Appendix
Petrographic opinion

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OPINION ON THE BOULDER FROM KONIKOWO (ROSTEK)

From the point of petrology the analysed specimen is a mica gneiss (metamorphic rock) displaying apparent directional texture visible to the naked eye, emphasised by the presence of mica sheet (biotite). Mineralogically it is medium-grained (0.2–2 mm), isometric-scaly. The outer (ca 1 cm thick) surface of the boulder is weathered, with visible gold-hued scales of weathered biotite ("fool's gold") and white kaolinised feldspar. Deeper down (in the grooves – photo1) the rock is largely unweathered. The components of the boulder are well visible to the naked eye, and include quartz (glassy, matt, grey-blue), feldspar (whitish-rose) and biotite (black, scaly) – photo 2. The specimen is veined with slender (up to 1 mm) streaks, probably of feldspar. Its light brown colour is secondary resulting from to the presence of iron compounds (a small fragment – less than 5 cm – of limonite with iron hydroxide adhering to one of the faces of the pebble).

The origin of the boulder is glacial, its form typical for this type of environment. Basing on its petrology the specimen belongs to the group of double-mica gneisses (granite gneiss) traceable to Angermannland, northern Sweden, from which area it was transported southward by the glacier not later than ca 15 000 years ago, ie during the younger stages of the Vistula glaciation. Similar boulder fragments commonly occur also within glacial deposits of the penultimate (Warta) glaciation.

The shape of the boulder is irregular. The base, its largest flat surface, is 23 × 21 × 21 × 16 cm, resembles in outline the base of a pressing iron, a form typically seen in erratic boulders. The maximum height of the boulder is 12.5 cm. Its side faces are steeply inclined or vertical, their surface irregular, 12.5 to 5 cm high. The main edges of the stone are rounded.

The boulder surface is not uniform in appearance. Most of it (much of the base, two entire largest side faces, half of the upper face) displays signs of natural abrasion: the surface of the stone is smooth, the side surfaces are marked with natural breaks, the edges are gently rounded, the colour of is uniform, light brown, suggesting even weathering. Other natural features include a pattern of streaks, emphasised by the presence of secondary iron compounds (dark brown in hue). It represents the lines where the naturally weakened structure of the boulder more prone to breaking.

Apart from described natural features the boulder surface displays a number of apparently non-natural indentations. The base – its largest surface – its faces these include an oval-shaped (4 × 4.5 cm) and on the other side, elongated indentations (7 × 3 cm) which reach down to the unweathered surface of the stone as may be seen from the change in the hue of the stone at their bottom to grey colour (Photos 1, 2). Other, shallower grooves do not go down as deeply through the outer weathered layer. In general both of the shorter faces of the base may be seen to be heavily weathered. More or less at 2/3 of the distance between the shorter faces is seen a series of four differently shaped impressions, starting with two small grooves 5.5 × 2 cm, one of them extending down to the unweathered surface of the stone. The longer axes of these grooves are at right angles to the shortest face of the base. Centrally in this series is a 6 × 5 × 1.5 cm indentation with a regular oval outline and well-defined edges, (Photo 2). The next mark is furrow like, 7 × 2.5 –5 cm and follows the line of the series. Its bottom is uneven, varying in depth from 5 to 1.5 cm. The furrow-like mark extends to the adjacent side face of the boulder. None of the described impressions, whether as a system or individually, follow in their orientation the direction of the natural streaks visible on the surface of the boulder base. The upper part of the specimen has a somewhat different morphology. Continuing the axis of the furrow on the side face is a small 2.5 × 2 × 1 cm impression which does not cut through to the unweathered section of the boulder.

By far the most striking of all indentations is the one seen near to the smallest side face of the boulder; in outline it resembles an "impression" of four fingers. The 10 × 8 cm mark is formed of elongated grooves rounded at the ends, cut down to the unweathered rock, with two well-preserved ridges in between. The particular shape of this impression and general morphology of the boulder make it convenient to grip the boulder at this place. When the four fingers of the hand are placed within the grooves, it turns out that that the thumb fits nicely into one of the furrows in the base of the boulder. A grip made at the opposite side of the boulder is not as convenient. The impression fits either both the right and the left hand but the right hand when positioned within the grooves on the upper face the boulder seems to secure a more firm hold and better positioning of the centre of gravity of the boulder.

Geological analysis does not make it possible to determine with any certainty whether the boulder in question served any useful function, was handled by gripping

in the manner described and whether the apparently non-natural impressions have resulted from this way of using it. Nevertheless it is evident that none of the marks in question could have developed due to natural weathering. Their shape is too irregular and variable as is their depth and arrangement which lacks any relationship to the natural lines of weaker resistance or the direction of crystal arrangement. Absence of weathering at the bottom of some of the non-natural impressions suggests that in geological sense they must be of "recent" date postdating the stage of glacial deposition and removal of the boulder from glacial sediments. Double-mica gneiss from Angermannland is a rock of relatively low resistance; its fragments encountered within boulder clays or on the ground surface crumble easily when touched. Rubbing the specimen in question with a finger easily dislodged the less resistant mica. This shows that the boulder could be worked with ease without applying much force. At the same time, its low resistance would have made it a poor choice for a heavy-purpose tool (eg for hammering at hard surfaces).

While it has not been possible to determine conclusively the origin of non-natural impressions on the boulder subjected to examination their character is such to suggest that the specimen had been used by humans in some way and as such may be viewed as an archaeological artefact.