of tusk (2/KK/2013/UO) (photo by Tomasz Ciesielczuk).

Fig. 28. Cement with enamel (3/KK/2013/UO) (photo by Tomasz Ciesielczuk).

Fig. 29. Molar (4/KK/2013/UO) (A and C: lateral views; B: occlusal view): 1 – enamel, 2 – root, 3 – dental plates, 4 – pulp, P – proximal end (photo by Tomasz Ciesielczuk).

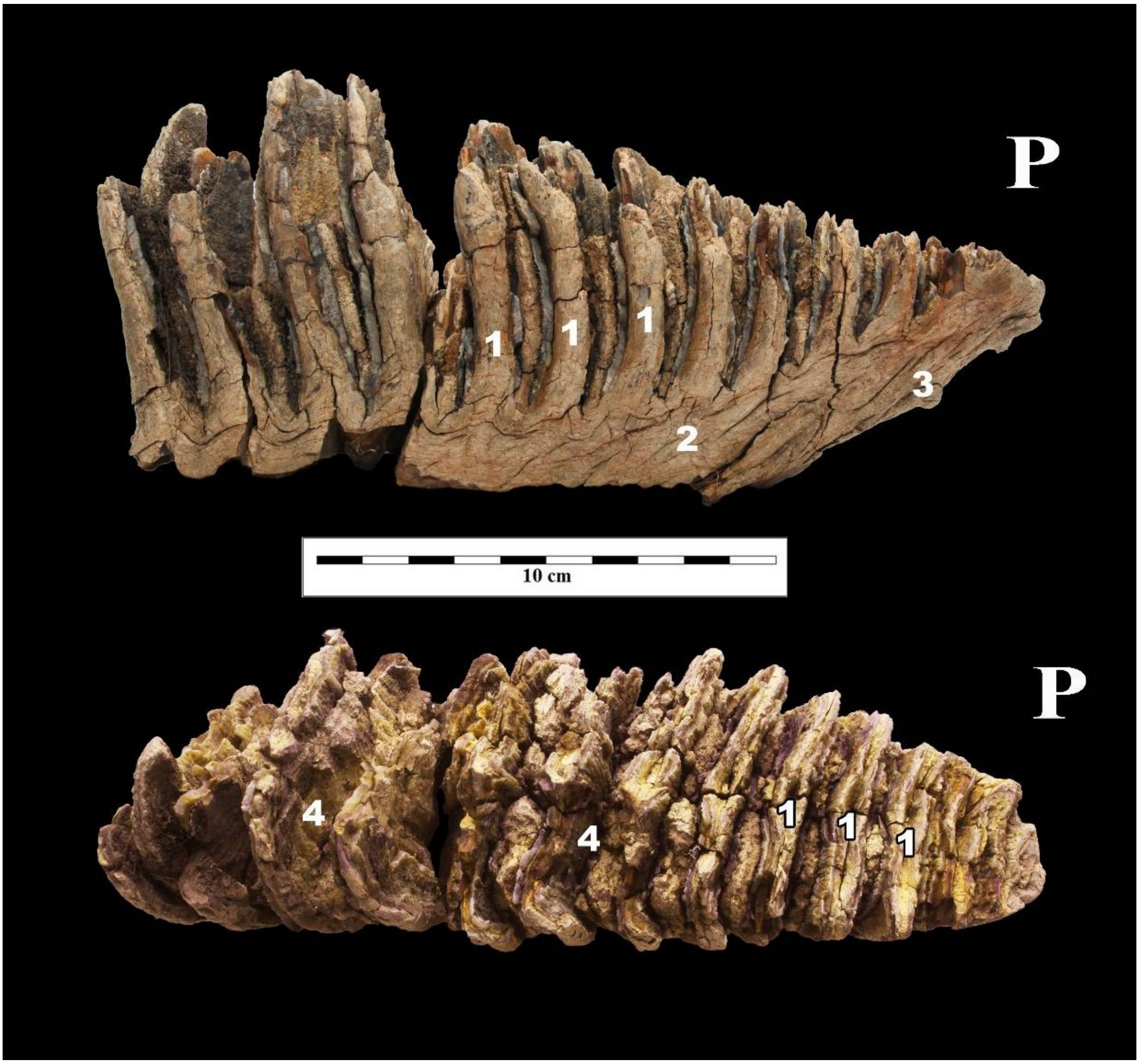

Fig. 30. Molar (3/KK/2014/UO): 1 – dental plates, 2 – corona dentis, 3 – enamel, 4 – pulp, P – proximal end (photo by Tomasz Ciesielczuk).

Table 1. List of mammoth bones and teeth found in the Opole region.

	Number of specimen	Type of bone or teeth	Provenance
1.	MŚO/P/4942	Molar	Unknown (post-German collection)
2.	MŚO/P/4943	Molar	Unknown (post-German collection)
3.	MŚO/P/4944	Molar	Unknown (post-German collection)
4.	MŚO/P/5069	Molar	Unknown (post-German collection)
5.	MŚO/P/5268	Molar	Unknown (post-German collection)
6.	MŚO/P/8466/1	Pelvis	Odra – Groszowice (Opole)
7.	MŚO/P/8466/2	Femur	Odra – Groszowice (Opole)
8.	MŚO/P/8466/3	Scapula	Odra – Groszowice (Opole)
9.	MŚO/P/8841/1	Molar	Brzeg
10.	MŚO/P/8841/2	Molar	Brzeg
11.	MŚO/P/8841/3	Molar	Brzeg
12.	MŚO/P/8841/4	Molar	Brzeg
13.	MŚO/P/8841/5	Molar	Brzeg
14.	MŚO/P/8841/6	Molar	Brzeg
15.	MŚO/P/8841/7	Molar	Brzeg
16.	MŚO/P/8841/8	Molar	Brzeg
17.	MŚO-A-202-1	Tusk	Bielice
18.	MŚO-A-202-2	Molar	Bielice
19.	MŚO-A-202-3	Molar	Bielice
20.	MŚO-A-202-4	Molar	Bielice
21.	---	Molar	Biesiec
22.	---	Molar	Dzierżysław
23.	---	Molar	Dzierżysław
24.	---	Molar	Dzierżysław
25.	---	Molar	Dzierżysław
26.	---	Molar	Dzierżysław
27.	---	Femur	Dzierżysław
28.	1/KK/2013/UO	Mandible	Sand Mine “Kotlarnia” S.A.
29.	2/KK/2013/UO	Tusk	Sand Mine “Kotlarnia” S.A.
30.	3/KK/2013/UO	Cementum with enamel	Sand Mine “Kotlarnia” S.A.
31.	4/KK/2013/UO	Molar	Sand Mine “Kotlarnia” S.A.
32.	3/KK/2014/UO	Molar	Malerzowice Wielkie

Table 2. Measurements of all molars of *Mammuthus primigenius*; in millimeters; where: P – Number of plates, L – Overall length, W- Maximum width, H – Maximum crown height, LF – Lamellar frequency, ET – Enamel thickness, HI – Hypsodonty index.

Number of specimen	P	L	W	H	LF	ET	HI
MŚO/P/4942	7X	170.0+	60.0^{9}	110.0^{6}	7	0.7–1.0	183.3
MŚO/P/4943	10X	140.0	50.0^{3}	130.0^{14}	9	0.3–0.5	260.0
MŚO/P/4944	X3+	150.0+	90.0^{9}	155.0^{1}	3	0.5–0.7	172.2
MŚO/P/5069	+8+	90.0+	90.0^{8}	145.0^{8}	8	0.5–0.7	161.1
MŚO/P/5268	+6X	120.0+	55.0^{2}	120.0^{6}	6	1.0–1.3	218.2
MŚO/P/8841/1	5X	140.0+	60.0^{12}	145.0^{1}	5	1.7–2.0	241.7
MŚO/P/8841/2	X2+	125.0+	100.0^{6}	135.0^{5}	2	1.3–1.5	135.0
MŚO/P/8841/3	+5+	120.0+	100.0^{1}	135.0^{10}	3	1.7–2.0	135.0
MŚO/P/8841/4	+6+	95.0+	90.0^{6}	135.0^{6}	6	1.8–2.1	150.0
MŚO/P/8841/5	+5X	155.0+	85.0^{1}	165.0^{4}	5	1.7–1.9	194.1
MŚO/P/8841/6	+6X	200.0+	70.0^{1}	155.0^{3}	6	1.5–1.9	221.4
MŚO/P/8841/7	X9X	110.0	55.0^{4}	85.0^{4}	9	0.7–1.0	154.5
MŚO/P/8841/8	7X+	195.0+	80.0^{10}	140.0^{13}	7	0.9–1.3	175.0
MŚO-A-202-2	X12	245.0+	90.0^{12}	235.0^{12}	7–8	1.3–1.7	261.1
MŚO-A-202-3	X7+	230.0+	110.0^{15}	230.0^{8}	6–7	1.3–1.7	209.1
MŚO-A-202-4	+7X	330.0+	70.0^{2}	170.0^{13}	6–7	1.5–1.8	242.9
4/KK/2013/UO	+5+	45.0+	65.0^{5}	65.0^{5}	5	0.7–1.0	100.0
3/KK/2014/UO	12+	221.0+	62.0^{11}	99.0^{12}	6–7	1.8–2.0	159.7

Table 3. Measurements of the fragmentary right pelvis; in millimetres.

Number of specimen	Width of ilium wing	Minimum width of ilium shaft
MŚO/P/8466/1	570.0	110.0

Table 4. Measurements of right femur; in millimetres.

Number of specimen	Shaft length	Smallest shaft width	Kneecap facet width	Bloc width	Medio-lateral and antero-posterior diameters of distal shaft end
MŚO/P/8466/2	460.0	170.0	100.0	200.0	210.0 230.0

Table 5. Measurements of scapula; in millimetres.

Number of specimen	Length	Width	Height
MŚO/P/8466	270.0 - 280.0	135.0 – 300.0	75.0

Table 6. Measurements of all mammoth tusks; in millimetres (Pulp cavity depth not measured – see comment in the Materials and Methods).

Number of specimen	Length	Maximum transverse diameters (vertical/horizon tal)	Transverse diameters of dentine tusk dip (vertical/horizon tal)	Width/length of depression on inner surface of tusk
MŚO-A-202	A: 620.0 B: 480.0 C: 470.0	180/170.0 150/130 120/100	- - -	No depression
2/KK/2013/UO	305.0	50.0/49.0	30.0/34.0	No depression

Table 7. Measurements of mandible; in millimetres.

Number of specimen	Greatest symphysis width	Symphysis length	Distance between horizontal branches at level of posterior edge of alveoli	Greatest length of lower jaw	Height of horizontal branch under middle of a functional tooth
1/KK/2013/UO	50.0	30.0	55.0	L: 240.0 R: 170.0	L: 50.0 R: 52.0

Table 8. Measurements of part of cement with enamel; in millimetres; where: L – Overall length, W- Maximum width, ET – Enamel thickness.

Number of specimen	L	W	ET
3/KK/2013/UO	155.0	72.0	0.7