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AMBER TREATMENT WORKSHOPS OF THE RZUCEWO CULTURE IN ŻUŁAWY

Amber treatment workshops of Rzucewo culture communities have been discovered in recent years at the mouth of the lower Vistula in the Żuławy depression. Following morphological, technological and raw material classifications of discovered amber relics, the author discussed ceramic, flint and stone finds. Reconstructions of the production process of various forms of amber ornaments from the late Neolithic in the lower Vistula region have been based on the author's findings and on experimental studies. A comparative analysis of relics with well investigated assemblages of the Rzucewo culture on the south coast of the Baltic made it possible to date the Żuławy sites to the end of the III and beginning of the II millennium. There occurred in those times significant climatic changes resulting in a rather rapid draining of areas so far covered by the Vistula Gulf. Its western bank line shifted several kilometers to the east. This created advantageous conditions for the development of seasonal settlement of Rzucewo culture groups arriving from morainic plateaus. An inviting factor was the relatively easy access to amber the popularity of which rose rapidly in those times in distant inland areas. This led to the development of an animated barter in amber.

INTRODUCTION

Since the beginnings of the 1960's, the local population carried out a wasteful exploitation of amber in flat excavations on fields and meadows surrounding the State Agricultural Farms at Niedźwiedziówka and Wybicko, commune Stegna, voiv. Elbląg. Information gathered by the Elbląg Conservancy Office in 1981 and a part of materials reclaimed through buying[1] indicate the existence in these regions of Żuławy of archaeological sites from the late Neolithic. The Institute of Archaeology Warsaw University cooperating with the Elbląg Conservancy Office began, therefore, intensive inventory researches and diagnostic excavation studies. Pertinent information was also gathered from the local population including numerous prospectors who discovered amber in archaeological assemblages (and continue searching for it) in the form of large quantities of amber raw material, semi-products, finished ornaments, production waste, flint and stone implements used in amber treatment and sherds. According to their accounts, wooden logs of various thickness have also been found on sites with a particular accumulation of relics.

The relics at Niedźwiedziówka and Wybicko have occurred rather shallow under the surface of the soil. They are most often 50–70 cm deep and only sometimes, in depressions, 1.5 m deep. There are obvious concentrations on insignificant oblong elevations (20–50 cm) along the SW—NE line. There is no doubt that the wasteful exploitation of archaeological sites carried out so far has yielded some scores of kilograms of amber which gives an impression of the abundance of ruined assemblages.

Relics here discussed represent, therefore, only a small proportion of the discovered total. We were able, at least, to determine with some exactness excavation sites. Lots of amber is still hoarded by the local population at Nowy Dwór Gdański and in Gdańsk. Some of the sources here discussed derive from inven-

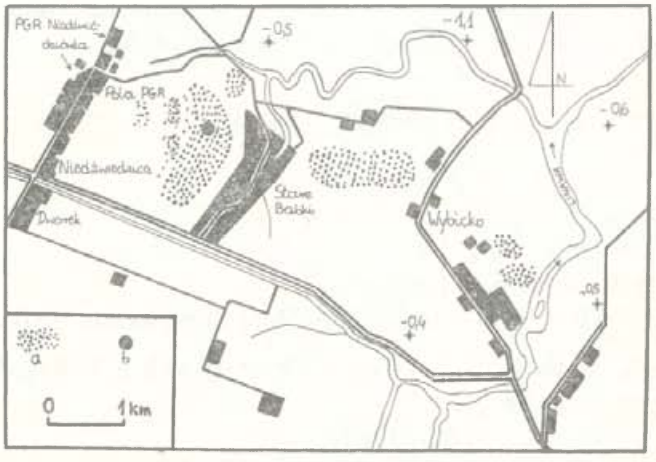

Fig. 1. Position of discussed sites
1 — Niedźwiedziówka, site I; 2 — Wybicko, site I

[1] The author expresses gratitude to Mgr. M. Jagodziński for making purchased relics available (JAGODZIŃSKI 1982).

tory research studies conducted by the author at Niedźwiedziówka in 1981.

The Niedźwiedziówka and Wybicko regions where relics have been found were described respectively as sites I, but they include a succession of sites (Fig. 1) difficult to individuate.

ANALYSIS OF SOURCES

AMBER RELICS

Site I at Wybicko yielded in all 1545 amber relics, site I at Niedźwiedziówka — 729. They included chiefly semi-products of ornaments, production rejects and raw material (Tab. 1). Finished ornaments were unique.

Table 1. A general characteristic of relics from site I at Niedźwiedziówka and site I at Wybicko, voiv. Elbląg

Site	Amber relics			Ceramics weight	Flint and stone relics
	ornaments and semi-products	production waste	raw material		
Niedźwiedziówka, purchased	394	250	44	—	—
as above, from surface research	19	17	5	3.52kg	97
Wybicko, purchased	206	1043	296	—	—
Together	619	1310	345	3.52kg	97

The amber material was classified according to several aspects after a method earlier prepared by the author (Mazurowski 1978; 1983a). The catalogue part of the work includes compilations of particular forms of finished ornaments and semi-products.

Since analysed assemblages include forms not mentioned in the earlier prepared classification list (Mazurowski 1978; 1983a) a supplement has been appended.

Classification list of amber ornaments from the Stone Age in Poland (the so-called south Baltic or Vistula circle of amber distribution in the Stone Age).

GROUP 1. BEADS

Subgroup A, tubular (Fig. 2).

Class I, cylindrical (lAI):
variant a, long (lAIa),
variant b, short (lAIb).

Class II, of a trapezoid, oblong cross-section (lAII).

Subgroup B, button-shaped (buttons) with a V-shaped opening (fig. 2).

Class I, circular (lBI):
variant a, lenticular cross-section (lBIa),
variant b, flat-convex cross-section (lBIb),
variant c, ornamented on the upper side with a pattern of punctures (lBIc).

Class II, oval (lBII):
variant a, lenticular cross-section (lBIIa),
variant b, flat-convex cross-section (lBIIb).

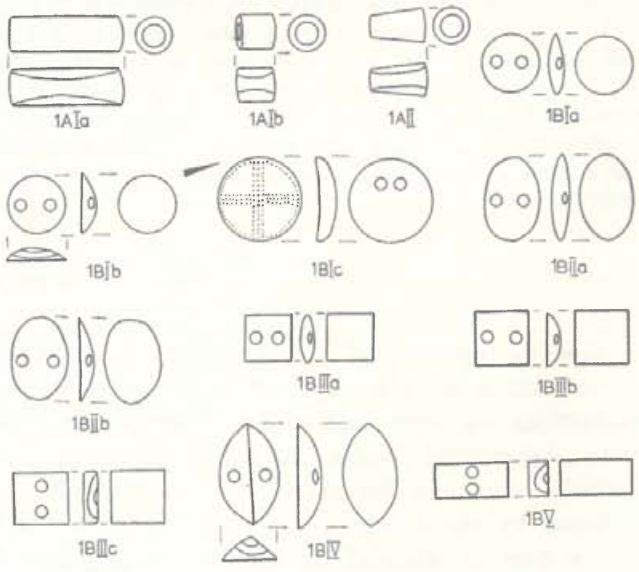

Fig. 2. Schematic sketches of subgroup 1A and 1B beads

Class III, square (lBIII):
variant a, lenticular cross-section (lBIIIa),
variant b, flat-convex cross-section (lBIIIb),
variant c, rectangular cross-section (lBIIIc).

Class IV, elliptic (lBIV).

Class V, rectangular (lBV).

Subgroup C, axe-shaped (Fig. 3).

Class I, double axe-shaped, elongated oval outline (lCI):
variant a, lenticular cross-section (lCIa),
variant b, flat-convex cross-section (lCIb).

Class II, double axe-shaped, rectangular outline (lCII):
variant a, lenticular cross-section (lCIIa),
variant b, flat-convex cross-section (lCIIb).

Class III, claviform-biconoidal (lCIII)

Class IV, axe-shaped with a nodular poll (lCIV).

Class V, quinquelateral axe-shaped (lCV).

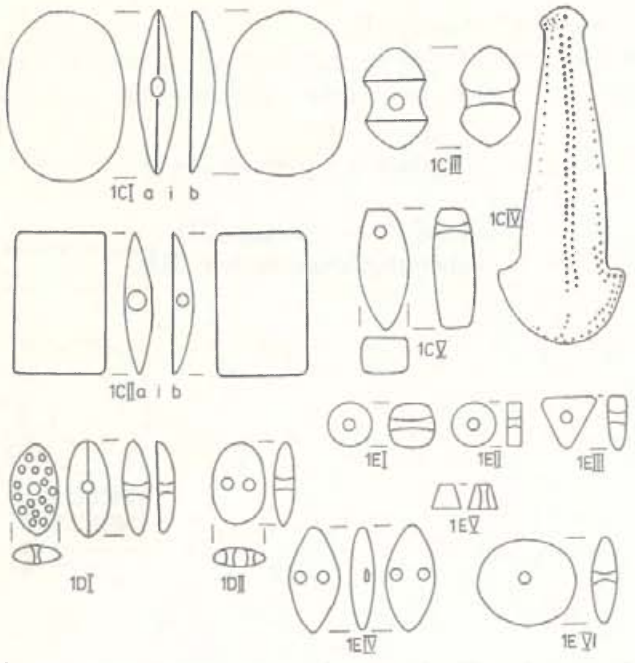

Fig. 3. Schematic sketches of subgroup 1C, 1D and 1E beads

Subgroup D, elongated oval (Fig. 3).

Class I, with a single frontal opening in the central part (lDI).

Class II, with two frontal openings in the central part (lDII).

Subgroup E. Other beads (Fig. 3).

Class I, circular (lEI).

Class II, cylindrical (lEII).

Class III, triangular (lEIII).

Class IV, rhomboid with two openings in the central part (lEIV).

Class V, conoidal (lEV).

Class VI, discoidal (lEVI).

GROUP 2. PENDANTS (Fig. 4)

Subgroup A, asymmetrical (2A).

Subgroup B, symmetrical (2B).

Class I, trapezoid (2BI):

variant a, regular with straight edges (2BIa),

variant b, with convex side edges and a rounded top (2BIb),

variant c, one side edge concave and the other convex (2BIc).

Class II, oval (2BII).

Class III, rectangular (2BIII).

Class IV, triangular (2BIV).

Class V, axe-shaped (2BV).

Class VI, tetragonal with a contraction of side edges near the top (2BVI).

Subgroup C, anthropomorphic (2C).

Subgroup D, zoomorphic (2D).

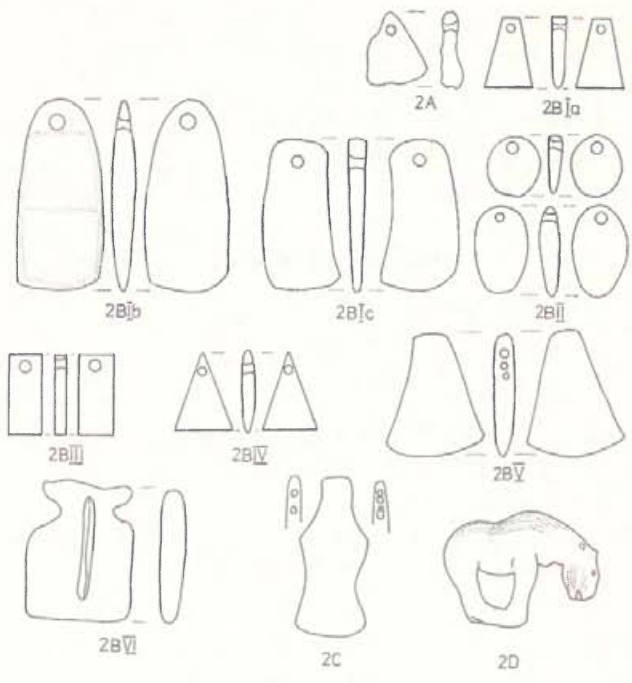

Fig. 4. Schematic sketches of pendants (group 2)

GROUP 3. ORNAMENTS SHAPED AS TETRAGONAL AND OVAL PLATES (Fig. 5)

Subgroup A, with a V-shaped opening.

Class I, rectangular (3AI):

variant a, with openings in each corner on the lower side (3AIa),

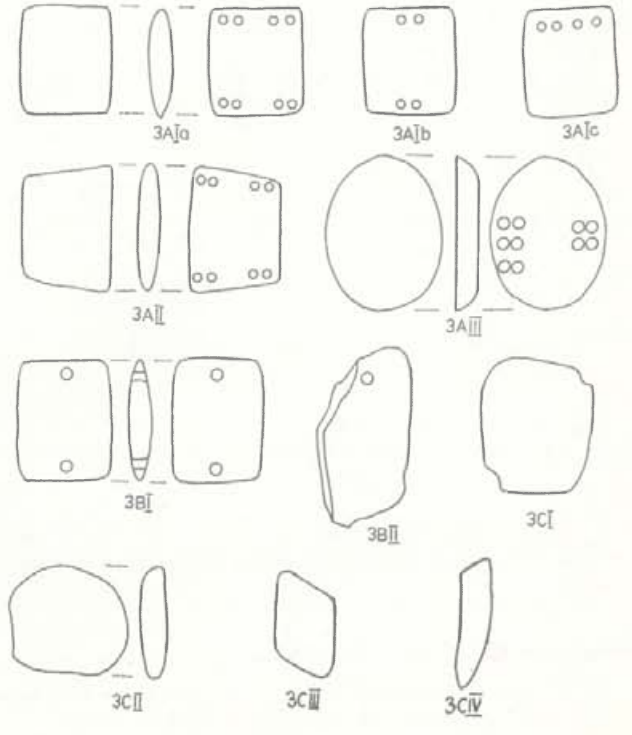

Fig. 5. Schematic sketches of group 3 ornaments

variant b, with one opening at the two shorter edges on the lower side (3AIb),
variant c, with two openings at the shorter edge (3AIc).
Class II, trapezoid (3AII).
Class III, oval (3AIII):
variant a, with openings on the lower side (3AIIIa),
variant b, one outlet of each opening is situated on the lower side, the other on the side edge (3AIIIb).

Subgroup B, with frontal openings.
Class I, rectangular (3BI).
Class II, oval (3BII).

Subgroup C, plates without openings.
Class I, tetragonal (3CI).
Class II, oval (3CII).
Class III, in the shape of parallelograms (3CIII).
Class IV, icicle-shaped (3CIV).

GROUP 4. DISKS WITH OPENINGS IN THE CENTRAL PART (Fig. 6)

Subgroup A, ornamented.
Class I, circular (4AI):
variant a, lenticular cross-section (4AIa),
variant b, flat-convex cross-section (4AIb).
Class II, oval (4AII):
variant a, lenticular cross-section (4AIIa),
variant b, flat-convex cross-section (4AIIb).

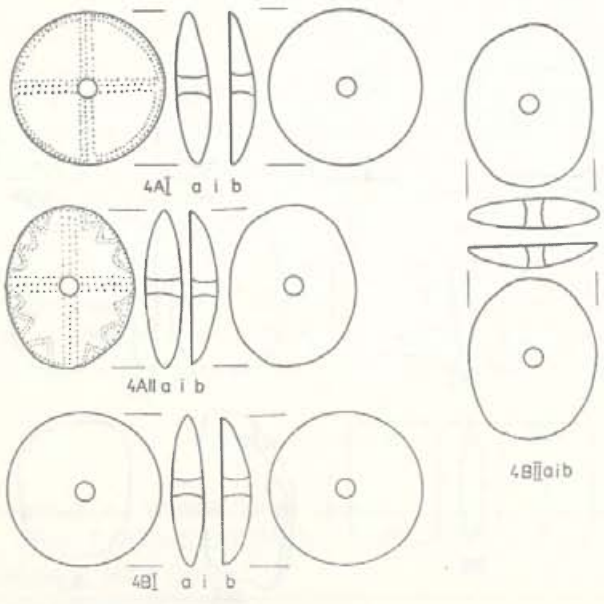

Fig. 6. Schematic sketches of group 4 ornaments (discs)

Subgroup B, without ornament.
Class I, circular (4BI):
variant a, lenticular cross-section (4BIa),
variant b, flat-convex cross-section (4BIb).
Class II, oval (4BII):
variant a, lenticular cross-section (4BIIa),
variant b, flat-convex cross-section (4BIIb).

GROUP 5. RINGS (Fig. 7)

Class I, lenticular cross-section (5I).
Class II, flat-convex cross-section (5II).

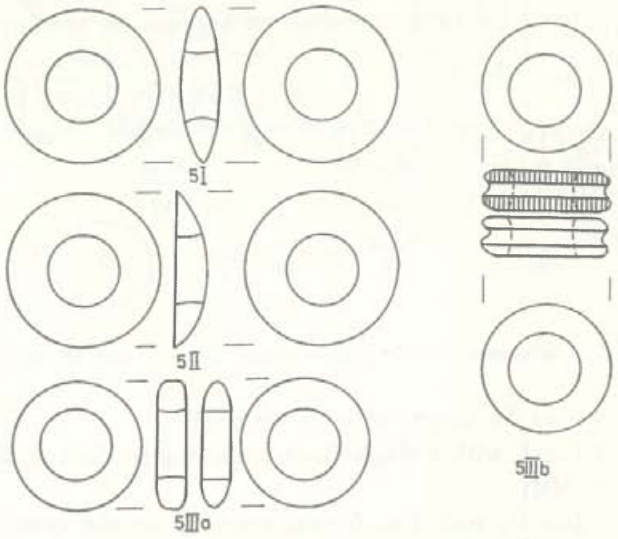

Fig. 7. Schematic sketches of rings (group 5)

Class III, broad, rounded outer edge (5III):
variant a, as above (5IIIa),
variant b, with a longitudinal groove through the centre of the outer edge (5IIIb).

GROUP 6. SEPARATORS (Fig. 8)

Class I, section of a circle (6I).
Class II, rhomboid (6II).

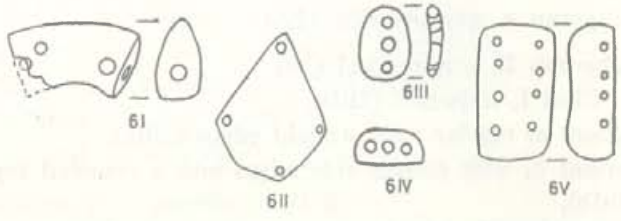

Fig. 8. Schematic sketches of separators (group 6)

Class III, oval (6III).
Class IV, conoidal (6IV).
Class V, rectangular (6V).

GROUP 7. INDETERMINATE ORNAMENTS

This group includes ornaments or their fragments which have lost their original shape due to destruction or damage.

Only some of the forms presented on the classification list appeared on site I at Niedźwiedziówka and site I at Wybicko (Tab. 2). Those relics can also be grouped in particular categories according to the similarity of technological characteristics reflecting the degree of progress of the production process (production classification). A careful analysis of all relics from this aspect will make it possible to reconstruct the process of amber treatment. As will be seen, individuated technological groups (T) correspond to concrete stages of the production cycle.

Table 2. Frequency of particular forms of amber products from Niedźwiedziówka and Wybicko

Form of ornament	Niedźwiedziówka		Wybicko		Together
	n	%	n	%	
1AIa	214	51.8	74	35.9	288
1AIb	—	—	3	1.4	3
1BIa	39	9.4	10	4.8	49
1BIb	—	—	4	1.9	4
1BIIa	72	17.4	32	15.5	104
1BIIb	2	0.4	9	4.3	11
1BII	—	—	20	9.7	20
1BIIIa	1	0.2	—	—	1
1BIIIb	1	0.2	4	1.9	5
1BIV	1	0.2	—	—	1
1B*	30	7.2	—	—	30
1CIa	13	3.1	8	3.8	21
1CIb	1	0.2	—	—	1
1CIIa	26	6.3	14	6.8	40
1CIIb	—	—	2	0.9	2
1EVI	1	0.2	—	—	1
2A	—	—	1	0.4	1
2BIa	—	—	3	1.4	3
2BIII	1	0.2	—	—	1
2BV	—	—	2	0.9	2
4BIa	1	0.2	—	—	1
Group 7	10	2.4	20	9.7	30
Together	413	99,4	206	99,3	619

TUBULAR, CYLINDRICAL BEADS, LONG (lAIa)

These beads, most numerous at both sites (Specif. 1 and 7), comprised 288 objects (214 at Niedźwiedziówka and 74 at Wybicko). The length of lAIa beads is always greater than their diameter (e.g., Fig. 9:1,2,9,10,12,13). This longitudinal cross-section is rectangular or of a similar shape, their transverse cross-section is circular or oval. Pieces used for initial treatment could have a transverse, tetragonal or multilateral cross-section. They are between 13 and 79 mm (pieces 18–33 mm were prevailing) long of a (most frequently) 6–24 mm diameter and 4–8 mm wide opening. Only 2 pieces from Niedźwiedziówka can be acknowledged as finished and suitable for use (Pl. I 2,3), all others are semi-products. As regards the similarity of technological characteristics they form the following groups:

Group TI comprises 128 semi-products lAIa (91 from Niedźwiedziówka and 37 from Wybicko). In relation to the lAIa assemblage of beads this amounts to about

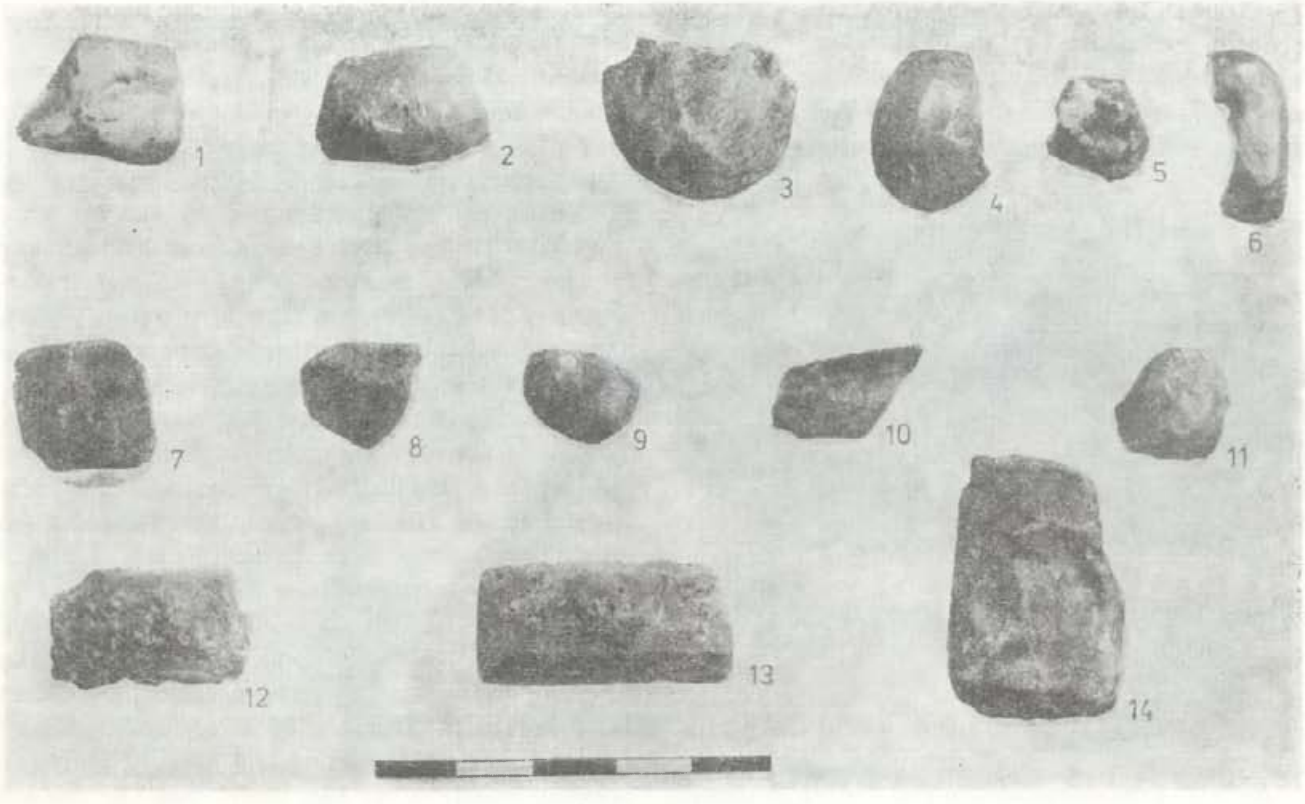

Fig. 9. Niedźwiedziówka, site I. Semi-products of amber ornaments

42.5% at Niedźwiedziówka and 50% at Wybicko). The assemblage includes beads treated initially in various degrees. Their common characteristic is the absence of perforation traces. They can be clearly individuated into 2 subgroups.

Subgroup TIa (69 pieces from Niedźwiedziówka and 26 from Wybicko) embraces the earlierst semi-products fo ms which — with the use of flint implements — were given the semblance of finished beads. Their entire surface or part of it shows numerous, small chipping negatives remaining after treatment. Parts of outer cortex sometimes remained in places without traces of surface treatment. Some pieces, particularly those with a very smooth surface, show traces of cortex not only on lateral planes but also on the two bases. A frequent tetragonal cross-section and an absence of traces of surface polishing was characteristic of subgroup TIa products. Bases on which openings were to be made have not yet been formed or were shaped only initially with flint implements. Traces of grinding on hard pads were discovered on only 3 pieces from Niedźwiedziówka (inv. nos. 9,84 and 147). The first has specific scratches remaining after grinding one of the bases although its cross-section resembles a square, the two opposite faces of the lateral surface are covered with natural cortex, the other base was treated initially by a flint tool (chipping negatives). The other 2 pieces (of one only fragments remained) have carefully ground lateral surfaces but their bases are hardly formed. Three other impressive rudimentary objects from Niedźwiedziówka (inv.nos. 1, 2 and 4, Pl. I31,34,36) were produced by splitting a longitudinal lump of amber weighing about 100 g into 4 parts. The three discovered parts (the fourth is missing) were fitted together and reflexion waves were found to be in concert (Fig. 10).

Fig. 10. Niedźwiedziówka, si. I. Two semi-produced lAIa beads from a split amber lump

Successive spots of strokes made by a hard tool are also noticeable.

Analyses have shown clearly that for the production of beads classified in subgroups TIa as lAIa Neolithic men chose lumps of amber resembling their shape. The splitting of larger lumps was done infrequently. Lumps were more often cut by means of a thread. Relevant traces were noticed on 5 early initial forms from Niedźwiedziówka (inv.nos. 199–203). What is more, 2 of them (inv.nos. 202 and 203) are 2 fitting halfs of the same oval lump of amber (Fig. 11). The characteristic grooves

Fig. 11. Niedźwiedziówka, site I. Early beginning forms of lAIa beads obtained by cutting an amber lump with a thread

left by thread, seen on the two halves, fit perfectly. This is the first noticed case of the use of this technique in the Stone Age in the south Baltic area of amber distribution. No analogy has been found in the entire Baltic coast zone.

Out of the discussed TIa subgroup of lAIa semi-products from Niedźwiedziówka, 50 pieces (about 72.4%) were quite suitable for further treatment. The remaining 19 were mostly large fragments produced by a too strong pressure of the flint implement during surface treatment. Further 3 pieces were damaged during base treatment (inv.nos. 35, 43, 54). In one case (inv.no. 51), subsequent to the removal of the outer cortex, it appeared that there are 3 lines of natural cracks inside the lump. Further treatment would have been fruitless.

Out of 26 relics from the TIa subgroup from Wybicko none was suitable for further treatment. Almost all objects represent only fragments. 15 pieces were damaged during surface treatment and 9 during base shaping. Two lAIa objects are whole. They were not investigated, however, because of their heterogenous, cracked or porous inner structure. The worker could have noticed it only after removing the outer cortex (inv.nos. 3 and 9). Further treatment would have caused splitting.

Subgroup TIb. This group includes 33 semi-products lAIa (22 from Niedźwiedziówka and 11 from Wybicko). They are distinguished by grinding traces on the lateral faces and bases. They are of a rectangular shape in the longitudinal cross-section and have, in general, no chipping negatives on the lateral face. By carefully grinding the two bases it was tried to set them in right

angles to the lateral face; treatment was limited to the achieving of an approximate cylindrical shape of the bead.

Five semi-products lAIa of the TIb subgroup from Niedźwiedziówka were suited for further treatment (inv. nos. 9, 14, 20, 65, 97). The remaining, preserved in various degrees, are damaged. The central part of one piece had a natural opening transverse to the axis — a crack during the grinding of the lateral face. lAIa semi-products from Wybicko included in subgroup TIb are preserved in fragments due to damages which occurred analogous to those already referred to. Traces of thread cutting are noticeable on the lateral face of one object (inv.no. 28).

Group TII. This is the most numerous technological group of semi-produced lAIa beads. It comprises 117 (54.6%) objects from Niedźwiedziówka and 37 (50%) from Wybicko. Their common characteristics are drilling openings with flint perforators. This method was variously advanced but ended in failure. None of the semi-products of group TII was suitable for further treatment. Openings were drilled from two sides — this may be seen in the uncovered parts of their grooves with traces of white squash-amber dust.

Group TIII. Only 4 samples of lAIa semi-products from Niedźwiedziówka belong to this group (inv.nos. 77, 79, 80, 118). They are ornaments almost ready for use. Distinguishing features of group TIII are completed perforations, traces of careful grinding of the lateral face and bases and polishing. Fine cracks along the axis have been found on the lateral face of the 2 objects (inv. nos. 77, 80) ready for polishing. Polishing traces have been observed, however, on the two remaining semi-products. One of them has, moreover, on a part of the face, typical grinding scratches (inv.no. 118). Both were unsuitable for use or could have been worn for a very short time. One has a clear crack on its entire length, the other — a deep chipping negative on its lateral face.

Group TIV. It includes only 2 completely finished lAIa beads from Niedźwiedziówka with carefully polished and shining surfaces. The share of finished products at this site is, therefore, only 0.9% of all lAIa beads.

TUBULAR, CYLINDRICAL BEADS, SHORT (AIb)

The difference of these beads from the lAIa group lies in their length being equal to, or slightly smaller than the diameter, usually not exceeding 10 mm. The Wybicko assemblage included 3 of these semi-produced ornaments (Fig. 12:1,2,10). One shows traces of cir-

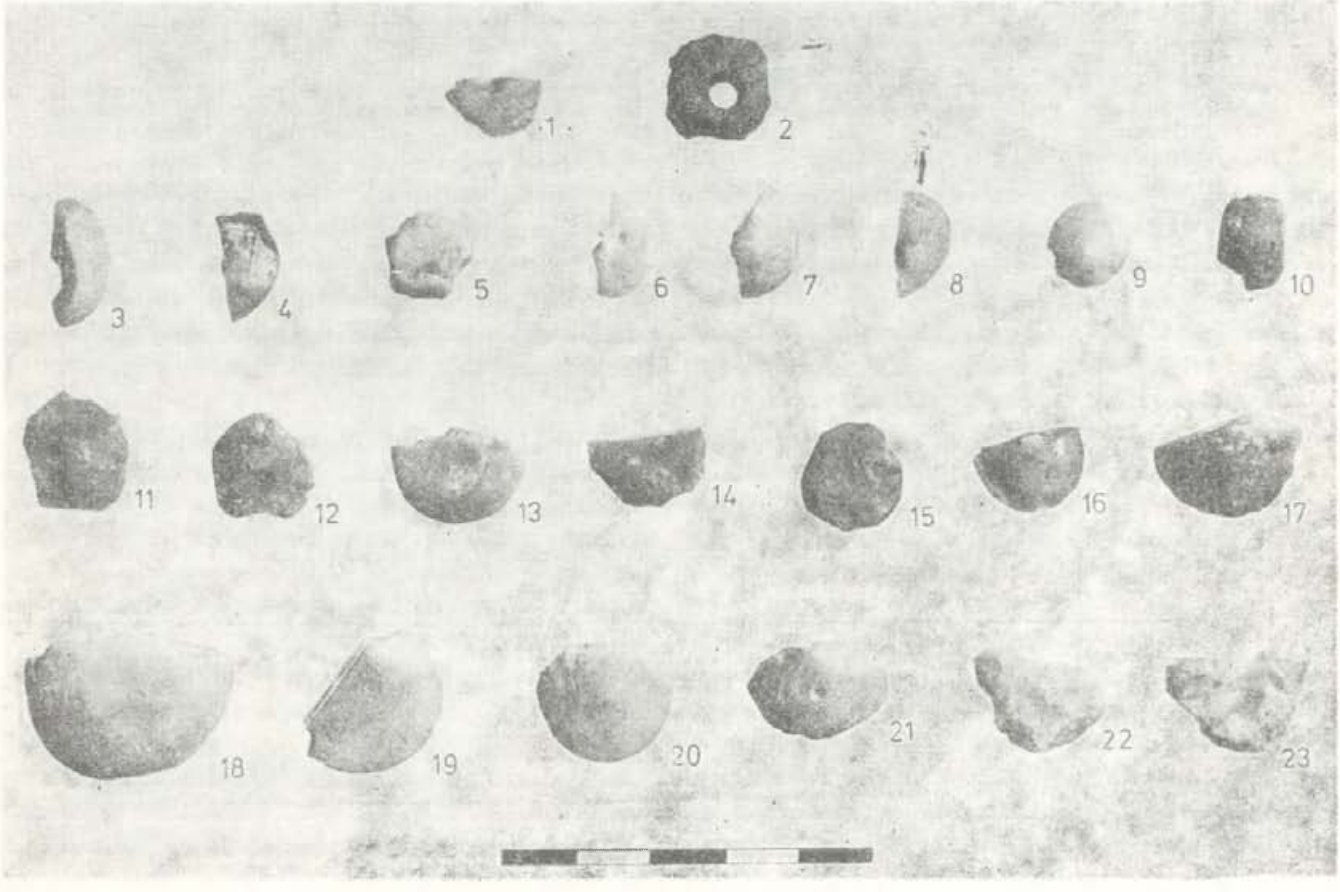

Fig. 12. Wybicko, site I. Semi-products of amber ornaments

cular treatment of the lateral face with a flint implement and natural surfaces with entrance points of a bilaterally perforated opening. It represents, therefore, technological features typical of group TIII. With the perfectly smooth surface of bases with opening outlets, it sufficed to grind off the outer cortex of the amber. There was no necessity for a previous fashioning of faces, particularly prior to perforation. An analogous situation involves the remaining lAIb semi-products. They were damaged during bilateral perforation attempts. They may be included, therefore, in group TII.

BUTTON-SHAPED (BUTTONS) BEADS WITH V-SHAPED OPENINGS (lB)

These ornaments make up, on both sites, the second largest group. Tables 3 and 4 show their differentiation as regards morphological and technological features. Forms included in class lBII and lBI dominate decisively in assemblages of relics of the lB subgroup from Niedźwiedziówka and Wybicko, the remaining are sporadic samples (Specif. 2 and 8). The largest include forms IBIIa and b. Some are up to 30 mm long, up to 23 mm wide and up to 10 mm thick. Relics included in classes lBI, lBIII and lBIV do not exceed 20 mm in length or in diameter. The proportion of damaged objects is shown in Table 5.

Group TI. Included semi-products representing 66.4% of all button-shaped beads from Niedźwiedziówka and 80.9% from Wybicko (index z_2). Their common feature is the absence of openings.

The subgroup TIa includes initial forms of button-shaped beads which were shaped with flint implements to resemble finished ornaments. In addition to pieces of an obvious circular or loval shape and numerous chipping negatives on the upper and lower face, there were objects with only traces of cuts on the outer edge and the surface covered with natural cortex. Frequent were also initial pieces with one natural and the other treated surfaces. Some relics from Niedźwiedziówka represent only a very early stage of treatment, making it impossible to classify them within a specific group or variant. Their clas-

Table 3. Niedźwiedziówka, site I. Technological groups of the button-shaped (buttons) beads with V-perforation

Class, variant	Technological groups										All together	
	TIa		TIb		TII		TIII		TIV (fin.)			
	x	*z*	*x*	*z*	*x*	*z*	*x*	*z*	*x*	*z*	*x*	*z*
1BIa	13	33.3	11	28.2	13	33.3	2	5.1	—	—	39	99.9
1BIIa	15	20.8	25	35.7	21	29.1	9	12.5	2	5.1	72	99.8
1BIIb	—	—	1	50.0	1	50.0	—	—	—	—	2	100.0
1BIIIa	1	100.0	—	—	—	—	—	—	—	—	1	100.0
1BIIIb	—	—	1	100.0	—	—	—	—	—	—	1	100.0
1BIV	—	—	—	—	—	—	1	100.0	—	—	1	100.0
1B*	30	100.0	—	—	—	—	—	—	—	—	30	100.0
All together *x*, z_2	59	40.4	38	26.0	35	23.9	12	8.2	2	1.3	146	

x — quantitatively; *z* — % of all ornaments of a particular classification category; z_2 — % of all ornaments of subgroup IB from a site

Table 4. Wybicko, site I. Technological groups of the button-shaped beads (buttons) with V-perforation

Class, variant	Technological groups									
	TIa		TIb		TII		TIII		TIV (fin.)	
	x	*z*	*x*	*z*	*x*	*z*	*x*	*z*	*x*	*z*
1BIa	2	20.0	2	20.0	6	60.0	—	—	—	—
1BIb	2	50.0	2	50.0	—	—	—	—	—	—
1BII	20	100.0	—	—	—	—	—	—	—	—
1BIIa	20	62.5	4	12.5	8	25.0	—	—	—	—
1BIIb	7	77.7	1	11.1	—	—	1	11.1	—	—
1BIIIb	2	50.0	2	50.0	—	—	—	—	—	—
All together *x*, z_2		z_1		z_2		z_2		z_2		z_2
	53	67.0	11	13.9	14	17.7	1	1.2	—	—

x, *z*, z_2 — see table 3

Table 5. The proportion of unsuccessful forms among semi-products of button-shaped beads from site I at Niedźwiedziówka (N) and site I at Wybicko (W)

Class, variant	Site	Number of products	Technological groups								All together	
			T Ia		T Ib		T II		T III			
			x	y	x	y	x	y	x	y	x	y_1
1BIa	N	39	5	38.4	6	54.5	13	100.0	2	100.0	26	66.6
	W	10	0	0	1	50.0	6	100.0	—	—	7	70.0
1BIb	N	—	—	—	—	—	—	—	—	—	—	—
	W	4	1	50.0	2	100.0	—	—	—	—	3	75.0
1BII	N	—	—	—	—	—	—	—	—	—	—	—
	W	20	2	10.0	—	—	—	—	—	—	2	10.0
1BIIa	N	72	4	26.6	10	40.0	21	100.0	4	44.4	39	54.1
	W	32	3	15.0	3	75.0	8	100.0	—	—	14	43.7
1BIIb	N	2	—	—	—	—	1	50.0	—	—	1	50.0
	W	9	2	28.5	1	100.0	—	—	0	0	3	33.3
1BIIIa	N	1	0	0	—	—	—	—	—	—	—	—
	W	—	—	—	—	—	—	—	—	—	—	—
1BIIIb	N	1	—	—	0	0	—	—	—	—	—	—
	W	4	0	0	0	0	—	—	—	—	—	—
1BIV	N	1	—	—	—	—	—	—	0	0	—	—
	W	—	—	—	—	—	—	—	—	—	—	—
1B*	N	30	4	13.3	—	—	—	—	—	—	4	13.3
	W	—	—	—	—	—	—	—	—	—	—	—
All together	N			y_3		y_3		y_3		y_3		y_4
		146	13	22.0	16	42.1	35	100.0	6	50.0	70	47.9
	W	79	8	y_3 15.1	7	y_3 63.6	14	y_3 100.0	0	y_3 0	29	y_4 36.7

x — quantitatively; y — % of all semi-products of a particular category from a concrete technological group or subgroup, y_2 — % of all semi-products of a particular classification category; y_3 — % of all semi-products of a particular technological group or subgroup; y_4 — % of all button-shaped beads from a defined site.

sification was terminated at the level of subgroup (IB*); twenty IBII pieces from Wybicko had an untouched upper and lower surface or only initial chipping negatives. It is obvious that in the production of IBI and IBII forms the circular or oval shape was often achieved by an initial formation of a rectangular piece followed by cutting off the corners.

The amber raw material used in the production of button-shaped beads need not have been as good as the material for IAIa pieces. This concerned in particular smaller objects. An analysis of early half-products indicated that attempts were made at producing them from natural lumps resembling planned ornaments. The use of parts from split lumps was rare. Some of the IBII pieces from Wybicko show traces of fire in the form of burning and thermic cracks (inv.nos. 115, 117, 133). Contact with fire occurred probably after treatment since amber, being too brittle, is after heating unsuitable for mechanical treatment.

The subgroup T Ib includes semi-products of button-shaped beads with traces of grinding on the upper and lower surfaces and, sometimes, on the inner edge. This is why a part of these beads has a faceted edge. Grinding was to give the semi-product its final shape. Hence the polygonal planes with densely distributed scratches on some surfaces. Amber dust was found on them. A part of IBIIIb semi-products from Wybicko and Niedźwiedziówka had one surface faceted, which gave it a pyramidal shape. This effect was achieved by grinding off the convex side under a certain angle (Pls. II 3, VII 11,20).

Group TII Includes semi-products with traces of V-shaped perforations and ground surfaces, sometimes edges. Openings were as a rule on the convex side in the centre of the ornament. Outlets of grooves in IBII and IBIV forms were always transverse to the longer axis of the bead and, in IBIIIb pieces, on the axis, never on the transverse. All the beads here discussed were damaged during perforation and became unsuitable for further treatment. A too vertical position of drills sometimes caused damage to the ornament during the final phase of drilling or during repeated polishing, e.g., pieces IBIa and IBIIa from Niedźwiedziówka (Pls. II 2,5, VI 34).

The third technological group includes semi-products

with (2 exceptions) successful perforations and traces of a successive phase of grinding and polishing. Representative of this group are 2 pieces lBIa, 9 — lBIIa and one lBIV from Niedźwiedziówka and one lBIIb piece from Wybicko. Of interest is object lBIIa from Niedźwiedziówka (Pl. III 12). Since its opening was damaged during the final polishing phase, it was perforated again, bilaterally, and thus provided with a frontal opening at the top. This way, it resembles a 2BII pendant.

Group TIV. This least numerous group includes only 2 completed pieces suitable for the use of lBIIa beads from Niedźwiedziówka (Pl. III 3,28). They have smooth, carefully polished and shining surfaces.

The assemblages of button-shaped beads from the two sites were studied from the aspect of the proportion of damaged forms using numeral (x) and percent (y–y_4, Tab. 5 and 6) indexes. Considering the frequency of

Table 6. The proportion of button-shaped beads of particular technological groups in the forming of index y_4 and its relation to index z_2

Site	Number of relics	Index	Technological groups				Indexes
			TIa	TIb	TII	TIII	
Niedźwiedziówka	146	y_4	8.9	10.9	23.9	4.1	47.9
		z_2	40.4	26.0	23.9	8.2	98.5*
Wybicko	79	y_4	10.1	8.8	17.7	—	36.7
		z_2	67.0	13.9	17.7	1.2	99.8

* Final forms (TIV) not includet.

relics, y_3 and y_4 indexes seem to be the most representative. The remaining indexes of variants lBIa and lBIIa can also be accepted as conclusive. These data indicate that all beads of technological group II ($y_4 = z_2$) were completely destroyed while semi-products of TIa and TIb subgroups show the lowest value in the y_4 index, despite the high z_2 index. Contrary to appearances, the small proportion of group TIII semi-products in creating z_2 and y_4 indexes is also essential, since only a negligent percent of ornaments was damaged during the final grinding and polishing process.

AXE-SHAPED BEADS (lC)

Only beads of a double-axe shape with an outline of an elongated oval (lCI) and rectangle (lCII) were discovered at the two sites. Particular classes included variants a and b. Forms lCIb and lCIIb were few in comparison with variants of a lenticular cross-section (cf. Specif. 4 and 11). Niedźwiedziówka yielded 40 pieces of the lC subgroup and Wybicko — 24. They were exclusively semi-products (Tab. 7).

Beads lCI and lCII are included among sizable ornaments. Their length reaches up to 42 mm, they are up to 36 mm wide and up to 13 mm thick But much smaller pieces are numerous. Probably, a part of them are rudimentary damaged forms lCI or lCII, taken for secondary treatment (halfs). The long, lateral openings of these ornaments are in the central part and penetrate the entire width. Their outlets are on the side edges.

Table 7. Technological groups of the axe-shaped beads from site I at Niedźwiedziówka (N) and site I at Wybicko (W)

Class, variant	Site	Technological groups								All together
		TIa		TIb		TII		TIII		
1CIa	N	2		—		11		—		13
	W	2		—		5		1		8
1CIb	N	—		—		1		—		1
	W	—		—		—		—		—
1CIIa	N	10		9		6		1		26
	W	9		2		3		—		14
1CIIb	N	—		—		—		—		—
	W	—		—		2		—		2
		z_2		z_2		z_2		z_2		
All together	N	12	30,0	9	22.5	18	45.0	1	2.5	40
	W	11	45.8	2	8.3	10	41.6	1	4.1	24

Coefficient z_2 — see table 3.

The first technological group includes 21 beads of a double-axe shape from Niedźwiedziówka and 15 from Wybicko. They were initially shaped with flint implements, traces of this treatment can be seen in chipped off negatives on surfaces and edges (TIa). Some of these forms have, moreover, traces of grinding (TIb).

Subgroup TIa. Includes 12 semi-manufactured lC beads from Niedźwiedziówka and 11 from Wybicko. These are exclusively lCIa and lCIIa objects. Remains of cortex on the surface indicate that natural flat amber plates were used in their production. Extensive areas of negatives on lateral edges and some lCIIa initial pieces from Niedźwiedziówka (inv.nos. 334, 335) and Wybicko (inv.nos. 84, 87, 88, 90) indicate clearly that they were produced from raw material plates previously divided into parts. Traces of treatment with flint implements appear mostly on uneven places on the upper and lower surfaces. Plains were covered with cortex but were even left for grinding. The same concerned level, flat lateral edges of some lCIIa objects from Niedźwiedziówka (inv.no. 333) and Wybicko (inv.no. 83). Attention should be directed to early begining of lCIIa pieces produced from previously damaged forms of this variant (Pl. V 33, Figs. 12:22,13:9–11).

The subgroup TIb includes nine lC objects from Niedźwiedziówka and two from Wybicko. They are exclusively lCIIa beads. Grinding traces of various intensity

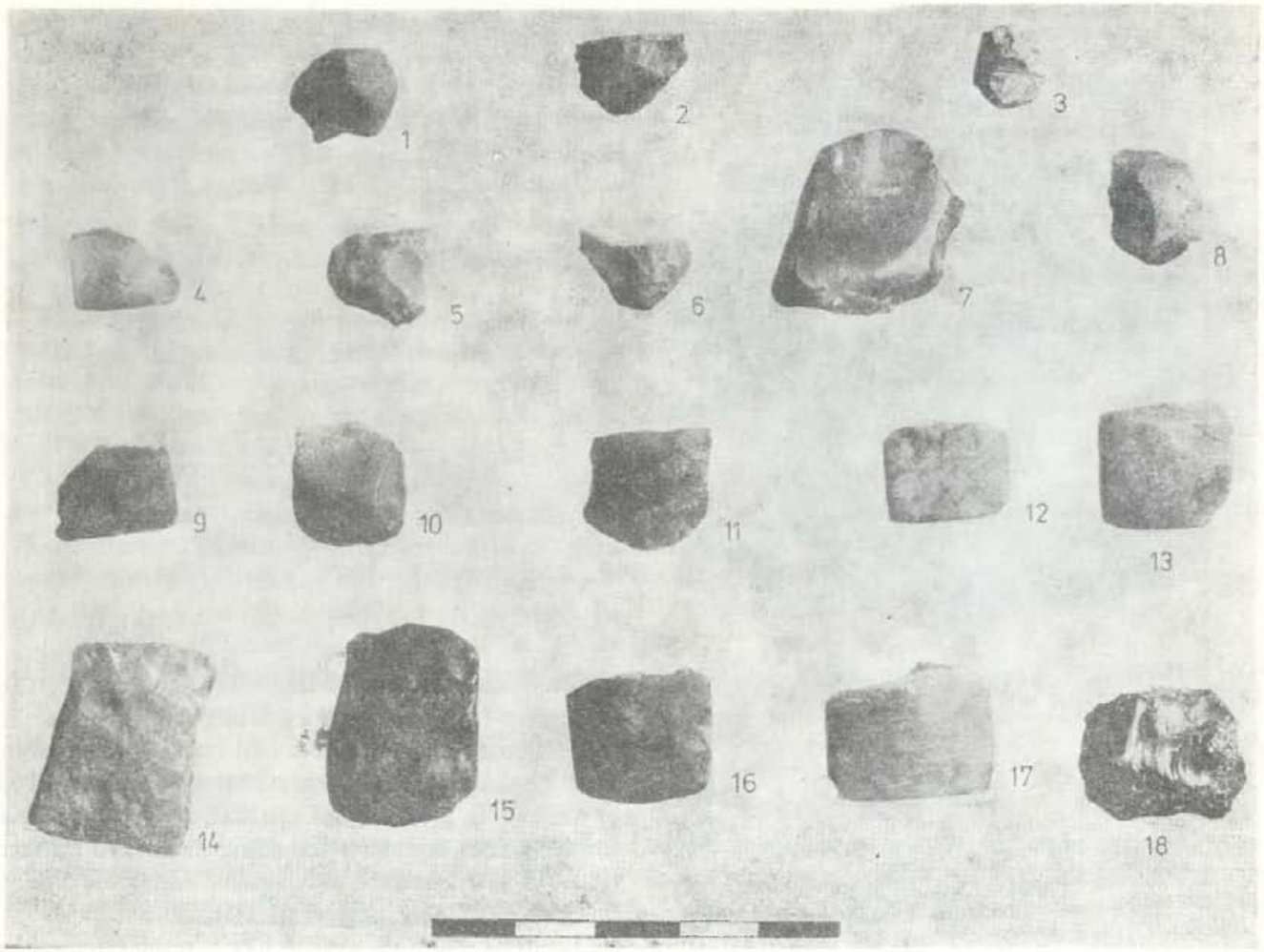

Fig. 13. Wybicko, site I. Semi-products of amber ornaments

cover the upper, lower sides and edges. Most advanced in treatment are two semi-products from Niedźwiedziówka (Pl. III 32, 34). There are few chipping negatives made by flint implements together with grinding and polishing traces on their surfaces. The technique of polishing was used for the first time in treating semi-produced pieces of the TIb subgroup. One was damaged while the plane (base) was being prepared for perforation on the two lateral edges (inv.no. 341). A more successful shaping of analogous planes was observed on two consecutive lCIIa pieces from Niedźwiedziówka (inv.nos. 340 and 343). Numerous relics of the TIb subgroup have circularly faceted edges.

Group TII. Relics from this group are the most numerous: Niedźwiedziówka: 18 pieces, Wybicko: 10 pieces. All have traces of an unsuccessful bilateral drilling of openings with flint implements. As was mentioned, it was necessary, prior to drilling, to specially prepare lateral edges where the opening was planned. On most beads there were single chipping negatives analogous to those found on some lCIIa pieces of the TIb subgroup. Only one lCIb piece from Niedźwiedziówka (Fig. 9:3) had in this place special indentations, frequently found in double-axe shaped amber beads west of the Oder River (cf. Schuldt 1974, 100–109, figs. 3–6, 8, 9; Mazurowski 1976). Analogous indentations have been found there on double-edged stone axes, so-acIled *Amazonenäxte*, imitations of which were tried to be made in amber. In Poland, identical indentations have been found in two ornaments of the Rzucewo culture. A lCIa bone bead was found at the Rzucewo settlement (Kostrzewski 1931, 59, Pl. II 10), while an analogous amber form was discovered by the author during researches at the Suchacz settlement.

Group TIII. It includes only two relics. The lCIa semi-product from Wybicko (inv.no. 82) and lCIIa from Niedźwiedziówka (Pl. III 25). The first was damaged during polishing, the second — in the final phase of grinding of the lateral edge (at the top).

The proportion of damaged lCIa, b and lCIIa, b semi-products is characteristic of the two sites (Tabs. 8 and 9). Completely damaged are all objects from group TII, analogous to previously discussed lAIa and lB beads. Subgroups TIa and TIb from Niedźwiedziówka and the TIa subgroup from Wybicko contain the least damaged semi-products.

Table 8. The proportion of unsuccessful forms among axe-shaped (1C) semi-produced beads from site I at Niedźwiedziówka (N) and site I at Wybicko (W)

Class, variant	Site	Number of relics	Technological groups								Together damaged	
			TIa		TIb		TII		TIII		x	y_1
1CIa	N	13	2		—		11		—		13	100.0
	W	8	2		—		5		1		8	100.0
1CIb	N	1	—		—		1		—		1	100.0
	W	—	—		—		—		—		—	—
1CIIa	N	26	1		6		6		1		14	53.8
	W	14	6		2		3		—		11	78.5
1CIIb	N	—	—		—		—		—		—	—
	W	2	—		—		2		—		2	100.0
			y_3		y_3		y_3		y_3			y_4
Together	N	40	3	23.0	6	66.6	18	100.0	1	100.0	28	70.0
x, y_3, y_4			y_3		y_3		y_3		y_3			y_4
	W	24	8	100.0	2	100.0	10	100.0	1	100.0	21	87.5

x, y_2, y_3, y_4 — see table 5.

Table 9. The proportion of 1CI and 1CII beads of particular technological groups in the forming of index y_4 and its relation to index z_2

Site	Index	Technological groups				Together accord. to indexes
		TIa	TIb	TII	TIII	
Niedźwiedziówka	y_4	7.5	15.0	45.0	2.5	70.0
	z_2	30.0	22.5	45.0	2.5	99.8
Wybicko	y_4	33.3	8.3	41.6	4.1	87.5
	z_2	45.8	8.3	41.6	4.1	99.8

OTHER BEADS (IE)

The semi-produced IEVI bead (Pl. II21) was found at Niedźwiedziówka. It is of a discoidal shape, lenticular in the transverse cross-section. The frontal bilaterally drilled opening is in the central part of the ornament. The outer edge is faceted, surfaces show traces of grinding and polishing. Cortex remained on one of these relics around the opening. This relic shows features characteristic of group TIII. It differs from 4BI and 4BII ornaments in size and a very small diameter of the opening and a considerable thickness in relation to its diameter.

PENDANTS (GROUP 2)

The common basic characteristics of pendants is the position of the, most often, frontal opening at one edge. Discussed collections contain 7 pendants: 2A, 2BIa, 2BIII and 2BV (Specif. 5 and 12).

Subgroup 2A includes asymmetrical pendants. They resulted from a bilateral drilling of a frontal opening at the upper edge of specially chosen natural lumps of amber. Their surfaces and edges were not treated. The asymmetry and irregularity of forms resulted from the resignation of dividing pieces into classes and variants. Each of these pendants can represent a separate class or variant. In the analyzed material, only pendant 2A from Wybicko represents the above mentioned features (Pl. VII17). One surface was damaged during the drilling of the frontal opening (group TII).

Pendants 2BIa are shaped like a regular trapezium with straight edges, the transverse and longitudinal cross-sections are rectangular. Only 3 such semi-products were found at Wybicko (Pl. VII14–16). Two have no traces of openings (TIa and TIb), and one was damaged during drilling (TII) and differs from classic 2BIa forms because the opening is positioned closer to the central part.

The transverse cross-section of one symmetric, rectangular pendant (2BIII) from Niedźwiedziówka (Fig. 9:6) shows a rectangular form, its edges are slightly rounded. This semi-product was damaged during the final phase of drilling the frontal opening (TII).

Two semi-produced symmetrical axe-shaped pendants have been discovered at Wybicko (2BV). Their top parts were damaged during grinding (Pl. VII18,19). Completely preserved specimens of the 2BV class resemble in their outlines axes of a broad arcuated blade and a much narrower slightly convex head. The closely situated opening is set transversely to the longer axis of the ornament. Its outlets are on the side edges. In their transverse cross-section, 2BV forms are rectangular and lenticular in the longitudinal section. These two specimens have more slender proportions and analogous cross-section features in preserved parts.

During surface researches at site I at Niedźwiedziówka, researchers discovered a semi-produced circular disk of

a lenticular cross-section (4BIa). Its opening was drilled from two sides with a 6 mm flint drill. The disk was damaged during the final stage of treatment — i.e., during polishing (Pl. II26). Traces of these activities are clearly preserved on the surfaces. This 4BIa object represents, therefore, characteristics of group TIII.

OBJECTS OF INDETERMINED SHAPE (GROUP 7)

The Niedźwiedziówka and Wybicko sites have yielded also very early initial forms of amber ornaments included in subgroup TIa. Considering the still unspecified form and some single traces of chipping or flaking, it was difficult to determine their final shape. They were, therefore, included into a separate group. Considering, however, their form, size and traces of surface treatment on some objects, attempts were made at determining their supposed final purpose (Specif. 6 and 10). The decisive majority could have been intended for beads in subgroups IB or IE. Traces of thread cut appear on 5 pieces from Niedźwiedziówka in addition to chipping off and negatives of larger flaking (inv.nos. 385, 387, 389, 391, 392).

PRODUCTION WASTE FROM AMBER TREATMENT

The ancient material from the two sites included a considerable amount of production waste (Tab. 10). Most numerous were flakes and bits measuring less

Table 10. A characteristic of amber production waste from site I at Niedźwiedziówka and site I at Wybicko

Site	Waste category			Together	
	scales chips < 10mm long	scales 10–20mm long	blades 15–28mm long	pieces	weight in g
Niedźwiedziówka, purchased	197	53	—	267	76.27
as above, from surface research	14	3	—	—	—
Wybicko, purchased	826	197	20	1043	341.50
Together	1037	253	20	1310	417.77

than 10 mm (Fig. 14). More seldom were flakes 10–20 mm long, the most sizable reached up to 35 mm in width. Out of the waste pieces from Wybicko, 20 had features typical of semi-raw material distinguished in flint industry, namely flakes. In our case, these were of course, production remains and their shape and proportions are accidental. They originated most frequently after the flaking of side edges of flat raw material plates. Methods deveoped in the process of flint production were undoubtedly ln amber treatment, adapting them, however, to properties of the softer raw material. All flakes, blades and larger chips show clearly preserved stricking points, knots and reflection waves. They were certainly chipped off by means of an intermediary tool. The direct use of hammer stones, if only to split larger lumps into smaller pieces, would be impossible considering the characteristics of amber.

Fig. 14. Wybicko, site I. Amber production waste

Pieces covered with cortex on the entire upper surface or its part amounted to about 75% of waste material. This proves that at the core production treatment of amber ornaments the chipping off technique was stopped directly after the cortex was removed and initial shaping concluded. The direct use of a sharp flint tool was then safer and more effective. It allowed to achieve the required shape of the ornament more precisely. Fine chips without or partly without cortex have remained from this stage of treatment. These objects are relatively few in the analyzed material, they were rejected by disinterested present-day collectors. But it is certain that small chips frequently appeared on the two recently excavated sites. Using stone treatment terminology, they may be defined as chips deriving from surface retouching.

AMBER RAW MATERIAL

It must be emphasized that several selections were made of the amber raw material found at the two sites before it became the object of study in this paper. This does not concern the quantitative index only. More essential is its qualitative impoverishment. The most sizeable lumps were kept by collectors. Only 345 small

pieces are at the author's disposal (Fig. 15). Together they weigh: those from Niedźwiedziówka — 56,35 g and from Wybicko — 203.45 g. The weight of one piece does not exceed 15 g. According to information of present-day amber prospectors, lumps weighing 30–50 g were frequently found there, the larged weighed 100–200 g. The later were, of course, unique finds. These

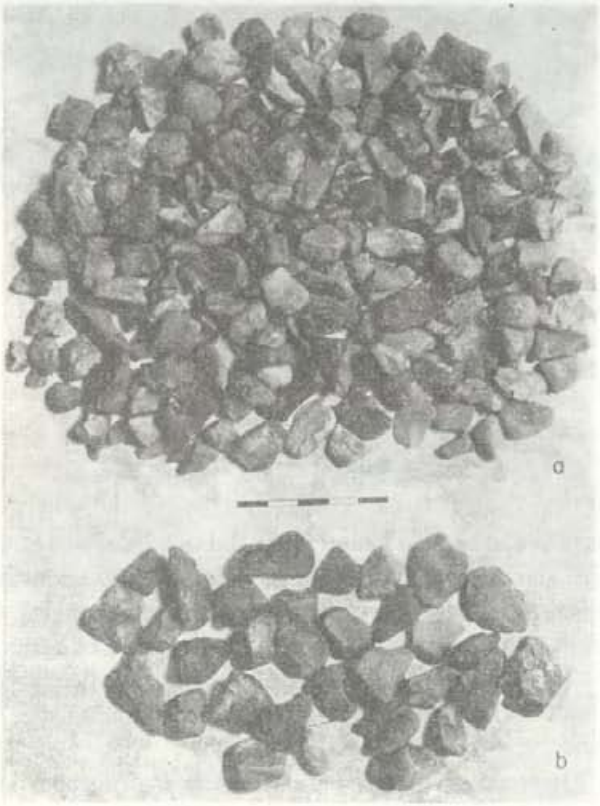

Fig. 15. Wybicko, site I. Amber raw material
a — unsuitable for treatment; *b* — suitable for treatment

choice pieces were readily used by Neolithic producers at both sites. An example may be the large 1 lAIa beads from Niedźwiedziówka (cf. Fig. 10). Considering their weight, individual lumps used in production weighed about 100 gram.

The entire relevant raw material was classified by the author in relation to its suitableness for — prehistorical, of course — treatment. It appeared that out of 296 lumps from Wybicko only 29 rather small pieces (beads lB, lE and small forms 2A and 2B) were suitable for production, and from Niedźwiedziówka, out of 49 pieces — only 8. The chief disqualifying factors of rejected raw material were their insufficient size, inadequate shape of lumps, heterogenous inner structure (stratification, cracks, deep pores caused by organic vestiges, incrustation or incrustation-stratal texture or soil interpolation) and the presence of foam-type amber.

Small flat plates decisively dominate among amber pieces chosen for treatment. Most derived from the subcortical part of pines (*Pinus succinifera*).

RAW MATERIAL CLASSIFICATION OF SEMI-PRODUCTS AND FINISHED ORNAMENTS

A characteristics of amber varieties as regards suitableness for treatment and principles of raw material classification was presented by the author in previous works (Mazurowski 1978; 1983a, 13–19). But an introduction seems necessary. R. Klebs (1887) distinguished the following variants of amber: transparent, clouded, foamy, bastard, osseous. This is in order of transparency, depending on the quantity, quality and density of microscopic free spaces distributed in amber, the so-called vesicles (cf. Savkevič 1970, 100–102). These factors substantially influence the hardness and brittleness (Savkevič 1970, 152–157, Pl. 17, ibid. bibliography). Generally speaking, the higher the index of transparency, the greater the hardness. S.S. Savkevič's studies (1970, 152, 156) have shown that even in one piece of amber deviations in the index of hardness (kG/mm^2) can reach up to $\pm 5\%$. Much greater differences ($\pm 20\%$) occur when variants — transparent, bastard and osseous — coexist in one lump.

Considering these properties of particular amber variants and their colouring we can make a correct analysis of raw material used in the production of ornaments. Results of raw material classification should explain principles of selecting variants of amber in the production of defined ornaments, causes of damages and resigning from further treatment. These data have been used in part in discussing forms of relics.

We may assume, of course, that achieved data will not be entirely competent. These relics have not derived from compact objects such as, for example, amber workshops studied as composite unities. Moreover, most of the here analyzed semi-products were damaged or rejected during treatment. But, in my opinion, a complete set of sources from one workshop will never be available. First of all, we shall always be deprived of their most essential category — finished ornaments which, as a rule, were taken away from the workshop. This is why materials from such well investigated objects will only increase the degree of probability of conclusions formed by archaeologists. There are also essential conditions rather elusive in source analyses, such as the different degree of mastering the technique of treatment by producers, conditions involving the production process, places from which raw material was obtained and its condition.

Nevertheless, the material from Nieźwiedziówka and Wybicko is of a collosal significance for the here discussed problem since it was obtained from several workshop-type objects, relics represent various stages of the production process and are well preserved. The last factor is very important in the proper specification of raw material varieties. Most of the hitherto known

Table 11. The degree variants of amber raw material were used in the production of particular categories of ornaments

Class, variant	Site	Number of ornaments	Variant of amber									
			transparent		cloudy		bastard		osseous		blended variants	
			x	y_6	x	y_6	x	y_6	x	y_6	x	y_6
1AIa[1]	N	214	74	34.5	68	31.7	20	9.3	8	3.7	43	20.1
	W	74	24	32.4	13	17.6	16	21.6	3	4.0	17	22.9
1A1b	N	—	—	—	—	—	—	—	—	—	—	—
	W	3	1	33.3	1	33.3	1	33.3	—	—	—	—
1BIa	N	39	5	12.8	10	25.6	8	20.5	6	15.3	10	25.6
	W	10	—	—	3	30.0	5	50.0	—	—	2	20.0
1BIb	N	—	—	—	—	—	—	—	—	—	—	—
	W	4	1	25.0	—	—	2	50.0	—	—	1	25.0
1BIIa	N	72	4	5.5	21	29.1	14	19.4	10	13.8	23	31.9
	W	32	6	18.7	10	31.2	7	21.8	4	12.5	5	15.6
1BIIb	N	2	1	50.0	—	—	—	—	1	50.0	—	—
	W	9	1	11.1	4	44.4	1	11.1	2	22.2	1	11.1
1BII	N	—	—	—	—	—	—	—	—	—	—	—
	W	20	2	10.0	8	40.0	6	30.0	—	—	4	20.0
1BIIIa	N	1	1	100.0	—	—	—	—	—	—	—	—
	W	—	—	—	—	—	—	—	—	—	—	—
1BIIIb	N	1	—	—	1	100.0	—	—	—	—	—	—
	W	4	1	25.0	2	50.0	—	—	—	—	1	25.0
1BIV	N	1	—	—	—	—	—	—	1	100.0	—	—
	W	—	—	—	—	—	—	—	—	—	—	—
1B*	N	30	2	6.6	12	40.0	5	16.6	3	10.0	8	26.6
	W	—	—	—	—	—	—	—	—	—	—	—
1CIa	N	13	2	15.4	6	46.1	3	23,0	—	—	—	15.4
	W	8	4	50.0	2	25.0	1	12.5	—	—	1	12.5
1CIb	N	1	—	—	1	100.0	—	—	—	—	—	—
	W	—	—	—	—	—	—	—	—	—	—	—
1CIIa	N	26	2	7.7	7	26.8	8	30.7	2	7.7	7	26.8
	W	14	8	57.1	3	21.4	1	7.1	1	7.1	1	7.1
1CIIb	N	—	—	—	—	—	—	—	—	—	—	—
	W	2	2	100.0	—	—	—	—	—	—	—	—
1EVI	N	1	—	—	1	100.0	—	—	—	—	—	—
	W	—	—	—	—	—	—	—	—	—	—	—
2A	N	—	—	—	—	—	—	—	—	—	—	—
	W	1	—	—	—	—	1	100.0	—	—	—	—
2BIa	N	—	—	—	—	—	—	—	—	—	—	—
	W	3	—	—	2	66.6	1	33.3	—	—	—	—
2BIII	N	1	—	—	—	—	—	—	—	—	1	100.0
	W	—	—	—	—	—	—	—	—	—	—	—
2BV	N	—	—	—	—	—	—	—	—	—	—	—
	W	2	1	50.0	—	—	—	—	1	50.0	—	—
4BIa	N	1	—	—	—	—	—	—	—	—	1	100.0
	W	—	—	—	—	—	—	—	—	—	—	—
Group 7	N	10	—	—	1	10.0	6	60.0	1	10.0	2	20.0
	W	20	5	25.0	7	35.0	5	25.0	—	—	3	15.0
				y_5		y_5		y_5		y_5		y_5
	N	413	91	22.0	128	30.9	64	15.4	32	7.7	97	23.4
x, y_5				y_5		y_5		y_5		y_5		y_5
	W	206	56	27.1	55	26.7	47	22.8	11	5.3	36	17.4

Notes. N — Niedźwiedziówka, site I (together: purchased and from surface research); W — Wybicko, site I; x — quantitatively; y_5 — in %, quantity of semi-products and ornaments from a particular variant of amber in relation to all semi-products and ornaments from a defined site; y_6 — percentage of semi-products and ornaments of a particular category of division produced from a specific variant of amber.

[1] One 1AIa object of an unspecified variant of amber was found on each of the sites.

Neolithic relics in Poland were found to be oxidized to such a degree as to almost exclude any possibility of defining not only the original colouring of the object but even the variant of amber — if laborous and costly physical and chemical methods are not used. Due to the long-time remaining of discussed relics in a swampy environment their oxidization process has been stopped. Semi-products and finished ornaments have been preserved, therefore, in a condition unchanged since their treatment. The great majority of objects has no traces of inner cortex, that is, a partly oxidized layer directly beneath the brown outer cortex. The case is quite different, however, in regard to raw material brought out with the ornaments. Its surface is covered with a thick outer cortex and particular lumps would have to be broken up to define the variant of amber. This was why we resigned from specifying variants of natural lumps of raw material.

Table 11 presents quantitative and percent indexes of the use of amber varieties in particular Categories of ornaments (x, y_6). Index y_5 (Tab. 11) shows the relation of production from a respective variant of raw material to all amber products found at Niedźwiedziówka and Wybicko.

Semi-products and finished ornaments did not include objects made from foamy amber, although some lumps of it occurred among the natural raw material. Investigating amber ornaments from the Stone Age in Poland, I have also failed to discover any items produced from it (Mazurowski 1978; 1983a, 53). There must be, therefore, a concrete reason for the absence of products from foamy amber. It is simply this, that its heterogenous, disturbed inner structure, revealed by the presence of vesicles of various size and form, made mechanical treatment quite impossible. These properties of foamy amber were well known to Neolithic producers in Żuławy. The conscious selection of raw material for the production of ornaments in the younger Stone Age is an important lead, this was substantiated by the value of index y_5 concerning types of amber in Niedźwiedziówka and Wybicko assemblages (cf. Tab. 11). Well, besides the osseous amber, the other variants have more or less similar percent values. This is surprising, since generally speaking, the transparent variant prevails quite clearly among other raw materials nowadays found on the Baltic coast, while pieces of osseous amber — also in investigated assemblages — are rather few. The high percentage of clouded amber also deserves attention. Relevant relics from Niedźwiedziówka constitute the largest group (30.9%) and at Wybicko (26.6%) equal to forms produced from transparent amber (27.1%).

To better present the degree particular variants of amber have been used in the production of defined ornaments, we have used the y_7 index which shows the relation of all products of a respective classification category made from a specific variant of amber to all products of this variant found at a concrete site. Some classes and variants of products are represented by one or several specimens, thus their y_7 index has been calculated for a higher classification category — i.e., subgroups. This involved button-shaped (subgroup 1B) and axe-shaped beads (1C). On account of this, we investigated in conjunction forms 1EVI, 2BIII, 4BIa and those belonging to group 7 from Niedźwiedziówka, and forms 1AIb, 2A, 2BIa, 2BV and group 7 from Wybicko. The common analysis of ornaments from subgroup 1B and 1C is even more substantiated because they are characterized by a common size, an analogous production process and the same raw material „requirements".

The percent values of index y_7 obtained at the two sites are presented in Table 12. Variants of raw material

Table 12. The degree variants of amber were used in the production of particular forms of products at Niedźwiedziówka (N) and Wybicko (W), according to index y_7 (in %)

Product category	Site	Number of products	Amber variants				
			transparent	cloudy	bastard	osseous	blended variants
1AIa	N	214	81.3	53.1	31.2	25.0	44.3
	W	74	42.7	23.6	34.0	27.2	47.2
1B	N	146	14.2	34.3	42.2	65.6	42.2
	W	79	19.8	49.0	44.6	54.5	38.8
1C	N	39	4.3	10.4	17.1	6.2	9.2
	W	24	25.0	9.0	4.2	9.0	5.5
Other ornaments	N	13	—	1.5	9.2	3.1	4.1
	W	29	12.5	18.1	17.0	9.0	8.3
Together	N		99.8	99.3	99.7	99.9	99.8
	W		100.0	99.7	99.8	99.7	99.8

have been arranged in it successively according to their degree of transparency and index of hardness. The last space includes ornaments made of two or three variants of amber joined in one piece. The following regularities have been observed at Niedźwiedziówka:

1. Transparent amber was most readily used in bead production 1AIa (index y_7 18.3%), its quality dropped by leaps in regard to forms of 1B and 1C subgroups.

2. Clouded amber has also the highest value of the y_7 index among 1AIa forms, but it is much lower than the transparent forms. In turn, its value in subgroups 1B and 1C is much higher in comparison with the transparent, but a drop by leaps is also noticeable in the 1AIa—1B—1C sequence.

3. Bastard amber was readily used in production of the 1B subgroup (index y_7 42.2%), more seldom in 1AIa and still less in 1C ornaments.

4. Osseous amber shows the highest y_7 index (65.6%) in the button-shaped beads subgroup (IB) and 2.5 times lower than among IAIa forms. It was rarely used in the production of IC ornaments.

The raw material characterized by the presence of two or three variants of amber in one lump merits individuation. It shows more or less equally high values of the y_7 index for IAIa and IB beads and a low frequency in the subgroup IC. The high percentage of IAIa forms blending transparent and clouded amber (T+C) merits attention as regards data shown in Table 13.

Table 13. Variants of blended amber from site I at Niedźwiedziówka and the degree they were used in ornament production

Blended variants	Number of products	Beads						Remaining ornaments	
		IAIa		IB		IC			
		x	%	x	%	x	%	x	%
T+C	27	16	59.2	6	22.2	2	7.4	3	11.1
T+O	24	10	41.6	10	41.6	3	12.5	1	4.1
B+O	15	3	20.0	11	73.3	1	6.6	—	—
C+O	13	6	46.1	6	46.1	1	7.7	—	—
T+B	8	5	62.5	3	37.5	—	—	—	—
C+B	7	2	28.5	5	71.5	—	—	—	—
T+B+O	2	—	—	—	—	2	100.0	—	—
T+C+O	1	1	100.0	—	—	—	—	—	—

Symbols of particular amber variants are shown in the Catalogue.

These variants have the highest indexes of hardness and the greatest transparency. In turn, the quality of subgroups IB and IC products indicates a tendency to a leap-like decrease. It follows that raw material lumps of the here discussed variants of blending were treated in the same way as separately appearing transparent and clouded variants. A reverse tendency can be seen in blends of variants of the smallest hardness and transparency, namely bastard and osseous amber (B+O). Button-shaped beads (IB) were most readily produced from those lumps, just like from osseous amber. The remaining variants of blended raw material (T+O, C+O, T+B) show an almost equal percent share both among IAIa and IB objects, or are represented by single pieces.

The material from Wybicko indicates, in principle, analogous regularities in the sphere of using particular raw material variants in producing specific categories of ornaments but they are less legible. The y_7 index of transparent and clouded amber is almost one half lower among IAIa beads. However, the first variant was most readily used in producing forms referred to. In turn, 49.0% of clouded amber was used for buttons (IB). Despite all, the latter were most readily produced from osseous amber (index y_7 54.5%). Bastard amber has also maintained its highest y_7 index among buttons (44.6%). Similarly as at Niedźwiedziówka, blended raw material variants of the highest index of hardness — i.e., the T+C variant — decisively dominates among IAIa beads. The remaining, except the B+O variant, show a more or less equal distribution between IAIa and IB forms.

We were unable to determine clearly defined regularities in the selection of amber variants for the production of IC beads, pendants and other ornaments in our material. Perhaps, attention should be directed to the low y_7 index of IC beads produced from blended types. According to the author, other criteria, size and shapes of lumps above all, were decisive to a much higher degree in the choice of raw material for the production of ICI and ICII forms.

This criterion also played an essential role in the selection of raw material for the production of remaining categories. Thus, flat, sub-cortex plates with natural indentations or impressions of small tree knots sometimes preserved on the surface, were used almost exclusively in the production of ICI, ICII, 2A, 2BIa, 2BIII, 2BV, 4B and large IB ornaments. These small amber plates, 15–25 mm thick, were also readily used for the production of IAIa forms, just as block-shaped lumps. But in both cases they had to be divided into parts prior to proper treatment. Moreover, IAIa ornaments were produced from naturally shaped lumps resembling planned ornaments: icicle-, spindle- or cylinder-shaped.

Button-shaped (IB) represented the least raw material requirements. This resulted from their shape, average, size and the use of a specific V-shaped opening which, compared with long, lateral openings, considerably decreased the risk of damaging the ornament. Its other advantage was the possiblity of using it even in 6–7 mm long beads. The basic mass of raw material, particularly small assortment, was, therefore, devoted to the production of IB subgroup beads. The natural shape of many lumps later resembled finished ornaments.

Freedom of selection was limited considerably by: the amount of gathered raw material, its assortment as regards size and shape and the natural structural composition (dispersal) of amber varieties It need not always have been identical or similar to our contemporary assessments of the frequency of appearance of particular varieties in natural resources. Further, each producer endeavoured without doubt to make a maximum use of his gathered material. At the same time, the structure of products had to be, most probably, subordinated in a sense to the generally prevailing "fashion" in adorning bodies and clothing. Only all these criteria and circumstances, indirectly linked with the production process, decided the division of raw material for the production

of ornaments. This is why we observe certain divergences comparing the values of index y_1 relating to particular variants of raw material from the two sites.

Amber colouring was not a decisive factor in the choice of raw material for a specific category of ornaments. This factor could have a certain significance when compositions of necklaces and diadems were decided by users of ornaments Yellow and its various hues from light to dark predominate in investigated assemblages. More than 95% of finds at Niedźwiedziówka and Wybicko were of a yellow colour. The remaining 5% were mainly white, red, orange and beige with various hues. White and beige colouring was found mostly in osseous amber.

Archaeological literature frequently mentiones red amber relics from the Neolithic and later times. These finds differ from those made by the author. The red colour results from a long-lasting oxidization process. It is, therefore, a secondary colour acquired after a long deposition in cultural layers. The definition of the specific, original colour of amber requires the use of spectral analysis. This problem was already discussed by the author (Mazurowski 1984).

The Catalogue contains colour specifications of all investigated products. Colours are described separately keeping the same succession of particular members of the same variety — for ornaments of blended amber varieties.

POTTERY

The site at Niedźwiedziówka yielded 98 potsherds (3.52 kg) collected on the surface[2]. They are characterized by a great coincidence of technological features, above all, by the admixture of coarse-grained crushed granite and organic plant vestiges (grass, reeds). The later is incidental and resulted from the general use in the production of pottery of fine-grained bluish-grey or grey (sometimes grey-brown) loam. It occurs on the entire site directly beneath the cultural layer and contains identical plant vestiges. Prior to burning, the surface of vessels made from loam had been covered with brown clay, hence the two or three coloured cross-section of pottery walls. The surface is usually light or dark brown, separated in the middle by a bluish-grey to dark-grey, almost black layer. The surface finish is also very characteristic. It is mat, coarse and, sometimes, shows traces of rubbing with fingers, a whisk of grass or a stick. Rough, so-called kitchen pottery prevails (3.20 kg). Thin-walled forms with 4–7 mm thick walls, have been burned much more carefully, the finishing of the external surface (bowls) is more elaborate.

Preserved potsherds made it possible to distinguish 5 semi-spherical bowls (Figs. 16:7, 18:1,3–5), 4 deep bowls with short outward-bend necks (Figs. 16:1,2, 17:1,4), 2 large pots (Fig. 16:5, 17:3), 3 vase-shaped vessels (Fig. 17:2, 18:2,9), a container vessel with a wide opening (Fig. 16:8), an amphora (Fig. 18:7), a "bath-tub" elongated, oval-shaped vessel (Fig. 18:8) and flat bottoms of 4 pots (Fig. 16:3,4,6, 18:6).

[2] Mgr. M. Jagodziński collected about 0.8 kg of ceramics in 1981, the remaining 2.7 kg were collected by the author during surface researches. Very small sherds and bits of pottery excavated at present have also been found at Wybicko. They are characterized by identical technological features as were found on relics from Niedźwiedziówka.

Moreover, we distinguished 76 non-decorated belly sherds, including 63 from thick-walled vessels with wide openings and large belly diameters (container and vase vessels, pots) and 13 thin-walled sherds including remains of further 3 or 4 semi-spherical bowls.

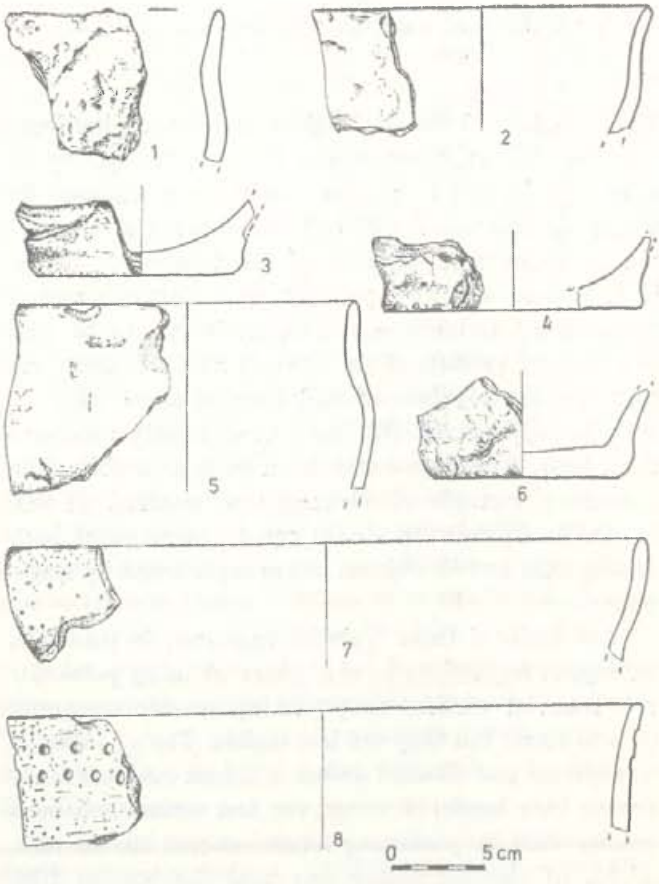

Fig. 16. Niedźwiedziówka, site I. Rzucewo culture pottery

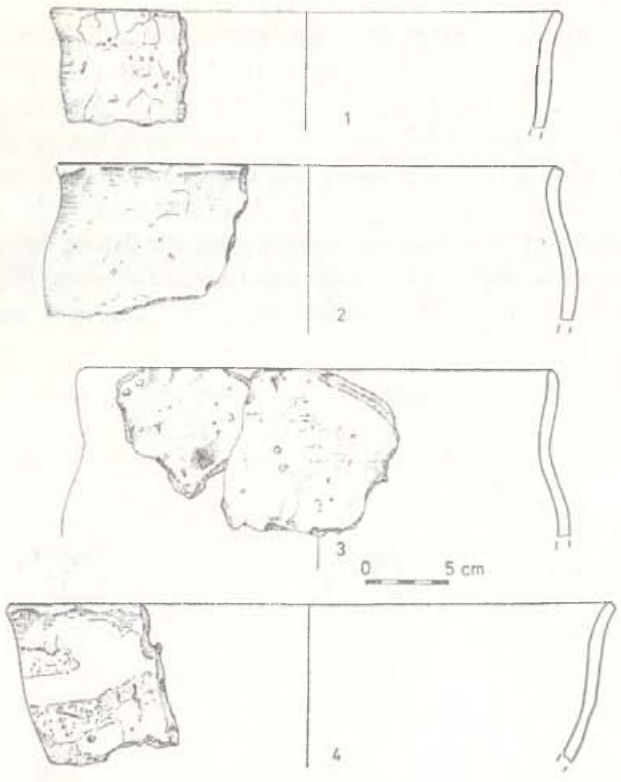

Fig. 17. Niedźwiedziówka, site I. Rzucewo culture pottery

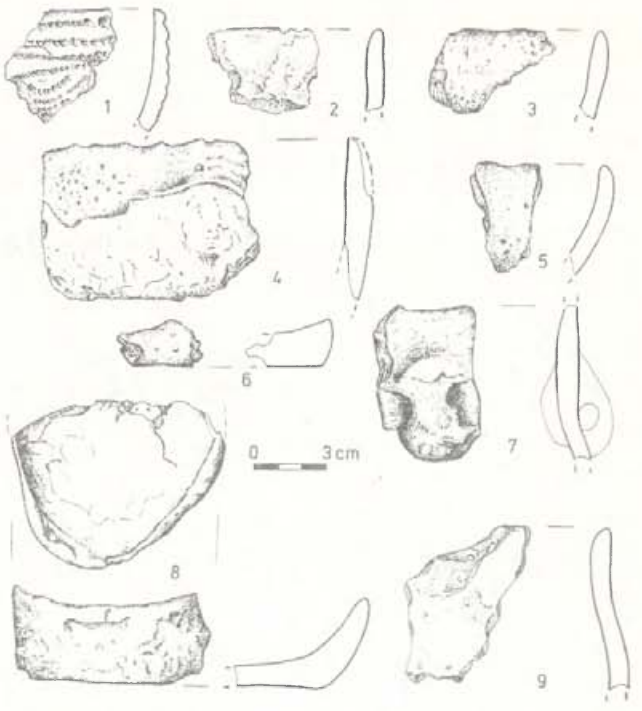

Fig. 18. Niedźwiedziówka, site I. Rzucewo culture pottery

FLINT AND STONE RELICS

Analyses embraced 93 flint and 4 stone relics discovered by the author during surface researches at site I at Niedźwiedziówka[3]. Some of the relics, including a small axe, were discovered in the cultural layer by a local amber prospector.

RAW MATERIAL

The production of flint implements involved the use of four variants of raw material generally found in moraine formations of the Baltic glaciation.

Variant I — erratic flints known as Baltic. They appear as small sized pebbles or in mineral forms. There is often a thin layer of damaged flint on the surface. Due to glacial transport the thin cortex layer was also partly or completely destroyed. The colour is bluish-grey to grey-blue, the fracture is correct and smooth (Balcer 1975, 56).

Variant II — includes so-called "Pieczysko" flints, distinguished in regard to their dark-brown colour caused by manganese precipitation when concretions were in loams of moraine formations during the first glaciation (Balcer 1975, 57). They are generally found in the form of variously sized pebbles.

Variant III — includes Pomeranian flints appearing as small pebbles (so-called "swallow bread") of a longer, up to 6 cm, diameter. Honey to grey-honey colour. Instead of a limestone cortex there is a thin layer of eroded flint mass.

Variant IV — erratic flints in the form of pebbles, matrix concretions or their fragments indicated by the presence of limestone cortex. Intensive dark-brown to black colour. The flint material often contains light bluish-grey or white-grey bands, lenticles or impurities such as limestone nodules. The fracture is mat, cleavability is weak (Mikoś 1983). The well preserved white limestone cortex may prove that this flint was obtained directly from cretaceous deposits found in the zone of moraine plateaux.

Forms of the IV variant of raw material decisively dominate in the analyzed assemblage of flint relics (83.8%), Pomeranian flint (III) implements amounted to only 11.8%, the remaining variants — a negligible 2.1%.

CHARACTERISTICS OF RELICS

Individuated among these relics were 32 splinters (i.e., 34.4% of the entire assemblage), 46 scales (49,4%), 13 natural concretions, their fragments or shivers (13.9%) and 2 tools (2.1%).

[3] Flint material from surface researches at Niedźwiedziówka and preparatory sounding works at Wybicko are subject of an individual work (cf. Mikoś 1983). The author wishes to express his thanks to Mgr. D. Mikoś for his agreement to use some data and findings.

The group of splinters comprises 6 one-polar objects (Fig. 19:5, 20:2,3), including 5 unilateral and 1 bilateral forms; 24 two-polar splinters and 15 bilateral (Fig. 19:6, 7,9–11, 20:7), 7 partly bilateral and one out of four unused flaked face (Fig 19:3,4,8), 2 reversible splinters with flaked faces at each pole but on opposite sides (Fig. 19:12), 2 splinters of a changed orientation (Fig. 20:5,8).

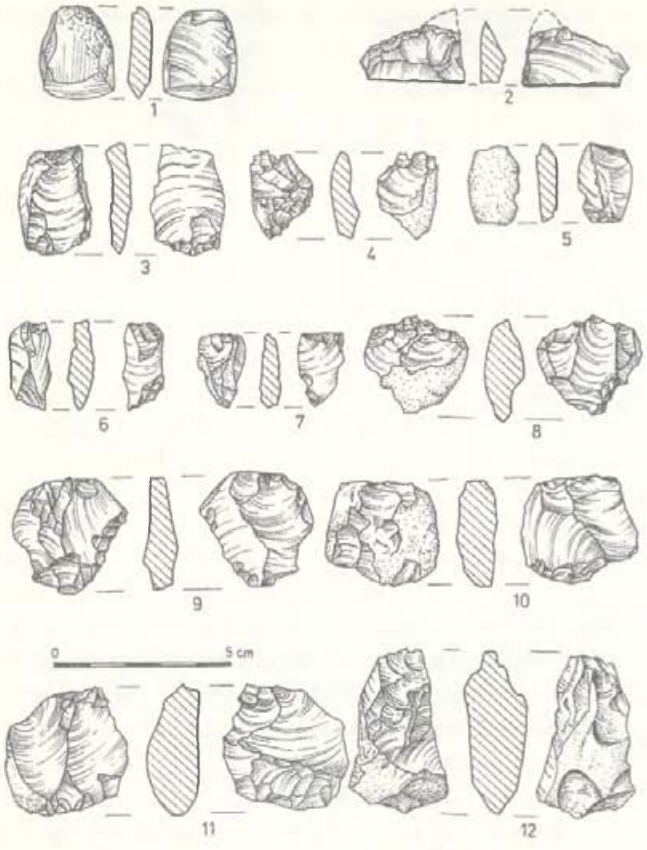

Fig. 19. Niedźwiedziówka, site I. Flint relics

Scales included 6 entirely cortex pieces, 17 cortex--negative and 23 negatives. Three edge chipping implements (Fig. 20:1,4,6) merit particular attention among natural flint concretions and their fragments.

Flint implements were represented by: 1 — a perforator with a broken tine, regenerated, which is seen in a regular, flaked off edge (Fig. 19:2), produced from a negative scale, raw material variant IV; 2 — a polished miniature axe from an initial splinter (Fig. 19:1), its working part is quite shiny, on the head and close to it are numerous traces of crushing which may indicate that it was used as a wedge-chisel which was hit by a hammer stone, raw material variant IV.

Dariusz Mikoś (1983) carried out microscropic studies of the Niedźwiedziówka implements. On the axe, he found traces of two phases of polishing and shining and a jagging of the working part. The damaged perforator shows distinct traces of repeated treatment seen in the already referred to trimming after flaking.

The assemblage of stone implements also includes fragments of 4 quartzite grinding plates (Fig. 21). They show clear traces of grinding on the upper plane or on the lateral edge (Fig. 21:1,2). Visible scratches on the first indicate that grinding was circular, whereas it was longwise on the other. One plate was used again as a support pad for flint treatment using the flaking (splinter) technique — seen in obvious traces of crushing (Fig. 21:1), which originated later than grinding scratches.

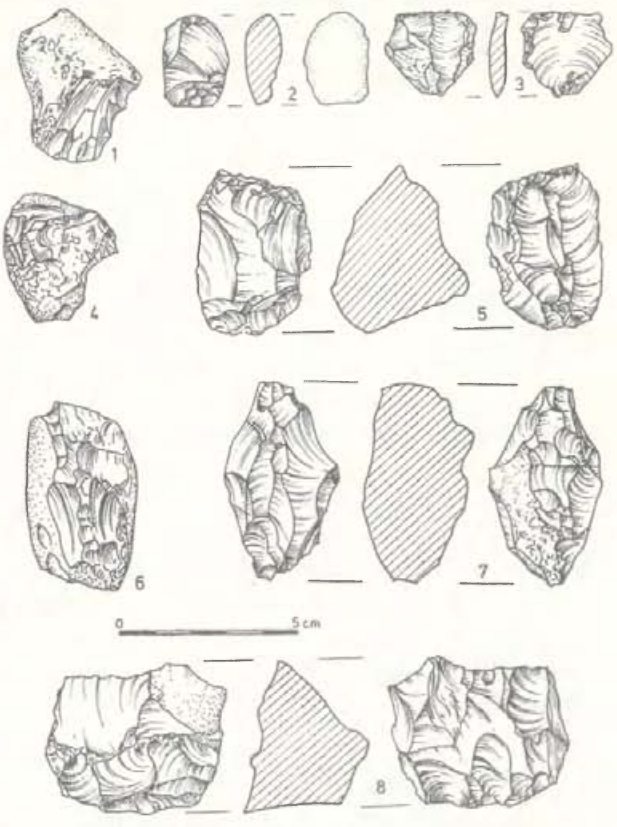

Fig. 20. Niedźwiedziówka, site I. Flint relics

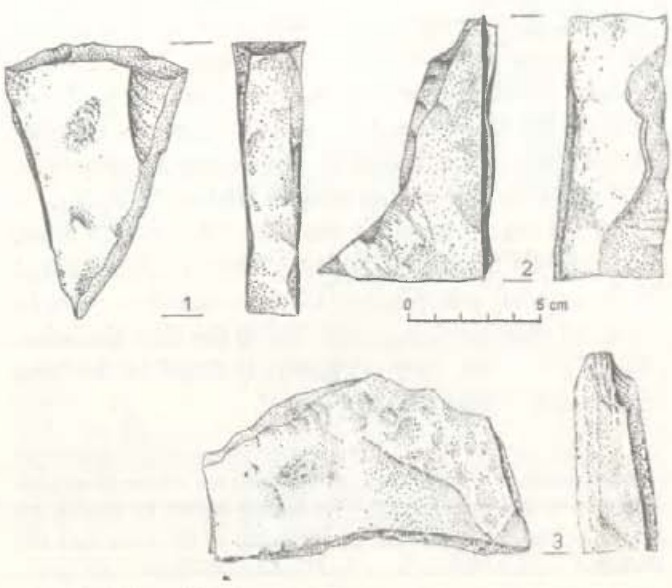

Fig. 21. Niedźwiedziówka, site I. Fragments of stone grinding plates

A RECONSTRUCTION OF THE PRODUCTION PROCESS OF AMBER ORNAMENTS

The problem concerning the reconstruction of the production process of amber ornaments by Neolithic communities in Poland was already discussed by the author (Mazurowski 1978; 1983a, 92–95). Elaborating the problem, the author based his work chiefly on a thorough analysis, above all, of finished products of several Neolithic cultures living between the Oder and Bug Rivers and on comparative data including the entire Baltic coast. Materials from Niedźwiedziówka and Wybicko are particularly valuable as they include, besides large quantities of semi-products, raw material and flint and stone implements used in production. All these relics originated, without doubt, at amber workshops.

In order to elucidate some doubtful technological problems, the author carried out experimental work with amber using implements from relevant Żuławy sites or those which may have been among the equipment of Neolithic producers (Fig. 22).

The comprehensive practical knowledge of Neolithic producers of certain physical and chemical properties of amber was the reason why only a very short time was required from the moment raw material was obtained up to its treatment. This was linked with endeavours to preserve its maximum moisture. Amber is then more resilient and, hence, better suited for mechanical treatment and cracks more seldom. The positive influence of water (or humid environment) on amber was well known to Neolithic people. Supporting evidence has been found in selected pieces of raw material deposited underground in the Rzucewo culture settlement at Suchacz (Ehrlich 1936). Investigations recently carried out there, revealed, between dwellings, 3 successive deposits of semi-produced and finished ornaments, some of which had been damaged during use. By keeping them underground producers thought to prevent the loss of basic properties. It is probable that the material gathered at Niedźwiedziówka and Wybicko was preserved in a similar manner. This has been confirmed by present-day amber collectors who maintained that amber concentrations occurred in some places on confined areas while there was none near by. Raw material was preserved identically during the Neolithic and the early Bronze Age on the south-eastern Baltic coast (Klebs 1882, 8–10; Jacobsons 1929, 473–484). It was also known in historical and contemporary times (Połujański 1854; Chętnik 1927).

When a sufficient amount of raw material was collected a selection followed. On its proper course depended the effectiveness of production, labour time and raw material economy. At the beginning, raw material not suited for treatment because of its smallness, unsuitable shape of lumps, heterogenous inner structure (cracks, deep pores left by organic vestiges, soil interpolations,

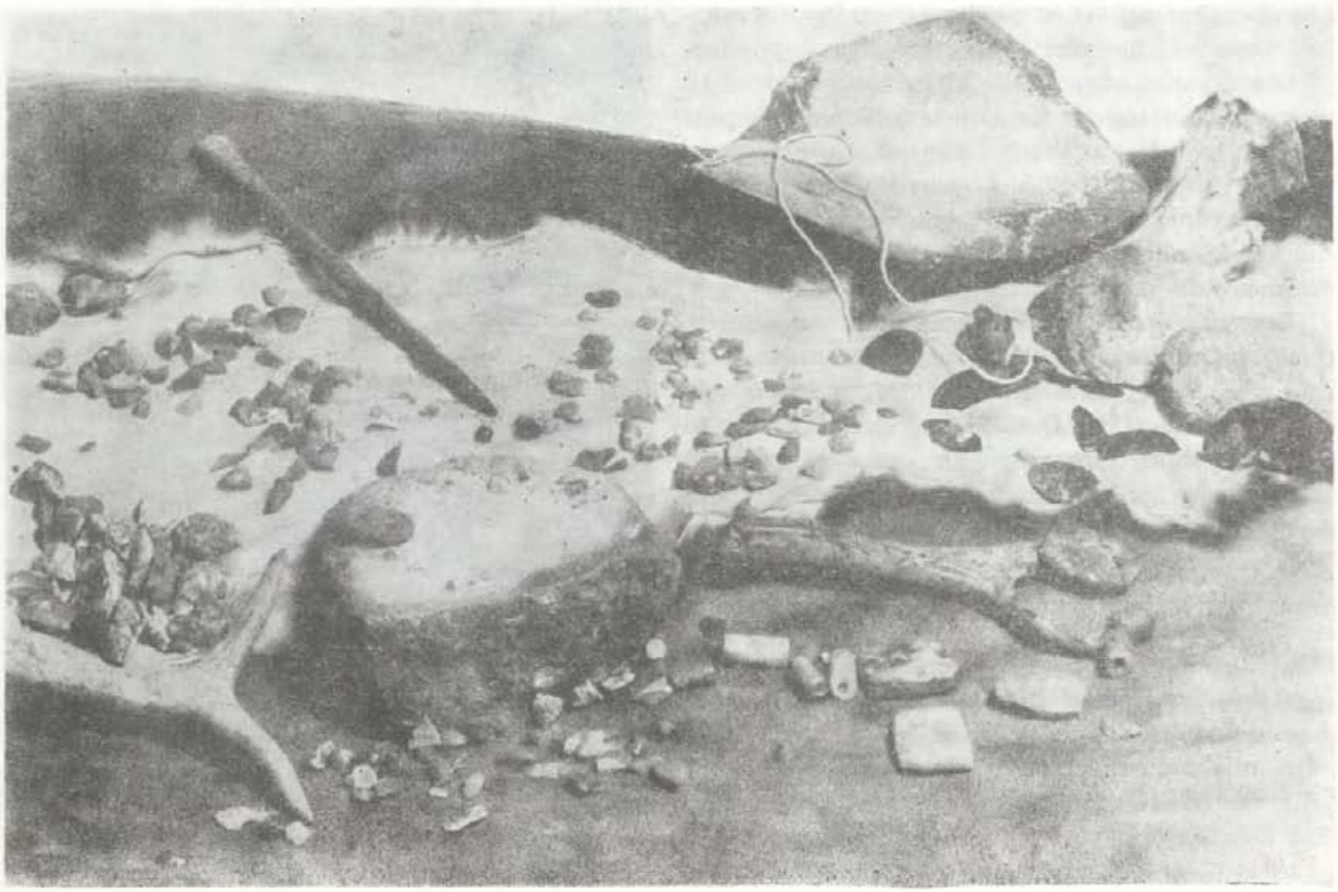

Fig. 22. A conjectural set of implements from a late Neolithic workshop of amber treatment in Żuławy

travertine or travertine-stratified texture) was rejected. Foamy amber was also put aside.

There followed a selection of raw material suited for treatment. This was done according to criteria involving the shape and size of lumps and the physical properties of amber variants. Raw material set apart for production of specific ornaments was chosen in accordance with principles:

1AIa beads required primarily amber lumps of the highest index of hardness, that is the transparent or clouded material or a blend of these two, shape approximating future products (icicles, spindle, cylindrical forms), laos block-shaped and thick plate forms. Raw material of the lowest index of hardness (bastard and osseous amber) was seldom included in production raw material.

1CI and 1CII beads required larger sub-cortex plates of amber regardless of type.

Button-shaped 1BI to 1BIV beads required usually a smaller raw material assortment, particularly variants of the lowest index of hardness but of a homogenous inner structure such as bastard and osseous amber and blends. Plate or even block pieces were sometimes taken for the production of button-shaped beads and production rejects for small ornaments.

Pendants (2A, 2BIa, 2BIII, 2BV) and discs (4BIa) required amber sub-cortex plates regardless of the variant; pieces lacking external cortex were primarily chosen for 2A forms.

The author previously individuated four phases of the production process (Mazurowski 1978; 1983a, 92–95). Only the first three phases are well documented in the investigated material, but they embrace the entire production cycle. Phase four deals with the repair and remaking of ornaments.

PHASE I. INITIAL TREATMENT

It embraces all functions from the beginning of treatment to such a shaping of semi-products that perforation was possible, namely the preparing of proper planes for drilling. Two sub-phases can be distinguished on the basis of analyzed materials:

Sub-phase Ia embraces initial functions — the splitting of larger lumps into smaller pieces and the treatment of surfaces and edges of early half-products forms of ornaments only with flint tools. They represent semi-products of all categories of the classification division included in group TIa. They are the earliest half-products forms of ornaments. As was clearly stated, all ornaments from Niedźwiedziówka and Wybicko were produced with the corring technique. The use of whole natural raw material lumps or their parts due to dividing up is not at variance with it.

Larger raw material pieces were divided according to three methods: a) using intermediary miniature flint axes (Fig. 19:1) and a stone or flint hammer stone; b) using a bone (Fig. 24) or horn intermediary tool and a hammer stone; c) cutting with a specially prepared thread (Figs. 25 and 26).

Most frequent are traces of the first two methods. They certainly required the use of soft pads or else the brittle raw material would have often been damaged. Animal skins were most probably used for this purpose (Fig. 23). Miniature axes were used primarily for dividing sub-cortex plates and flat pieces of raw material in general and also for the initial treatment of the outer edges of some ornaments, chiefly 1CI and 1CII beads, 2BIb and 2BIII pendants and, certainly 4BIa discs. This is indicated by characteristic near edge chips at the stricking point and very weakly curved wave negatives (1 or 2) on the chipping plane or analogous waves on the chipped off plane. The use of axes in dividing flat plates was even more purposeful because their broad blades produced a strictly defined direction of chipping. This could not have been achieved with a bone or horn intermediary. The precise use of an axe was possible

Fig. 23. Ia phase of treatment. The splitting of an amber lump with the use of a hammer stone and a bone intermediary tool

when the axe head was fixed a specially chosen piece of wood or bone- finding supported by experiment.

The second method of dividing raw material, requiring bone (Fig. 23) or horn intermediaries, was used, most probably, chiefly in splitting massive lumps into several parts or for successively chipping off larger shivers. This method left very characteristic traces in the form of obvious stricking points, well developed knots or their negatives and regular waves or their negatives. Traces of this method were found on few rudimentary forms of IB beads, ornaments from group 7 and also on a large number of flakes and blades. This may suggest its frequent use in initial surface treatment of larger ornaments. So far, no bone or horn intermediaries have been discovered at the two sites. It may be assumed that this function was fulfilled, among others, by bone awls or antler tines.

Thread cutting, for the first time noticed at the two sites, has had numerous examples. We may assume, therefore, that it was not exceptional there. This technique was used primarily to divide concretions into fragments of strictly defined regular shapes. Its traces appeared on the surface of some IAIa semi-products. We were able to complete articulating pieces from two such IAIa forms (cf. Fig. 11). Some of the before mentioned early semi-products beads of a regular rectangular cross--section probably originated in the same way. But many traces of chipping cover their faces and traces of cutting could have been obliterated.

There are two possible variants of cutting amber with thread. The first required two persons: one held the raw material lump while the other pulled the thread (Fig. 24). In the other variant, one person held the amber lump in one hand and a straight stick with a thread tied to it, in the other (Fig. 25). The lump was cut as it was rhythmically moved back and forth along the tightened thread. Our experiment has shown that the two methods were

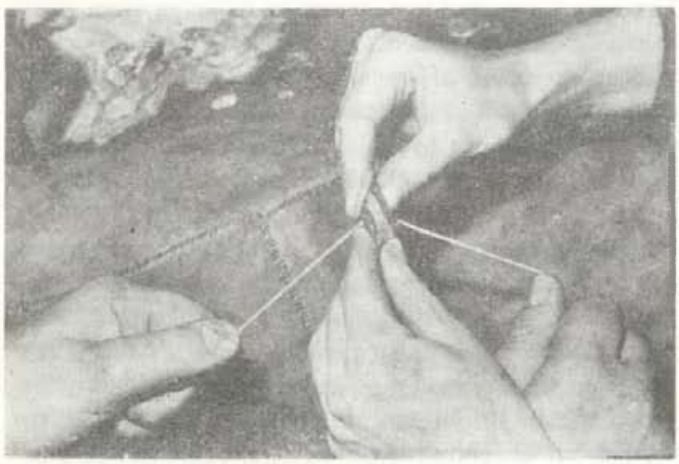

Fig. 24. Ia phase of treatment. The division of a raw material lump with thread by two persons

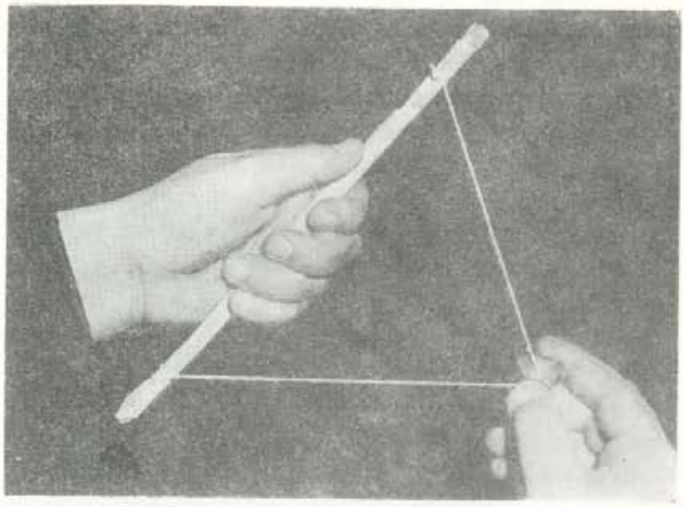

Fig. 25. Ia phase of treatment. The division of a raw material lump with thread by one person

equally effective — the cutting of a dry piece of amber 1.5 cm thick with a cotton thread took about 2 minutes. Further experiments involved the use of similar pieces of amber which were immersed in water for 48 hours. The required time of cutting was shortened afterwards by 40 seconds in the first variant and by 30 seconds in the second variant. It is important that identical traces of cutting were noticed on both experimental pieces and on prehistoric objects. The clearly arcuated scratches tallied with the direction of thread cutting. Contrary to presumptions, no strong, specially prepared threads were required for cutting. Experiments have shown that even a weak cotton thread strengthened automatically and increased its cutting power during use. Amber dust settles on it during rubbing. There is also an absorption of amber substances.

Most ornaments were produced from whole pieces of amber. The objective of further activities was to give future ornaments an approximate form. Button-shaped beads (IB) and those resembling a double axe (ICI and ICII) were achieved by an initial shaping of outer edges with the method of chipping off amber shivers with a miniature axe or an intermediary bone tool. But some of IBI–IBIV specimen, particularly smaller objects, suggest that this was done by a circular cutting of edges with a more precise flint implement. The surface of IAIa beads and their lateral bases were shaped in a similar, circular manner. Producers attempted to round the edges of IAIa pieces — which at this stage had a rectangular, transverse cross-section — by cutting them off with a flint implement. As a result, their transverse cross-section resembles in outline an octahedron. Here we approach the surface treatment which is common to all categories (except 2A). In the first place, it was to level the surrounding (IAIa, IAIb) surface, or the upper and lower surfaces (remaining ornaments). This was why traces of

treatment do not always appear on entire surfaces. Using — as requirements demand — sharp-edged flint scales, end-scrapers or even certain splinters, producers tried to remove all irregularities (Fig. 26). Level surfaces

Fig. 26. Ia phase of treatment. Removal of the outer cortex from the surface of the future ornament with a flint implement

covered with outer cortex were left untouched. Numerous chipping traces characteristic of this production stage, resemble surface retouching used in flint processing.

The flint assemblage from Niedźwiedziówka does not include special implements for the treatment of ornament surfaces (e.g., backed bladelets). We may assume that larger scales, scrapers and certainly splinters were used for this purpose. According to D. Mikoś (1983), traces of work were noticeable on edges of some splinters from Wybicko.

The most typical damages were caused to semi-products — during phase Ia — by disturbing the inner structure of the raw material while it was split into smaller pieces; the heterogenous, cracked inner structure of amber, indentations from organic vestiges and a too strong pressure of flint tools during the edge and surface treatment of the ornament.

Sub-phase Ib involves the final shaping of semi-produced ornamets by grinding them on fine-grained sandstone or quartzite pads. They are represented by semi-products from all categories of the classiffication division included in the technological subgroup TIb. Particular categories of ornaments are characterized by a much varied grinding method (Fig. 27). In a sense, we can speak here of types of grinding. Thus, lAIa beads were at first polished with narrow bands according to their length, subsequently the direction was changed into diagonal (Fig. 27:1,2). The transverse cross-section of the ornament changed, therefore, automatically, it became more oval or circular. In turn, button-shaped beads (lB) and those resembling double-axes (1CI and 1CII) obtained from flat or massive lumps of amber were most intensively ground at the outer edges, upper and lower sides (Fig. 27:3–5,7,9–11).

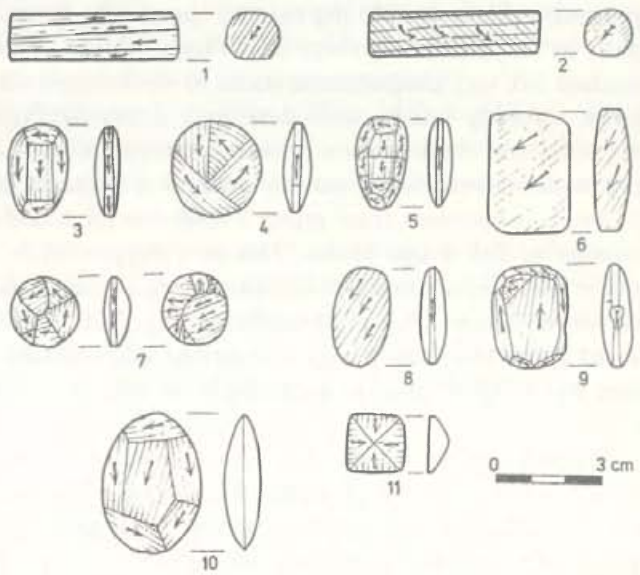

Fig. 27. Variants of grinding the surface and edges of ornaments

There were obvious attempts at achieving lenticular or flat-convex transverse cross-sections of ornaments. Some lBIIa and lCI beads show only traces of grinding — diagonal in relation to their longer axis. This involves, probably, semi-products made from raw material pieces of a more or less lenticular cross-section which, following an initial phase Ia treatment, did not require any more intensive grinding of edge parts in phase Ib.

The outer edge was ground in a circular way at the same time. After it was smoothed out, there followed another course of the same activities on the upper and lower surfaces. It was necessary to obliterate borders between particular polygonal faces. The ornament was pressed into the pad with, particularly, its inter-polygonal borders. Consequently, semi-products achieved more or less even faces or edges, traces of chipping from sub-phase Ia and remains of cortex were removed.

The preparing of spots intended for openings also belonged to the here discussed sub-phase treatment. This related particularly to lAIa, lCI and lCII beads. As regards lAIa forms, both bases were carefully ground endeavouring to achieve a right angle between them and the lateral face. The central part of some bases have a negative remaining after a single chipping stroke. The obtained depression was to prevent the slipping of the perforator during the initial working phase. The parallel bases increased the chance of a precise getting the drill through the centre of the ornament. The same functions were carried out in central parts of lateral edges of lCI and lCII beads. Negatives of a single chipping remained sometimes. If the near-edge parts were too thin for the

introduction of a drill, special notches were made (beads 1CI — Pls. III30, V17,18,20,26,27, Fig. 9:3). The shape of these beads closely resembled their lithic prototypes, so-called *Amazonenäxte*.

One of the faces was specially prepared to facilitate the V-shaped perforation in button-shaped beads. Regardless of the flat-convex or lenticular transverse cross-section, attempts were made at producing a more convex shape on the face where the opening was to be. The length of individual boreholes was thus shortened and the perforating tool was prevented from piercing through to the opposite side.

It should be added that no intended dusting power was used on surfaces during the grinding, since the highest possible rubbing power was tried to be achieved. During our experiments, we used grinding plates with and without chalk dusting. In the first instance, the removal of the outer cortex became practically impossible and all irregularities were smoothed out very slowly. If only the grinding plate was used, the same function was performed much faster. Already after a dozen or so moevements there appeared on the plate amber dust sediment which began to fill out uneven spots (on the ornament and the plate). Doubtlessly, the grinding plate had to be cleaned of dust from time to time.

What caused damage to semi-products in the Ib sub-phase was, first of all, a too strong pressing down of the treated object to the grinding plate, especially during the treatment of edges and adjacent parts and also the heterogenous inner raw material structure.

PHASE II. DRILLING OF OPENINGS

Many semi-produced ornaments damaged during drilling indicate clearly that it was the most difficult part of the production process as a whole. Successful drilling depended not only on the manual skill of the worker but also on the physical properties of the treated raw material. For this reason, the hardest variants of amber with homogenous inner structures were devoted first of all to the production of ornaments with long perforations. Pieces of softer (bastard, osseous) amber were usually used in the production of ornaments with short perforations (1B).

Analyzed assemblages include three types of openings: V-shaped, frontal and lateral (transverse). All were made with flint drills (perforators) as was proved by an analysis of all openings, particularly of semi-products damaged during phase II. Representative here are relics from various classification categories which, considering atributes of treatment, were included in group TII.

V-shaped openings have appeared in the investigated material only in button-shaped beads (1B), although they were found in other categories of ornaments discovered in the already referred to south Baltic (Vistula region) circle (Mazurowski 1978; 1983a, 23–53). The use of two obtuse angled ducts did much to prevent serious damage to the ornament. During drilling or use, frequently damaged was only the strap dividing duct entrances but not the whole bead. After repairs involving another drilling of an analogous or frontal opening at another spot, these ornaments could be used again. An example may be the already referred to semi-product 1BIIa from Niedźwiedziówka (Pl. III12). The great popularity of V-shaped openings was due, to a large degree, also to aesthetic reasons. Ornaments used for necklaces and diadems had openings imperceptible from the outside and a string or thin leather strip threaded through them

Lateral openings were found in 1AIa and 1AIb beads and, above all, 1CI and 1CII pieces. They were drilled from two sides so that ducts met in the central part of the ornament. Due to the shortness of the flint drill there were sometimes considerable difficulties in meeting these ends. This may be seen in circular scratches near the outlets of openings of some ornaments 1CIa and 1CIIa. This occurred when the whole length of the drill penetrating from one side failed to reach the opposite perforation. It was then necessary to press the drill further down. Sometimes workers returned to the previously bore hole to increase its length. Similar difficulties were probably encountered with longer forms 1AIa.

Our observations led to the conclusion that the size and proportions of ornaments with lateral perforations were limited on both investigated sites by the maximum length of the working part of flint drills. In the south Baltic region, producers of amber ornaments belonging to other Neolithic cultures, solved this problem by frequently using bone drills (Mazurowski 1978, 1983a, 93). These usually included awls and trimmed long bones of birds. Their abrasive power was increased by applying dusting from ground amber. Considering the general knowledge of amber perforation with bone implements in the Oder and Vistula basins, their absence at Niedźwiedziówka and Wybicko sites is difficult to comprehend.

The frontal openings in the investigated material were found in pendants 2A, 2B, beads 1EVI and discs 4BIa. They were also drilled from two sides. This is the most simple and safe type of perforation. This is probably why so few damaged semi-products in the relevant categories of ornaments were found among relics at the two sites.

An analysis of openings indicates that every producer had a set of flint perforators of various lengths and widths of the working part. The most delicate were

used for drilling button-shaped beads (1B) and pendants (group 2). It is possible that they were used initially for drilling lateral and some frontal openings. Later, bigger drills were used to gradually widen and lengthen the partly drilled duct. This was much safer than using massive drills at the beginning. The use of amber dusting powder with flint drills remains a matter for discussion. It was certainly used by other Neolithic cultures in the south Baltic area when perforations were made with bone implements. In the case here analyzed this was not necessary because, due to the continuous turning of the drill, there was sufficient amber dust in the duct. Its excess diminished the abrasive power of the flint perforator. This necessitated a frequent pulling out of the tool, the removal of dust and cleaning of the working part. This assumption has been supported by characteristic, sometimes overlapping scratches inside damaged ducts and their uneven walls. The presence of amber dust in scratches and depressions on the walls of openings are a normal sign in this case. Anyway, it is not an argument forejudging the intentional use of dust for drilling. The author's view was supported by experiments involving the use of flint perforators.

The function in the third phase of the production process did not require additional sets of tools. At work, producers held the semi-product in one hand and the drill in the other (Fig. 28). It is quite probable that the flint perforator was set in a piece of wood which made faster movements possible.

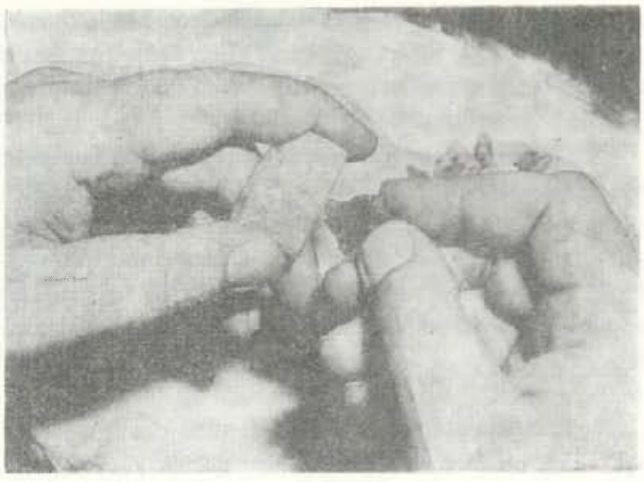

Fig. 28. II phase of treatment. Drilling a lateral opening in a lCIIa bead

Causes of damage of semi-products in phase II included most frequently: too much pressure on the drill and its irregular rotation during drilling; a too large size of the drill in relation to the thickness of the ornament; subgroup 1B beads: a too shallow position of ducts in V-shaped openings (a too large obtuse angle between ducts), a too vertical position of opening ducts which caused one or two frontal openings; an insufficient length of the drill in relation to the width (1CI, 1CII) or length of beads (1AIa); heterogenous raw material structure where the opening was made (cracks, joining of two types of amber).

PHASE III. FINAL TREATMENT

This production stage was the least difficult for producers. This is clearly indicated by the very low percent of relics from Niedźwiedziówka and Wybicko included in the III technological group and also the quantity of damaged forms. The final treatment involved a complete polishing of surfaces and edges of the ornament. This phase also includes ornamentation (Mazurowski 1978; 1983a, 94), but traces of it were not found among the here discussed assemblages. These activities required the use of supporting pads from supple rocks and organic raw material, and very fine-grained dust needed for polishing. In modern times, amber workers use chalk, finely ground limestone and amber, loam and fine-grained clay for this purpose (Połujański 1854; Chętnik 1927; 1952). Some of these materials were certainly available to Neolithic men from Niedźwiedziówka and Wybicko (fine grained loam and clay, amber dust and chalk).

The final process of ornament treatment began with the polishing of surfaces and edges on grinding plates already used in phase Ib. Delicate polishing with chalk or loam dust finally removed all irregularities. Moreover the close to edges parts of larger forms (1B, 1C, 1EVI, 4BIa) were further thinned down. This was also the moment to make a decision about leaving the faceted outer edges of some mentioned forms. Analogous questions in regard to surfaces of some 1BIIIb and 1BIV pieces were solved already in phase Ib.

Traces of oblong scratches probably made with a broad piece of bone or tine were found on some semi-products from phase III (Pls. II21,26, III29). These traces differ decisively from marks made during smoothing out on dusted grinding plates. We may assume, therefore, that there were two variants of surface polishing. The first, i.e., the use of dusted grinding plates, dominated.

Ornaments were subsequently polished to achieve completely smooth surfaces and glaze. At first, this was probably done on a piece of leather with a relatively thin layer of loam or chalk dust. Satisfactory results could also have been achieved by rubbing the ornament on leather without dusting. The characteristic amber gloss

was achieved by rubbing the object on a piece of outer leather or wool or a piece of woolen cloth. Following these procedures the ornaments were ready for use.

The author's experiments have proved that all scratches disappear most rapidly after rubbing the object on dusted materials — i.e., polishing on the inner part of leather and next — with a piece of woolen cloth.

Damages occurring in treatment phase III were caused by: a too strong pressing down of near-edge parts of the ornament during polishing on grinding plates; and as regards 1B beads — a too strong pressing of the surface with a V-shaped opening to the plate or leather resulting in a breaking of the strap.

As has been said, the author, working on Neolithic amber relics in Poland, differentiated a IV phase of treatment. This concerns finished products which, due to damage, were repaired or remade into other ornaments. In materials from Niedźwiedziówka and Wybicko, there appeared only semi-products 1BIIa and 1CIIa which, following damage, were remade during the same production cycle, into smaller objects of an analogous type (1CIIa). The semi-product 1BIIa from Niedźwiedziówka, with all features of button-shaped beads, has a second (frontal) opening and thus resembles a pendant in the 2BII class. Considering these reasons there are no ornaments in these assemblages which would reveal criteria proper to phase IV.

A COMPARATIVE ANALYSIS OF SOURCES

AMBER ORNAMENTS

An extensive assemblage of analogous forms of amber ornaments was produced at the two investigated sites (cf. Tab. 2), leading to the assumption that they originated in approximately the same time. Table 2 indicates, moreover, that ornaments from Niedźwiedziówka and Wybicko have similar structural features. As regards quantity, the ornaments from the two sites can be arranged in particular classes and variants successively (beginning with the most numerous): 1AIa, 1BII, 1BI, 1CII, 1CI. Within the IB and 1C class of beads, there dominate decisively ornaments of variant a. The remaining objects (beads 1AIb, 1BIIIa and b, 1BIV, 1EVI, pendants 2A, 2BIa, 2BIII, 2BV and discs 4BIa) belong to rare forms

The chronology of use of all forms of amber ornaments in the Vistula region engaged in amber treatment was discussed by the author in his previous works (Mazurowski 1978; 1983a, 24–86). The structural characteristics of amber products of all Neolithic cultures was also presented there. There is no need, therefore, to scrutinize these problems here.

Besides 1CIIa and b and 1AIb beads all forms of amber ornaments from Niedźwiedziówka and Wybicko have their corresponding objects in assemblages of the Rzucewo culture and some are typical only of the discussed culture (1BIV, 2A, 2BV). But other objects, especially beads 1B, 1C and 1EVI, show technological features typical of this culture. This involves the specific treatment of faceting outer edges and surfaces of some pieces. In Poland, the presence of this characteristics was found on certain amber ornaments of the Złota culture which coincides chronologically with the Rzucewo culture. But it occupied areas 400 km away from the Żuławy sites. This is why the above mentioned ornaments should be included, without hesitation, to the Rzucewo culture. So far, the formation of special cuts on lateral edges of 1CIa beads, to localize the lateral opening, was found only in this culture (Suchacz, Rzucewo).

1CIIa and b beads have been known in Poland so far only from some grave assemblages of the Globular Amphorae culture. An analogous piece was discovered in Mecklenburg (Schuldt 1974, fig. 8:15). The period these forms were in use was dated by the author to the years 2500–2200 B.C. In the light of unquestioned ^{14}C data relating to the Rzucewo culture at Šventoji in Lihuania (Rimantienė 1980, 7), it may be assumed that the Żuławy sites are of a similar chronology. Data (without calibration) are as follows:

Šventoji, site 1A — 4100±100 B.P. (Vs-22) = 2150± 100 B.C., 4120±80 B.P. (Ta-246) = 2170±80 B.C., 3860±50 B.P. (Le-835) = 1910±50 B.C.; site 9 — 3860±90 B.P. (Vib-1) = 1910±90 B.C.

Amber ornaments analogous to objects from Niedźwiedziówka and Wybicko (1AIa, 1BIa, 1BIIIb, 2A) have been discovered on the first of these sites. Relics resembling 2BIa and 4BIa pieces were discovered at other Šventoji sites (cf. Rimantienė 1980, 45–52, fig. 34–37). It should be added that the oldest material of the Rzucewo culture viewed from the typological aspect, appeared on site 2A which has no ^{14}C data, and the latest on site 9. We may assume, therefore, that this dating related to the classic (II) or perhaps later (III) phase of this culture, in accordance with J. Machnik (1978, 378 f.) division. In the light of these findings, there is a great probability that 1CIIa and b and 1AIb ornaments, known earlier in the Globular Amphorae culture, could have appeared in the Rzucewo culture as a result of intensive inter-community contacts. As

been indicated, among others, by T. Wiślański (1966, 115 f., 1975) and J. Machnik (1979, 375f.), the ceramic assemblage of the culture under discussion included many forms of pottery and ornamented motifs undoubtedly borrowed from the Globular Amphorae culture. These influences are noticeable also in pottery from Niedźwiedziówka. What is more, a large group of researchers recognizes features deriving from the Globular Amphorae culture as one of the two chief components of the Rzucewo culture. The author, however, directed attention at identical influences of the latter during the initial development period of amber production (Mazurowski 1983a, 69).

Some attention should be devoted to two categories of ornaments: beads 1BIII (variants a and b) and 1EVI. The 1BIII forms appeared in Poland at the turn of the III and II millennium almost solely in the Złota culture. However, in mass they appeared only in the subsequent two centuries. So far, Rzucewo culture sites on the Elbląg Uplands and areas west of the Vistula have yielded not one 1BIIIa or 1BIIIb bead. Yet they could not have appeared on Niedźwiedziówka and Wybicko sites earlier than in the Złota culture. From the chronological aspect they should correspond rather to the peak period of their popularity in the latter. Among others, there were in those times direct barter links between societies of the two cultures (Mazurowski 1983a, 100; 1983b, 177–188).

The bead 1EVI is the latest dated ornament from Niedźwiedziówka. It has numerous analogies discovered in graves of the Trzciniec culture dated to the end of the I and the turn of the I and II period of the Bronze Age (Kempisty 1978, 169, fig. 217, 244:2, 246:2,3, 256:1,5,9). Odd findings of several 1EVI specimens have been made on the coast of the Gdańsk Bay (collections of the Museum of Archaeology in Gdańsk, cat. nos. 1956:308, 1972:2). Some of these relics have been perforated with a metal implement. There is no substantiation, therefore, to date 1EVI beads from the Baltic coast earlier than to the aerly Bronze Age.

Summing up our deliberations, we may initially define the chronology of amber ornaments from Niedźwiedziówka and Wybicko to the decline of the Neolithic (21st–18th century B.C.). If the 1EVI bead form did not get into the Niedźwiedziówka assemblage incidentally this may indicate that there should be in this area also objects related to the Rzucewo culture settlement of the early Bronze Age.

We have only 4 completely finished ornaments from Niedźwiedziówka (0.65% of the assemblage), the remaining objects and all objects from Wybicko are semi-products from various stages of treatment. This certainly indicates the workshop type of these objects particularly so because they were found together with a large quantity of production waste and raw material.

POTTERY

Bowls are most numerous among pottery at Niedźwiedziówka (11–13 objects). Two types can be distinguished: semi-spherical (7 or 8 objects) and bowls with short outward bent necks. There were also 3 or 4 pots and large container vessels and vases. One amphora and a bath-tub-shaped vessel were also found. The discovered forms have many analogies in extensive assemblages of ceramic sources from systematically investigated Rzucewo culture settlements on the western bank of the Gdańsk Bay (Rzucewo, Gdynia, Osłonino) and from the Elbląg Uplands on the Vistula Gulf (Suchacz, Tolkmicko, Modrzewina, Święty Kamień-Przylesie, sites 1 and 2, Garbina). We have, therefore, refrained from discussing analogies with individual vessels. The reader will find them easily in works relating to the Rzucewo culture and its more important sites in Poland (Ehrlich 1923; 1925; 1936; 1940; Żurek 1954; Kilian 1955; Okulicz 1973, 118–133; Machnik 1979, 366–379). We have found that at the present stage of researches, the pottery from Niedźwiedziówka represents features relating to development phase II (classical) and III of the Rzucewo culture according to a division suggested by J. Machnik (1979, 378 f.). However, features typical of the I phase of this culture are absent.

In the analyzed assemblage there is also a complete absence of various types of beakers — so typical of the discussed culture. We cannot say at present to what degree the material, collected on the surface, has been representative for the entire site. But it does not seem to be quite accidental. The very small proportion of ornamented pottery is also surprising since permanent settlements of the Rzucewo culture have yielded typical and rich sets of various ornaments. This may have been linked with the character of the Rzucewo culture settlement in the here discussed part of Żuławy (seasonal camps).

The decisive majority or even all vessels from Niedźwiedziówka were produced in that area from local raw material — a grey loam with plant vestiges. Despite its semblance to clay it was less cohesive and waterproof due to the contents of fine-grained sand subject to fluctuations. This is why pottery surfaces were, prior to burning, coated with a thin layer of clay mixed with crushed granite. As a result, Żuławy pottery, maintaining general technological regularities and morphological features typical of the Rzucewo culture, indicates certain local peculiarities. It expresses the adaptation of communities temporarily living in those areas to local conditions.

FLINT AND STONE RELICS

Flint material from Niedźwiedziówka indicates that the production of flint implements took place where amber raw material was treated. This may be seen in the quantitative domination of relics undoubtedly linked with raw material exploitation. They include a great number of splinters used in the treatment of semi-raw material and a great quantity of scales from various stadia of splinter exploitation, treated as waste material. A further characteristics of flint workshops is the negligent number of mono-typic tools (2.1%) — i.e., those on which additional shaping treatment such as retouching, grinding or chipping off edges was carried out.

Raw material used in flint production included variants generally appearing on the surface of the Baltic morainic glaciation zone. But the decisive domination of erratic flint (variant IV) indicates that raw material was also obtained from upland cretaceous layers. It follows, that the raw material must have been carried to working sites because no such layers were discovered in the close environment.

The flint raw material discovered so far at Niedźwiedziówka should be connected with the splinter technique in obtaining semi-raw material. An analogous situation involves the flint assemblage from sounding studies on site I at Wybicko (Jagodziński 1982, 10f.; Mikoś 1983). The variants of raw material referred to have also been used there. The splinter technique is also known from permanent settlements of the Rzucewo culture (Żurek 1954, 18f., fig. 23:1–3; Tetzlaff 1970, 359–361, fig. 127:1–6; Mikoś 1983). But in addition, the method of obtaining flakes and blades from cores was employed there. This was proved by flint relics found by the author at a settlement of this culture at Suchacz.

Implements from Niedźwiedziówka have their analogous forms in the Rzucewo settlement (Żurek 1954, 18f.) but single specimens of perforators were also found at Suchacz (researches in 1981) and Tolkmicko (Mikoś 1983) settlements. The implement from Tolkmicko (preserved at the Malbork Castle Museum) is a sharp-tined form. Sounding studies at Wybicko yielded a slightly greater number of tools (Jagodziński 1982, 10f., fig. 9; Mikoś 1983). Finds included 3 miniature axes, a sharp-tined perforator and 2 points of other perforators (23:1,2), 3 grovers (23:3), 2 end-scrapers and several side-scrapers (Fig. 29:4–6) and scale with one partly retouched edge.

Forms doubtlessly used in amber treatment have been relatively numerous among flint implements found at Niedźwiedziówka and, above all, at Wybicko. They included, primarily, miniature axes, perforators and grovers. We may assume, therefore, that flint production at these sites was subordinated to the principal branch of economic activities of inhabitants, namely the treatment of amber. Grinding plates of which 4 fragments were discovered at Niedźwiedziówka were used, among others, in the amber production process. Identical plates appeared in large quantities in permanent settlements of the Rzucewo culture (cf. Żurek 1954, 22, 33–35, Pl. XV1,2, fig. 35). Both in permanent settlements. and seasonal camps these plates fulfilled various functions (Machnik 1979, 374). One of the plates found at Niedźwiedziówka was used again as a pad for flint treatment with the splinter technique.

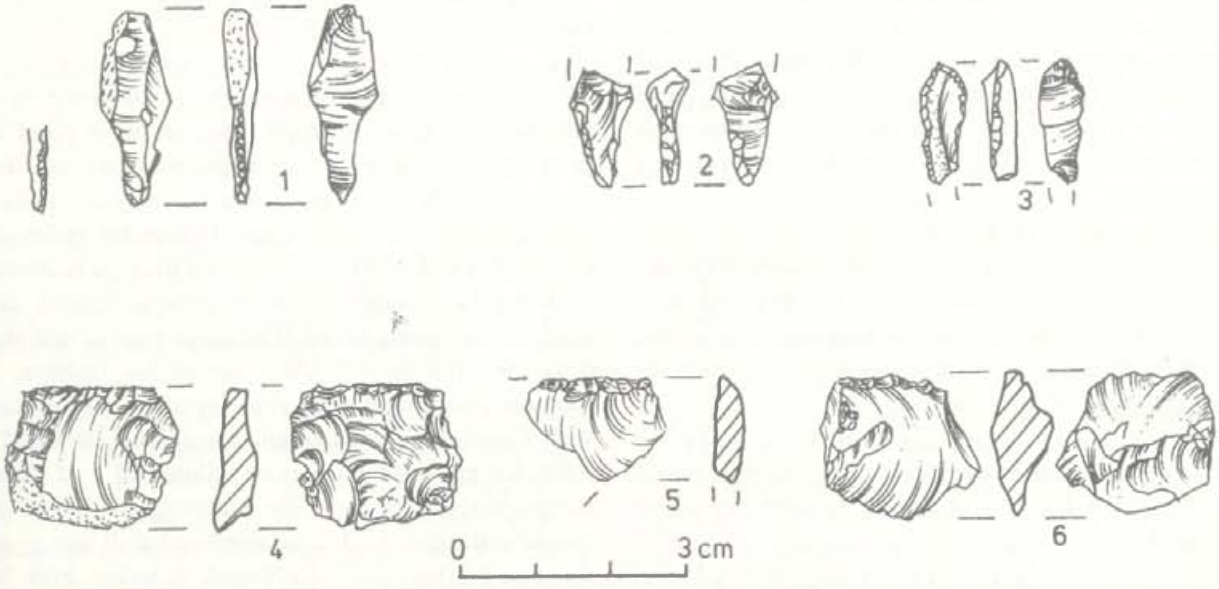

Fig. 29. Wybicko, site I. Some forms of flint implements

Accord. to D. Mikoś 1983

GENERAL REMARKS

The analyzed reli material undoubtedly derived from sites of a very specific character. These were seasonal settlements of Rzucewo Culture communities with remains of amber treatment workshops. The structure of the ancient assemblage indicates clearly the basic range of economic activities. The very extensive area on which materials from Niedźwiedziówka and Wybicko have been discovered and also their "insular" character suggest that there were several or a dozen or more camps active in an approximate chronological period (21st–18th century B.C.). It is difficult at present to individuate these camps. This will be possible after a thorough archaeological research of these areas covering a dozen or so square kilometers. It is also necessary to carry out a detailed geological investigation of not only the close environment of sites but of the entire wide strip where such finds were made — actually up to the seaside village of Stegna, voiv. Elbląg.

The up-to-date reconnaissance at Niedźwiedziówka and Wybicko sites together with information obtained from local amber prospectors exclude the possibility of existence of permanent, multi-seasonal settlements there. This is further supported by the unusually shallow depth of the cultural layer, its "insular" character, the absence of objects typical of permanent settlements (permanent houses, household caves) and of other economic activities.

Also other significant factors speak for the seasonal character of settlement in this region of Żuławy.

78 geological drillings one to three meters deep were made with a hand drill by the author in the region of the two sites within the framework of a research program on Neolithic settlement in Żuławy, realized by the Institute of Archaeology at Warsaw Uniwersity. Moreover, Doctor Aurelia Makowska from the Geological Institute in Warsaw, within systematic geological researches in Żuławy, made two 10 m deep drillings on site I at Niedźwiedziówka and one on site I at Wybicko. None of these drillings yielded traces typical of sea transgression either in the cultural layer or directly beneath it. The first traces of transgression appeared at a depth of 5–7 m. Profiles of small reconnoitring excavations made by the author at Niedźwiedziówka in 1981 and profiles of geological drillings allowed to reconstruct the stratygraphy of the site (Fig. 30):

Layer I — brown to grey silt (present-day soil level) 20–40 cm deep. Its underlying deposit is sometimes mixed with lower lying boggy soil due to present-day tilling or wasteful exploitation in recent years.

Layer II — strongly silted peat, fairly spread, brown (layer IIb) and black-brown dry-rot (layer IIa) developed from peat due to structural (mechanical and chemical) changes in the peat bog. These changes resulted from the lowering of the ground water level, the retention of peat-forming processes and a repeated inundation of the sediment. As a result of these processes the sediment acquires a typical aggregate (nut-clod) structure. The depth of layer II sometimes reaches 70 cm. but, on the average, does not exceed 30–40 cm. In the case of a very small depth the whole sediment changed into boggy soil. Rust-coloured spots, typical of iron hardpan processes, are often found on the surface of aggregates. The cultural layer with described relics is in the IIb deposit.

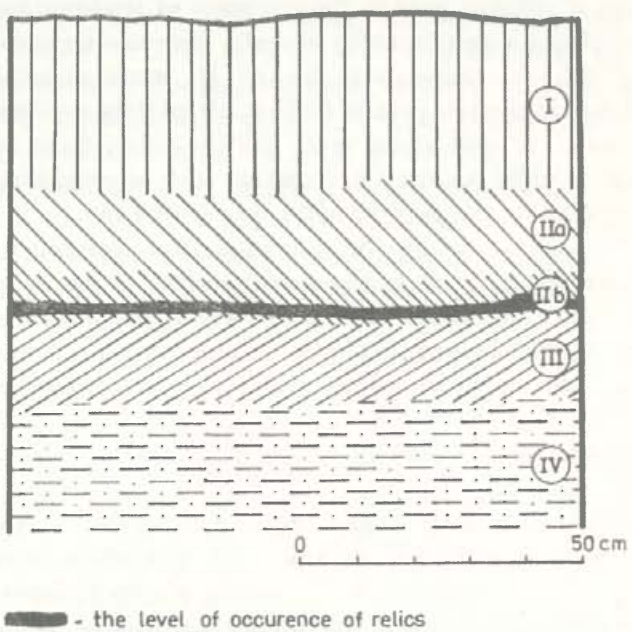

Fig. 30. Stratygraphy of site I at Niedźwiedziówka

Layer III — usually strongly watered, clammy silt of a light to dark brown, sometimes bluish-grey or grey, with or without macroscopically perceptible plant vestiges (reeds, grass, etc.). The uppermost part of this sediment contains well preserved alder tree trunks and decaying branches. The depth of layer III varies considerable (from 1 to 90 cm), the usual average is 20–40 cm.

Layer IV — sandy sediment, its upper part is almost always silty, going down it is more washed out due to a gradual decrease in the loam-pollen fraction. It is frequently stratified with thin layers of silt sometimes with disorderly placed fragments of reed or wood particles. Layer IV is light grey or yellow and — if gleyed — bluish-grey. It is typically waterlogged which made deeper drilling — with available hand drill bits — rather difficult. No changes were found. however, even in the deepest bore-holes (3 m). Bore-holes made with car drilles have shown that layer IV is 5–7 m deep at Nie-

dźwiedziówka and about 4 m at Wybicko. This is a much varied layer. It contains thin strata of sand and silt — sometimes wedging out each other. The roof of these sediments is wavy, differences in hight reach 20–50 cm. On the basis of up-to-date studies, it may be said that layer IV represents the profile of river bed sedimentation facies or silt deposited close to the bed.

Sites here discussed are situated, therefore, on river accumulated sand (layer IV) due to activities of the main bed of the Vistula or her numerous tributaries near the mouth. Still existing are Vistula branches Szkarpawa and Linawa flowing at a short distance from the archaeological sites. Historical data and geological observations indicate that the course of their beds changed even in the 13th–18th centuries (Bertram 1924; Sonntag 1914; Majewski 1969, 3–42; Szeliga 1982). In prehistoric times (of interest to us), the movement of Vistula, or her tributaries, waters must have shaped low, elongated sandbanks. They stretched from SE to NW. Subsequently, there developed in those times on the whole area a shallow, silted up and slowly overgrowing gulf in the western part of the Vistula Fen. The Vistula bed must also have shifted. This is indicated by layer III. Alder trunks and branches, reed and tall grass vestiges in the middle and higher part of the layer show that the reservoir overgrew rather rapidly. It was covered completely and initiated the development of a peat–boggy soil stratum during the subsequent period. This is reflected in layer IIb (peat) and IIa (black-brown) boggy soil. A relative lowering of the ground water surface must have occurred then. The considerable silting up of layer II indicates that peat developed in places regularly supplied with water and small mineral particles. Those loamy-pollen silt deposits are, therefore, the result of frequent floods. We have even noticed in layer II near Wybicko an admixture of coarser material: fine and medium grained and more seldom coarse-grained sand.

The SE—NW oriented holms were, of course, the first to dry up, while places where the Vistula Gulf bottom was lower took longer to dry. It is, therefore, not accidental that traces of Rzucewo culture camps, preserved in layer IIb, are grouped on those rises.

The presence of Vistula Gulf waters in the discussed part of Żuławy and, subsequently, its quite rapid vegetation overgrowth can be dated to the first phase of the Subboreal climate (SB_1). The drying up peak in this area and the development of seasonal settlements of Rzucewo culture communities may be dated to the second climatic phase (SB_2). According to many researchers, the years about 2200–1800 B.C. were the driest period of the Subboreal climate (Gross 1938, Tab. at p. 88; Firbas 1949, 104; Okulicz 1973, 63; Gudelis, Jemielianov 1982, Tab. 10). This tallies with the dating of Niedźwiedziówka and Wybicko sites, based on a typological-comparative analysis of relics.

These determinations concerning the position of the western bank of the Vistula Gulf in the Subboreal climate are largely in concert with research results of H. Bertram's (1924, 1–56) reconstruction of the Vistula delta in prehistoric times (Fig. 31). But certain corrections

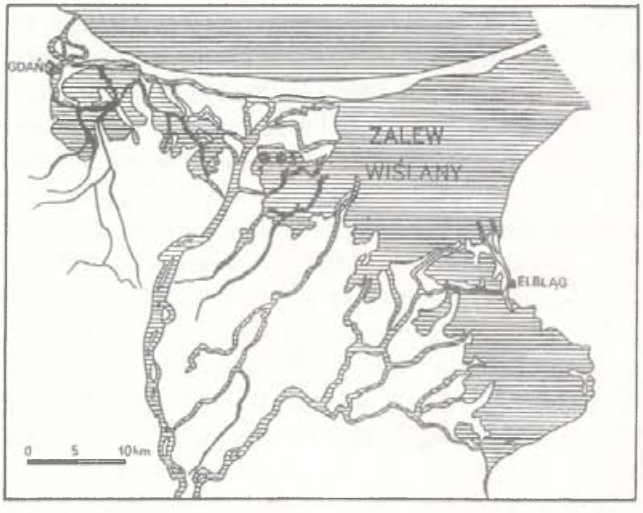

Fig. 31. The localization of discussed Rzucewo culture sites on a map of the Vistula mouth in 1300

1 — Niedźwiedziówka, site I; 2 — Wybicko, site I

Prepared by H. Bertram 1924

should be made. No signs of a renewed transgression of Vistula Gulf waters in phase SB_2 and the sub-Atlantic period (layers II and I) have been found in geological soundings and in Niedźwiedziówka and Wybicko profiles. However, residues of frequent floodings were observed. The bank of the reservoir was, therefore, at the turn of the 13th–14th centuries, east of Wybicko, at least 7–8 kilometres distant from the present-day Vistula bed.

An analogous phenomenon — occupation by Rzucewo culture communities of very low lying areas at the sea coast — took place in Lithuania (Rimantienė 1980). This has also been supported by analyses of palynological profiles of some sites and obtained radio-carbon data (Rimantienė 1979, 9–14; 1980, 6f.).

A permanent multi-seasonal stay at the two sites was rather impossible due to the danger of frequent floods in the winter-spring seasons. Seasonal settlement, from the beginning of summer to the end of autumn, was more purposeful. This did not rule out the possibility of returning of the same groups to the well known region. This probably explains the wide dispersal of settlement remains in the Niedźwiedziówka and Wybicko regions and the presence of probably analogous traces in neighbouring settlements.

Abundant source information indicates that the camps analyzed in this paper were not individual phenomena in Żuławy. Two particularly interesting finds

were made at Stegna. In the second half of the 19th century, during industrial amber exploitation, at the foot of a dune range on the Gdańsk Bay bank, an amber--and-wood layer was discovered at a depth of 4–5 m; several amber fragments extracted from it (in 1868) included a 1BIc bead (Lissauer 1887, 39; Klebs 1882, 47). The bead 1DI, published by R. Klebs (1882, Pl. X19) probably also originated there. In turn, in the inter--war period 47 amber ornaments were found near the same settlement in dune sands beneath peat at a depth of 2.25 m (La Baume 1935, 38, Pl. IL). These included 43 1BIV beads and 3 3AIII forms. The information that they were neither ground nor polished indicates that they were semi-products. An eventual presence of thread cutting on some beads may support this view.

In the second half of the 19th century at Wikrowo Wielkie, voiv. Elbląg, researchers discovered under a layer of humus and peat a fire-place with three stones and charcoal and a Neolithic vessel. An amber disc 4BIa was also found in peat there (Klebs 1882, 46, Pl. XI4). According to R. Klebs, it could have belonged to the fire-place assemblage, but there is no proof.

Remains of two Rzucewo culture settlements were also discovered at Sztutowo, voiv. Elbląg (Żurek 1954, 33), but in a slightly different geomorphological situation. Several other sites on the Gdańsk Bay, west of the present-day Vistula Estuary, have also been mentioned by J. Żurek (1954, 32–35). Let us add, that loose finds of Neolithic amber ornaments linked with the Rzucewo culture have very frequently appeared along the entire bank with the adjacent Żuławy depression (Mazurowski 1978; 1983a, 115–122). They have an identical chronology as Niedźwiedziówka and Wybicko relics. This statement also refers to previously mentioned relics from Stegna and Wikrowo Wielkie. They represent forms and some stylistic features typical only of the discussed culture.

Rzucewo culture settlements have also been discovered south of Niedźwiedziówka and Wybicko at Ostaszewo and Lichnowy but they were on higher, sandy elevations. Moreover, some stray finds of stone axes, often found in settlements of this culture, have been recorded up-to-date in Żuławy and the Vistula Bar (Kilian 1955, 241ff.; Okulicz 1973, 111f., figs. 46, 47).

The register of traces of Rzucewo culture settlements in Żuławy is, therefore, not so scanty but all finds are accidental. The hitherto held view on the small degree of Neolithic settlement in Żuławy is, therefore, most doubtful. The traditional method of surface researches yielded insufficient results in these specific conditions. The matter of searching for archaeological sites in these regions of Poland constitutes a separate problem exceeding the scope of this work. But the problem ought to be solved as soon as possible.

Collected data allows to advance the hypothesis that at the decline of the III and beginning of the II millennium there occured important climatic changes leading to a considerable drying up of the present depression. Some of its parts were intensively penetrated by Rzucewo culture groups arriving from coastal uplands in the western part of the Gdańsk Bay and, above all, from the Vistula Gulf. Groups who put up seasonal camps in the Niedźwiedziówka and Wybicko region probably came from the latter region, this has been indicated by a close semblance of ancient relics. It was certainly amber which excited sudden interest in that area — rather unhospitable for settlement. It was probably then or a little earlier that the settlement penetration to the Vistula Bar and the entire coastal stretch of dune uplands in the fen, east of the present-day Vistula mouth, and to analogous elevations to the south (Ostaszewo, Lichnowy) began.

The role of amber requires a more elaborate elucidation and references to the author's previous works (Mazurowski 1978; 1983a; 1983b). Amber was available to Rzucewo culture people throughout the range of their settlement on the Gdańsk Bay and the Vistula Gulf. As raw material, it was mostly gathered on beaches but it was also excavated from shallow Tertiary and Quarternary layers even in regions distant from the coast. The Rzucewo culture people achieved a high level of group specialization in gathering raw material, since it was usually found in dwellings and economic objects at almost every settlement. The process of amber ornament production was also well mastered. Numerous data indicate that up to the end of the III millennium they used raw material exclusively for their own requirements. It began to play an essential role in the economy of Rzucewo culture as an object of barter since the turn of the III and II millennium up to the end of the Neolithic. How did it come to that?

At the decline of the II (2500–2200) and in the III (2200–2000) stadium the popularity of amber reached the level of barter in Poland. This was due to its growing attractiveness among inhabitants of particular cultures inhabiting areas distant from its natural sources. They included the Globular Amphorae, the Funnel Beaker and Złota cultures in the Nałęczów Plateau and Sandomierz Uplands. Up to the end of the III millennium these groups obtained amber in direct barter with people of the Globular Amphorea culture, primarily from Mazovia and the Mazurian Lake District. The population of the latter culture achieved a relatively high degree of group specialization in exploiting amber raw material shallow Miocene, Pliocene and Quarternary deposits. But at the end of the III millennium settlement in these regions declined almost completely. The flow of amber to southern parts of Poland was, consequently, stopped.

This was felt most strongly by Złota culture communities. It became impossible to meet increasing demands for amber by other late Neolithic populations whose settlements coincided with "land" amber resources. They did not go beyong the stage of self-sufficiency in amber exploitation during the entire period of their existence. Principal reasons included a smaller output of "deposits" (Southern Małopolska, Silesia, Wielkopolska and Kujawy) and the simplest method of collecting raw material (gathering). In turn, in Mazovia and the Mazurian Lake District where deposite were abundant, Corded Ware culture communities and comprehensively taken cultures of the forest zone failed to show a greater interest in amber. In this situation, at the beginning of stadium IV (2000–1700 B.C.) the Złota culture and to a large extend Bell Beaker culture communities faced the necessity of searching for new areas capable to meet demands for amber raw material. It was then that direct barter contacts were made with Rzucewo culture groups from the Vistula Gulf and the Gdansk). Bay They reached their peak from the decline of the 20th century B.C. to the end of the Neolithic. These contacts were facilitated by the position of the two cultural units near the Vistula which in those times was undoubtedly an important communication route directly linking the settlement zones of the two cultures.

The new situation led to an intensification of amber gathering by coastal groups of the Rzucewo culture. Especially because buyers from the south were, probably, interested in raw material of the highest quality. Besides the exploitation of known sources these groups began to penetrate into hitherto inaccessible areas situated in the northern part of Żuławy and the presen-day entire stretch of the southern bank of the Gdańsk Bay. The choice of the place was probably not incidental. Until now, the banks of the Bay between Sobieszowo—Świbno—Mikoszewo—Stegna—Kąty Rybackie have the richest amber deposits on the entire Polish coast (Masicka 1970; Mazurowski 1983a, 19–23; 1983b). The sites at Niedźwiedziówka and Wybicko are situated 10 km south of the region referred to. It is, therefore, the direct hinterland of the present coastal zone. We do not know, however, where the banks of the Gdańsk Bay were in those times. Neither do we know exactly the range of the Vistula Bar and the Vistula Gulf to wards the west in phase SB_2. The solution of these basic problems in the future would allow to explain more exactly in which places amber was found by the Rzucewo culture people living in the settlement near Niedźwiedziówka and Wybicko.

The assertion that these groups gathered amber directly on the banks of the Gdańsk Bay is only apparently obvious. A thorough analysis deprives this variant of its logic even if we assume that the relevant stretch of the bank remained almost unchanged until our times. We have already shown that numerous traces of the Rzucewo culture such as settlements and stray finds occurred almost directly at the sea. Why then did the "Rzucewo" groups from Niedźwiedziówka and Wybicko not do the same? To set up camps near places of raw material exploitation was most economical and safe. This is even less comprehensible if we consider that the areas near Niedźwiedziówka and Wybicko were visited again and again for scores of seasons. The extensive range of settlement concentration excludes fortuity. According to the author, it is, therefore, almost impossible that these groups set out to the Gdańsk Bay to search for amber.

It is more probable that all seasonal camps in the relevant area were situated close to the region of amber exploitation or in its centre. This is posible if we assume that layer III appearing on the two sites comprises bottom sediments of the Vistula Gulf within its maximum range. The typical freshwater type of these sediments is probably due to the continuous flow of water into the fen from the main current of the Vistula and her numerous branches. Their small depth leads us to believe that the investigated region was situated close to the original bank. When the Vistula Gulf overgrew and dried up to a degree arriving Rzucewo culture groups could easily pick up large quantities of amber which was on the bottom of the reservoir (layer III). During storms, it became mixed with plant detritus from other regions of the fen and then dropped to the bottom. We have already stated that when layer II was formed at Niedźwiedziówka and Wybicko, the area was frequently flooded, this is seen in the pollen-loam slime. This would be, therefore, the result of floods linked with the seasonal rising of water in the fen, particularly in Winter and Spring. Amber, replaced by flood waters, remained on the surface of spacious meadows. When the water withdrew, groups of collectors arriving there in Summer--Autumn seasons were sure to find abundant raw material close to their camps. We can thus explain the relatively long-lasting attachment to those areas.

Raw material was obtained in two ways: 1 — amber was collected on the surface of surrounding meadows or the sifting through deposited plant detritus, 2 — it was extracted from layer III situated directly beneath the contemporary humus level. This required simple excavation methods analogous to those made by present--day prospectors.

Discovered amber was taken to the camp where a part of it was treated and prepared for requirements of the group. Most of the raw material was covered with earth and preserved for barter. Following the accumulation of large quantities, amber was transferred to permanent settlements where the barter took place. This

was why accumulations (deposits) of amber raw material was found near or inside houses (e.g., Suchacz) of some permanent settlements of this culture on the Elbląg Uplands.

Barter included amber raw material but not amber ornaments. This may be seen in the qualitative and structural characteristic of ornament collections of particular late Neolithic cultures from the south Baltic circle (Mazurowski 1978; 1983a, 54–86). Each of these cultures was characterized by some typical forms of ornaments not found in other cultures. These distinctions were often expressed in the use of different technical procedures in the production process of amber ornaments, hitherto unjustly described as "intercultural forms" (e.g., 1BIa, 1BIb, 1BIIa and b, 1BIII). In the times we have been discussing, there were also significant differences between amber production of the Złota and Rzucewo cultures[4].

Translated by Jan Rudzki

[4] Systematic excavations were initiated at the two sites in 1982–1983. The works at Wybicko have been supervised by Mgr. J. Jagodziński from the Office of Relic Documentation in Elbląg, and the works at Niedźwiedziówka — by the author. The already obtained extensive relic material fully supports views presented in this paper concerning the character of the settlement, its chronology and cultural class.

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CATALOGUE OF AMBER RELICS

This Catalogue includes all semi-products and finished forms of amber ornaments from site I at Niedźwiedziówka (Specif. 1–6) and site I at Wybicko (Specif. 7–12). Production waste and raw material characterized in the analytical par tare left out (p. 17f.). Description scheme:

Inv.no. — inventory number in the assemblage of a particular site.

Class, variant — forms according to a classification list (cf. pp. 6–8).

Treatment phase — on the basis of criteria presented on p. 26–31.

Fin. — final forms of ornaments.

Succinite — variant of amber from which the ornament was produced: T — transparent, C — clouded, B — bastard, O — osseous, X — 2 or 3 types of amber blended in the same relic, UV — undefined type because of its thick outer cortex (foamy amber does not appear in the discussed assemblage). Definitions of raw material variants have been prepared on the basis of macroscopic analyses, hence the possibility of a margin of error, this concerns principally the bastard variant because of its very fluid (relative) margin between this variant and osseous amber (this concerns inv.nos. from Niedźwiedziówka — 222, 229, 359, 360).

Amber colour — original, proper to its non-oxidized part. It is identical in the entire cross-section of the decisive majority of relics. There are, however, ornaments covered with a thin layer of outer cortex or remains of inner cortex. It is characterized by a gradual change of colour: from red on the outside, through orange hues to the original colour in the nucleus of the relic, it is then marked with the symbol UC — unspecified colour. There appear 2 or even 3 colours in most ornaments produced from blended variants of amber. Colour is then supplied in analogous succession as particular raw material variants.

Size — in millimetres. The point following the number defining length or width indicates that only a fragment of the ornament is preserved.

Weight — in grams.

Plate, figure — informing of plates or figures on which the relic has been presented.

Specification 1. Niedźwiedziówka, site I. Tubular cylindrical beads, long (1AIa)

Nr inv.	Phase of working					Succinite					Colour of succinite	Measurements, mm		Weight, grams	Plate, figure
	Ia	Ib	II	III	Fin.	T	C	B	O	X		lgth.	diam.		
1	+	–	–	–	–	–	+	–	–	–	yellow	78	24	24.90	I34
2	+	–	–	–	–	–	+	–	–	–	,,	79	23	24.98	I31
3	+	–	–	–	–	+	–	–	–	–	light-yellow	50	18	8.31	I30
4	+	–	–	–	–	–	+	–	–	–	yellow	57	30	15.60	I36
5	+	–	–	–	–	+	–	–	–	–	,,	22.	20	7.75	II44
6	–	+	–	–	–	–	+	–	–	–	cream-coloured-yellow	31	18	5.76	I33
7	+	–	–	–	–	–	+	–	–	–	honey yellow	30	21	8.21	I35
8	+	–	–	–	–	+	–	–	–	–	yellow	32	15	6.16	I20
9	+	–	–	–	–	–	+	–	–	–	honey yellow	32	19	8.16	I15
10	+	–	–	–	–	+	–	–	–	–	,, ,,	33	18	5.18	I32
11	+	–	–	–	–	+	–	–	–	–	,, ,,	32	12	5.60	I19
12	+	–	–	–	–	+	–	–	–	–	light-yellow	32	18	6.44	II32
13	+	–	–	–	–	+	–	–	–	–	,, ,,	39	20	10.80	II41
14	–	+	–	–	–	+	–	–	–	–	,, ,,	33	14	6.10	I16
15	+	–	–	–	–	+	–	–	–	–	yellow	40	21	7.82	II42
16	+	–	–	–	–	–	–	–	–	T+C	light-yellow	33	19	5.67	IV47
17	+	–	–	–	–	–	–	–	–	T+C	light-yellow+yellow	30	20	6.49	IV49
18	+	–	–	–	–	–	–	+	–	–	yellow	38	18	6.73	II38
19	+	–	–	–	–	–	–	–	–	T+O	light-yellow+white	42	16	5.47	I29
20	–	+	–	–	–	–	–	–	–	T+O	,, ,, ,,	26	17	6.35	I13
21	+	–	–	–	–	+	–	–	–	–	yellow	36	17	7.95	II43
22	+	–	–	–	–	–	–	–	–	B+O	cream-col. yellow+ +white	38	17	5.94	I28
23	+	–	–	–	–	–	+	–	–	–	yellow	32	19	6.59	I22
24	+	–	–	–	–	+	–	–	–	–	light-yellow	34	16	6.20	I25
25	+	–	–	–	–	+	–	–	–	–	yellow	28	18	5.74	II37
26	+	–	–	–	–	–	–	–	–	T+C	honey yellow	27	19	7.96	I27
27	+	–	–	–	–	–	–	–	–	T+C	honey yellow+cream--coloured-yellow	31	15	5.54	I18
28	+	–	–	–	–	–	+	–	–	–	cream-coloured-yellow	29	15	5.11	I24
29	–	+	–	–	–	+	–	–	–	–	honey yellow	18	16	4.87	II40
30	+	–	–	–	–	+	–	–	–	–	light-yellow	26	14	5.60	IV42
31	+	–	–	–	–	+	–	–	–	–	,, ,,	28	19	7.95	IV48
32	+	–	–	–	–	+	–	–	–	–	UC	25	13	2.76	IV50
33	+	–	–	–	–	+	–	–	–	–	yellow	28	14	3.86	II22
34	+	–	–	–	–	–	+	–	–	–	,,	25	13	3.56	I21
35	+	–	–	–	–	–	+	–	–	–	light-yellow	30	15	5.18	IV46
36	+	–	–	–	–	+	–	–	–	–	honey yellow	25	15	3.77	II34
37	+	–	–	–	–	+	–	–	–	–	yellow	38	16	5.61	I26
38	+	–	–	–	–	+	–	–	–	–	,,	26	12	3.28	II27
39	+	–	–	–	–	+	–	–	–	–	,,	23	13	3.00	–
40	+	–	–	–	–	–	+	–	–	–	,,	27	15	3.71	II28
41	–	+	–	–	–	–	–	–	–	T+B	light-yellow + yellow	30	16	5.10	IV48
42	+	–	–	–	–	–	–	–	–	T+C	light-yellow + cream--coloured-yellow	23	15	4.86	II33
43	+	–	–	–	–	–	–	–	–	T+O	honey yellow + cream--coloured-yellow	28	18	5.50	IV45
44	+	–	–	–	–	–	–	–	–	T+O	,, ,,	21	12	3.30	II25
45	+	–	–	–	–	+	–	–	–	–	yellow	19.	15	3.30	IV51
46	–	+	–	–	–	–	–	+	–	–	,,	18	14	3.60	V50
47	–	+	–	–	–	–	+	–	–	–	light-yellow	16.	15	3.49	V49
48	+	–	–	–	–	–	–	–	–	C+B	honey yellow + yellow	26	13	3.60	II23
49	+	–	–	–	–	+	–	–	–	–	yellow	24	16	3.71	II29
50	+	–	–	–	–	+	–	–	–	–	,,	21	15	3.30	IV36
51	+	–	–	–	–	–	+	–	–	–	,,	28	13	3.42	IV44
52	–	+	–	–	–	–	+	–	–	–	,,	27	15	3.55	–
53	+	–	–	–	–	–	–	+	–	–	,,	28	14	2.21	II24
54	+	–	–	–	–	–	+	–	–	–	,,	21	15	2.98	IV43
55	+	–	–	–	–	–	+	–	–	–	,,	30	16	5.36	I23
56	–	+	–	–	–	–	+	–	–	–	,,	21.	11	2.50	V42

Specification 1 condt.

Nr inv.	Phase of working					Succinite					Colour of succinite	Measurements, mm		Weight, grams	Plate, figure
	Ia	Ib	II	III	Fin.	T	C	B	O	X		lgth.	diam.		
57	+	–	–	–	–	–	–	–	–	C+O	honey yellow + cream-coloured-yellow	17.	15	3.69	IV38
58	+	–	–	–	–	–	–	–	–	T+O	cream-coloured-yellow	17	11	4.89	–
59	+	–	–	–	–	–	–	–	–	T+O	,, ,, ,,	16.	16	2.26	IV39
60	+	–	–	–	–	+	–	–	–	–	yellow	15	10	1.97	IV41
61	+	–	–	–	–	–	+	–	–	–	cream-coloured-yellow	14.	12	2.20	–
62	+	–	–	–	–	+	–	–	–	–	yellow	10.	15	0.64	–
63	–	+	–	–	–	–	+	–	–	–	cream-coloured-yellow	19.	15	0.64	–
64	–	–	+	–	–	–	+	–	–	–	honey yellow	31	16	3.76	–
65	–	+	–	–	–	+	–	–	–	–	light-yellow	24	11	2.16	I14
66	–	–	+	–	–	+	–	–	–	–	,, ,,	26	17	3.83	I9
67	–	–	+	–	–	+	–	–	–	–	,, ,,	30	17	3.99	–
68	–	–	+	–	–	–	–	–	–	T+B	light-yellow + honey yellow	27	12	2.69	II30
69	–	–	+	–	–	+	–	–	–	–	light-yellow	27	14	2.69	IV33
70	–	–	+	–	–	–	+	–	–	–	yellow	24	12	1.81	I8
71	–	–	+	–	–	+	–	–	–	–	,,	26	16	3.91	II39
72	–	–	+	–	–	–	+	–	–	–	light-yellow	26	13	2.76	II36
73	–	–	+	–	–	+	–	–	–	–	yellow	25	13	2.25	II35
74	–	–	+	–	–	+	–	–	–	–	yellow	24	16	2.58	IV35
75	–	–	+	–	–	+	–	–	–	–	,,	20	16	2.27	IV28
76	–	–	+	–	–	+	–	–	–	–	,,	30	13	1.39	IV32
77	–	–	–	+	–	–	+	–	–	–	,,	23	10	1.37	I1
78	–	–	–	–	+	–	+	–	–	–	light-yellow	22	9	1.07	I2
79	–	–	–	+	–	–	+	–	–	–	,, ,,	16	9	0.93	I4
80	–	–	–	+	–	+	–	–	–	–	,, ,,	14	12	1.05	I5
81	–	–	–	–	+	+	–	–	–	–	yellow	17	11	1.22	I3
82	–	–	+	–	–	+	–	–	–	–	,,	18	11	1.38	II31
83	–	–	+	–	–	+	–	–	–	–	,,	15	11	1.10	IV4
84	+	–	–	–	–	+	–	–	–	–	,,	27	9	1.18	–
85	–	–	+	–	–	+	–	–	–	–	,,	27	15	3.40	IV31
86	–	–	+	–	–	–	+	–	–	–	,,	29	16	2.18	IV21
87	–	–	+	–	–	+	–	–	–	–	,,	20	9	0.89	IV24
88	–	+	–	–	–	+	–	–	–	–	light-yellow	17	12	1.31	V43
89	–	–	+	–	–	–	+	–	–	–	milk-yellow	17	12	1.43	IV23
90	–	–	+	–	–	–	+	–	–	–	cream-coloured yellow	18	12	0.93	V34
91	–	–	+	–	–	+	–	–	–	–	yellow	19	9	0.88	IV13
92	–	–	+	–	–	–	–	–	–	T+O	yellow + cream-coloured-yellow	22	12	2.09	IV34
93	–	–	+	–	–	+	–	–	–	–	yellow	21	9	0.79	IV22
94	–	–	+	–	–	–	+	–	–	–	milk-yellow	23	14	2.39	IV26
95	–	+	–	–	–	–	–	–	+	–	white	23	11	1.11	V44
96	–	–	+	–	–	–	–	–	+	–	white	15	9	0.51	–
97	–	+	–	–	–	+	–	–	–	–	yellow	23	13	2.14	I17
98	–	–	+	–	–	+	–	–	–	–	,,	21	13	1.75	IV30
99	–	–	+	–	–	–	–	+	–	–	light-yellow	22	13	1.45	I7
100	–	–	+	–	–	–	–	+	–	–	yellow	18.	10	1.01	IV12
101	–	–	+	–	–	–	–	–	–	B+O	cream-coloured-yellow	18	10	0.80	IV8
102	–	–	+	–	–	–	+	–	–	–	honey yellow	19	11	1.16	I12
103	–	–	+	–	–	–	+	–	–	–	,, ,,	22	9	0.82	IV1
104	–	–	+	–	–	–	+	–	–	–	,, ,,	22	16	2.58	IV25
105	–	–	+	–	–	–	–	–	–	T+B	light-yellow + cream-coloured-yellow	20	11	1.37	I10
106	–	–	+	–	–	–	–	–	–	T+B	yellow + cream-coloured-yellow	19	10	1.00	I11
107	–	–	+	–	–	–	–	+	–	–	yellow	19	10	0.79	IV29
108	–	–	+	–	–	+	–	–	–	–	,,	18	14	2.24	IV27
109	–	–	+	–	–	+	–	–	–	–	,,	13.	12	1.21	–
110	–	–	+	–	–	–	–	+	–	–	,,	20	10	0.95	V35

Specification 1 condt.

Nr inv.	Phase of working					Succinite					Colour of succinite	Measurements, mm		Weight, grams	Plate, figure
	Ia	Ib	II	III	Fin.	T	C	B	O	X		lgth.	diam.		
111	–	–	+	–	–	–	–	+	–	–	yellow	21	15	1.76	IV11
112	–	–	+	–	–	–	–	–	+	–	honey yellow	15.	10	0.92	IV2
113	–	–	+	–	–	–	+	–	–	–	,, ,,	20	14	1.06	–
114	–	–	+	–	–	–	+	–	–	–	,, ,,	22.	15	1.29	IV14
115	–	–	+	–	–	–	+	–	–	–	,, ,,	16.	12	0.64	IV16
116	–	+	–	–	–	–	–	+	–	–	yellow	13.	13	0.52	I6
117	–	+	–	–	–	–	+	–	–	–	honey yellow	15.	9	0.62	–
118	–	–	–	+	–	–	+	–	–	–	,, ,,	14	7	0.73	IV9
119	–	–	+	–	–	–	+	–	–	–	,, ,,	19	9	0.57	IV10
120	–	–	+	–	–	+	–	–	–	–	,, ,,	17.	12	0.71	IV20
121	–	–	+	–	–	–	+	–	–	–	,, ,,	22.	14	1.60	IV19
122	–	–	+	–	–	+	–	–	–	–	,, ,,	19.	11	0.63	IV15
123	–	–	+	–	–	–	+	–	–	–	cream-coloured-yellow	19	15	1.28	–
124	–	–	+	–	–	+	–	–	–	–	yellow	20	10	0.85	IV5
125	–	–	+	–	–	–	–	–	–	T+O	yellow + cream-coloured-yellow	20	13	1.66	IV7
126	–	–	+	–	–	+	–	–	–	–	yellow	20	12	1.05	–
127	+	–	–	–	–	–	–	–	–	T+C +O	yellow + white	16.	16	1.64	IV40
128	–	–	+	–	–	–	+	–	–	–	light-yellow	15	11	1.16	V39
129	–	–	+	–	–	+	–	–	–	–	,, ,,	18	12	0.78	IV3
130	–	–	+	–	–	–	–	+	–	–	,, ,,	14.	12	0.81	V45
131	–	–	+	–	–	+	–	–	–	–	honey yellow	16	9	0.46	–
132	–	–	+	–	–	–	+	–	–	–	,, ,,	22	13	0.99	IV17
133	–	–	+	–	–	–	–	–	–	T+B	yellow + honey yellow	15	10	0.86	IV6
134	–	+	–	–	–	–	–	–	–	C+O	yellow + cream-coloured-yellow	11.	10	0.67	–
135	–	–	+	–	–	+	–	–	–	–	light-red	14.	10	0.58	V38
136	–	–	+	–	–	–	–	–	–	T+O	yellow + white	10.	12	0.79	–
137	–	–	+	–	–	–	+	–	–	–	cream-coloured-yellow	14.	8	0.50	–
138	–	–	+	–	–	–	–	–	+	–	milk-white	16	11	1.00	–
139	–	–	+	–	–	–	–	–	+	–	cream-coloured-yellow + brown	15	10	0.46	–
140	–	–	+	–	–	–	+	–	–	–	yellow	14.	11	0.63	–
141	–	–	+	–	–	+	–	–	–	–	,,	11.	6	0.22	–
142	–	–	+	–	–	–	+	–	–	–	,,	10.	11	0.67	–
143	–	–	+	–	–	–	+	–	–	–	cream-coloured-yellow	21	16	1.39	IV18
144	–	–	+	–	–	–	+	–	–	–	,,	12.	13	0.45	–
145	–	–	+	–	–	+	–	–	–	–	light-red	21	15	1.99	V37
146	–	–	+	–	–	–	–	–	–	T+C	light-yellow + milk-white	21	14	0.96	V36
147	+	–	–	–	–	–	–	+	–	–	yellow	14.	15	1.37	–
148	–	–	+	–	–	–	+	–	–	–	yellow	12.	10	0.63	–
149	–	–	+	–	–	+	–	–	–	–	,,	15.	11	0.69	–
150	–	–	+	–	–	–	+	–	–	–	,,	9.	10	0.54	–
151	–	–	+	–	–	–	–	–	–	T+C	yellow + cream-coloured-yellow	10.	11	0.79	–
152	–	–	+	–	–	+	–	–	–	–	yellow	16	8	0.27	–
153	–	+	–	–	–	+	–	–	–	–	dark-yellow	10.	18	1.81	–
154	–	–	+	–	–	–	–	–	–	C+B	yellow	23	18	2.30	–
155	–	–	+	–	–	–	–	–	–	T+C	,,	16.	10	0.48	–
156	–	–	+	–	–	–	+	–	–	–	,,	13.	12	1.09	–
157	–	–	+	–	–	–	–	–	–	UV	UC	16.	14	0.88	–
158	+	–	–	–	–	–	+	–	–	–	yellow	14.	13	1.28	–
159	+	–	–	–	–	–	+	–	–	–	,,	9.	15	0.91	–
160	–	–	+	–	–	–	–	+	–	–	,,	13.	15	0.70	–
161	–	–	+	–	–	–	–	–	–	C+O	yellow + white	11.	16	0.81	–
162	–	–	+	–	–	–	–	+	–	–	yellow	12.	10	0.69	–
163	–	–	+	–	–	–	–	–	–	C+O	honey yellow + white	15.	11	0.93	–

Specification 1 condt.

Nr inv.	Phase of working					Succinite					Colour of succinite	Measurements, mm		Weight, grams	Plate, figure
	Ia	Ib	II	III	Fin.	T	C	B	O	X		lght.	diam.		
164	–	–	+	–	–	–	–	+	–	–	honey yellow	9.	13	0.57	–
165	–	–	+	–	–	–	–	+	–	–	,, ,,	17.	12	0.58	–
166	–	–	+	–	–	–	–	+	–	–	,, ,,	12.	12	0.73	–
167	–	–	+	–	–	–	+	–	–	–	,, ,,	18	11	0.58	–
168	–	–	+	–	–	–	–	–	+	–	white	9.	9	0.25	–
169	–	–	+	–	–	–	+	–	–	–	yellow	10.	11	0.29	–
170	–	–	+	–	–	+	–	–	–	–	light-yellow	16.	9.	0.34	–
171	–	–	+	–	–	+	–	–	–	–	honey yellow	10.	14	0.77	–
172	–	–	+	–	–	–	+	–	–	–	yellow	17.	11	0.48	–
173	–	–	+	–	–	+	–	–	–	–	light-red	11.	12	0.40	–
174	–	–	+	–	–	–	+	–	–	–	cream-coloured-yellow	9.	11	0.62	–
175	–	–	+	–	–	–	+	–	–	–	,,	17	12.	0.64	–
176	–	–	+	–	–	–	–	–	–	T+C	yellow + cream--coloured-yellow	15	10	0.68	–
177	–	–	+	–	–	–	+	–	–	–	light-yellow	11	9	0.37	–
178	–	–	+	–	–	+	–	–	–	–	,, ,,	12.	9	0.43	–
179	–	–	+	–	–	–	–	–	–	T+C	yellow + cream-coloured-yellow	15	9	0.34	–
180	–	–	+	–	–	–	–	+	–	–	yellow	13	7	0.26	–
181	–	–	+	–	–	+	–	–	–	–	honey yellow	10.	10	0.33	–
182	–	–	+	–	–	–	–	–	–	T+C	light-yellow + cream--coloured-yellow	13.	12	0.54	–
183	–	–	+	–	–	+	–	–	–	–	yellow	11.	9	0.24	–
184	–	–	+	–	–	–	–	–	–	T+C	light-yellow + cream--coloured-yellow	8.	10	0.36	–
185	–	–	+	–	–	–	+	–	–	–	white	7.	12	0.27	–
186	–	–	+	–	–	–	+	–	–	–	light-yellow	13.	10	0.47	–
187	–	–	+	–	–	–	+	–	–	–	yellow	12.	9	0.35	–
188	–	–	+	–	–	+	–	–	–	–	honey yellow	12.	7	0.18	–
189	–	–	+	–	–	–	+	–	–	–	yellow	8.	13	0.28	–
190	–	–	+	–	–	–	+	–	–	–	,,	6.	11	0.26	–
191	–	–	+	–	–	+	–	–	–	–	honey yellow	4.	15	0.36	–
192	–	–	+	–	–	+	–	–	–	–	,, ,,	9.	9	0.21	–
193	–	–	+	–	–	–	–	–	–	T+O	light-yellow + yellow	15.	12	0.43	–
194	–	–	+	–	–	–	–	–	+	–	cream-coloured-yellow	8.	10	0.19	–
195	–	–	+	–	–	+	–	–	–	–	dark-yellow	11.	7	0.12	–
196	–	–	+	–	–	–	–	–	–	B+O	,, ,,	6.	9	0.12	–
197	–	–	+	–	–	+	–	–	–	–	honey yellow	10.	10	0.21	–
198	–	–	+	–	–	+	–	–	–	–	,, ,,	10.	7	0.10	–
199	+	–	–	–	–	–	–	+	–	–	light-yellow	9.	16	0.54	–
200	+	–	–	–	–	–	–	+	–	–	yellow	18	13	1.36	V41
201	+	–	–	–	–	–	–	–	–	C+O	light-yellow + cream--coloured-yellow	32	16	3.30	V47
202	+	–	–	–	–	–	–	–	–	T+C	light-yellow + honey yellow	39	16	5.34	V40
203	+	–	–	–	–	–	–	–	–	T+C	,,	43	15	5.26	V46
204	+	–	–	–	–	–	–	–	+	–	white	12.	12	0.76	–
393	+	–	–	–	–	–	+	–	–	–	honey yellow	19	7	1.06	IV37
394	+	–	–	–	–	–	+	–	–	–	,, ,,	15.	11	0.66	–
395	–	+	–	–	–	–	+	–	–	–	,, ,,	33	14	4.51	10:13
396	+	–	–	–	–	–	–	–	–	T+C	light-yellow + yellow	26	15	3.43	10:12
397	+	–	–	–	–	–	+	–	–	–	light-yellow	22.	14	2.33	10:2
398	+	–	–	–	–	–	–	–	–	T+C	light-yellow + dark-yellow	22.	15	2.28	10:1
399	–	+	–	–	–	–	–	+	–	–	yellow	14.	12	0.89	10:9
400	–	–	+	–	–	+	–	–	–	–	light-yellow	21.	11	0.46	10:10
401	–	–	+	–	–	–	+	–	–	–	,, ,,	10.	12	0.31	–
402	–	+	–	–	–	–	–	–	–	–	honey yellow + yellow	3.	15	0.48	–
	69	21	118	4	2	74	68	20	8	43				540.69	

1–204, 393, 394 — purchased 395–402 — form author's surface investigations

Specification 2. Niedźwiedziówka, site I. Button-shaped beads with V-perforation (buttons)

Nr inv.	Class, variety	Phase of working					Succinite					Colour of succinite	Measurments, mm				Weight, grams	Plate, figure
		Ia	Ib	II	III	Fin.	T	C	B	O	X		diam.	lgth.	wid.	thick.		
205	1BIa	–	–	+	–	–	+	–	–	–	–	honey yellow	18	–	–	7	0.97	II6
206	1BIa	–	–	+	–	–	–	+	–	–	–	milk-yellow	24.	–	–	8	1.00	VI32
207	1BIa	–	+	–	–	–	+	–	–	–	–	honey yellow	20	–	–	8	1.16	II11
208	1BIa	+	–	–	–	–	–	+	–	–	–	,, ,,	23	–	–	8	1.79	II19
209	1BIa	–	–	–	+	–	–	–	–	+	–	dark-yellow	15.	–	–	6	0.35	II2
210	1BIa	–	–	+	–	–	+	–	–	–	–	honey yellow	19.	–	–	8	0.81	VI33
211	1BIa	+	–	–	–	–	–	+	–	–	–	,, ,,	17	–	–	7	0.93	II14
212	1BIa	–	–	+	–	–	–	+	–	–	–	yellow	14.	–	–	6	0.27	VI37
213	1BIa	–	–	+	–	–	–	–	–	–	B+O	milk-yellow	14.	–	–	7	0.30	VI38
214	1BIa	–	–	–	+	–	–	–	–	+	–	cream-coloured--yellow	12	–	–	4	0.28	II4
215	1BIa	–	–	+	–	–	–	–	–	–	B+O	milk-yellow	17.	–	–	6	0.42	VI36
216	1BIa	–	–	+	–	–	–	–	–	+	–	yellow	18.	–	–	6	0.39	VI34
217	1BIa	–	+	–	–	–	–	–	+	–	–	light-yellow	16.	–	–	7	0.48	–
218	1BIa	–	–	+	–	–	–	+	–	–	–	honey yellow	12.	–	–	6	0.24	–
219	1BIa	–	–	+	–	–	–	+	–	–	–	,, ,,	12.	–	–	6	0.23	–
220	1BIa	–	–	+	–	–	–	+	–	–	–	yellow	24.	–	–	8	0.66	–
221	1BIa	–	+	–	–	–	–	–	–	–	C+B	honey yellow+ +yellow	17	–	–	7	1.04	II12
222	1BIa	–	+	–	–	–	–	–	+	–	–	yellow	17.	–	–	6	0.63	VI44
223	1BIa	–	+	–	–	–	–	–	–	–	C+B	honey yellow+ +yellow	16	–	–	7	0.70	II1
224	1BIa	–	+	–	–	–	–	–	+	–	–	honey yellow	24	–	–	8	1.68	II17
225	1BIa	+	–	–	–	–	–	–	–	–	T+B	yellow	22	–	–	7	1.50	II13
226	1BIa	+	–	–	–	–	–	–	–	–	C+B	,,	21	–	–	11	2.18	II18
227	1BIa	–	+	–	–	–	–	+	–	–	–	dark-yellow	22	–	–	12	2.33	II16
228	1BIa	–	–	+	–	–	–	–	–	–	T+C	honey yellow+ +yellow	24.	–	–	9	1.64	II15
229	1BIa	+	–	–	–	–	–	–	+	–	–	dark-yellow	17	–	–	9	1.03	VI40
230	1BIa	+	–	–	–	–	–	+	–	–	–	light-red	18	–	–	9	1.60	VI51
231	1BIa	–	+	–	–	–	–	–	+	–	–	light-yellow	17	–	–	7	1.10	VI42
232	1BIa	+	–	–	–	–	+	–	–	–	–	honey yellow	24.	–	–	11	2.30	VI52
233	1BIa	–	+	–	–	–	–	–	+	–	–	yellow	16	–	–	7	0.75	II9
234	1BIa	+	–	–	–	–	–	–	–	+	–	dark-yellow	12	–	–	4	0.39	VI41
235	1BIa	–	–	+	–	–	–	+	–	–	–	yellow	17	–	–	8	0.70	VI35
236	1BIa	–	–	+	–	–	–	–	–	+	–	white + brown	20.	–	–	8	0.57	–
237	1BIa	+	–	–	–	–	–	–	+	–	–	light-yellow	13	–	–	5	0.30	–
238	1BIa	+	–	–	–	–	–	–	+	–	–	,, ,,	17	–	–	5	0.48	–
239	1BIa	+	–	–	–	–	+	–	–	–	–	,, ,,	17	–	–	7	0.64	–
240	1BIa	+	–	–	–	–	–	–	–	+	–	yellow	9	–	–	4	0.31	–
314	1BIa	–	+	–	–	–	–	–	–	–	B+O	milk-yellow	16	–	–	6	0.68	VI45
315	1BIa	–	+	–	–	–	–	–	–	–	B+O	honey yellow+ + yellow	17	–	–	8	1.25	VI43
316	1BIa	+	–	–	–	–	–	–	–	–	C+O	yellow + white	22	–	–	8	2.21	II20
241	1BIIa	–	–	–	–	+	–	+	–	–	–	honey yellow	–	30	19	8	1.81	III28
242	1BIIa	–	+	–	–	–	–	+	–	–	–	,, ,,	–	29	23	7	2.26	III24
243	1BIIa	–	+	–	–	–	+	–	–	–	–	light-yellow	–	30	23	8	2.91	III26
244	1BIIa	–	–	–	+	–	+	–	–	–	–	yellow	–	32	23	8	2.28	III27
245	1BIIa	–	–	–	+	–	–	+	–	–	–	,,	–	23	20	7	1.51	III15
246	1BIIa	–	–	+	–	–	–	–	+	–	–	,,	–	23	17	7	1.02	III23
247	1BIIa	–	–	–	+	–	–	+	–	–	–	,,	–	20	18	6	0.98	III29
248	1BIIa	–	–	–	+	–	–	–	–	–	C+O	,,	–	23	18	5	1.04	III12
249	1BIIa	–	–	–	+	–	–	+	–	–	–	,,	–	23	19	8	1.38	III14
250	1BIIa	–	–	–	+	–	–	+	–	–	–	honey yellow	–	20	18	8	1.20	III13
251	1BIIa	–	–	–	+	–	–	+	–	–	–	yellow	–	20	15	6	0.73	III1
252	1BIIa	–	+	–	–	–	–	–	–	–	T+O	light-yellow+ +yellow	–	20	16	8	1.24	III16
253	1BIIa	–	+	–	–	–	–	–	+	–	–	yellow	–	22	18	8	1.51	III18
254	1BIIa	–	–	+	–	–	+	–	–	–	–	,,	–	9.	14	8	0.62	V1

Specification 2 condt.

Nr inv.	Class, variety	Phase of working					Succinite					Colour of succinite	Measurments, mm				Weight, grams	Plate, figure
		Ia	Ib	II	III	Fin.	T	C	B	O	X		diam.	lgth.	wid.	thick.		
255	1BIIa	–	–	+	–	–	–	+	–	–	–	honey yellow	–	14.	22	7	0.96	V2
256	1BIIa	–	–	+	–	–	–	+	–	–	–	,, ,,	–	13.	18	6	0.65	V5
257	1BIIa	–	+	–	–	–	–	–	+	–	–	yellow	–	11.	18	8	0.97	VI49
258	1BIIa	–	+	–	–	–	–	–	–	–	T+B	,,	–	20	17	8	1.19	V14
259	1BIIa	–	–	+	–	–	–	–	–	–	C+B	,,	–	9.	15	6	0.46	V4
260	1BIIa	+	–	–	–	–	–	–	+	–	–	,,	–	25	22	8	2.36	III21
261	1BIIa	–	+	–	–	–	+	–	–	–	–	dark-yellow	–	31	26	9	3.80	III22
262	1BIIa	–	+	–	–	–	–	–	–	–	B+O	yellow	–	21	16	8	0.26	VI50
263	1BIIa	+	–	–	–	–	–	–	+	–	–	light-yellow	–	19	15	9	1.34	V12
264	1BIIa	+	–	–	–	–	–	–	–	–	T+C	,, ,,	–	24	20	10	1.92	III20
265	1BIIa	+	–	–	–	–	–	–	–	–	T+C	, ,,	–	32	21	12	3.23	III19
266	1BIIa	+	–	–	–	–	–	–	–	–	T+O	light-red + + beige	–	26	20	10	2.54	V9
267	1BIIa	–	+	–	–	–	–	+	–	–	–	yellow	–	22	19	10	1.67	V15
268	1BIIa	+	–	–	–	–	–	–	–	–	T+O	light-yellow + + yellow	–	24	17	7	1.28	V11
269	1BIIa	+	–	–	–	–	–	–	+	–	–	yellow	–	22	16	9	1.37	V10
270	1BIIa	–	+	–	–	–	–	+	–	–	–	,,	–	20	14	8	0.93	VI48
271	1BIIa	+	–	–	–	–	–	–	–	–	B+O	light-yellow + + yellow	–	27	17	9	1.59	V13
272	1BIIa	+	–	–	–	–	–	–	–	–	C+B	yellow	–	21	16.	9	1.02	–
273	1BIIa	+	–	–	–	–	–	–	–	+	–	milk-yellow	–	10.	13	7	0.50	–
274	1BIIa	–	+	–	–	–	–	–	–	+	–	white	–	21	13	9	0.95	VI46
275	1BIIa	–	+	–	–	–	–	+	–	–	–	milk-yellow	–	10.	8.	8	0.24	V3
276	1BIIa	–	–	+	–	–	–	–	–	–	T+O	yellow	–	16	13	7	0.59	III4
277	1BIIa	–	–	–	+	–	–	+	–	–	–	honey yellow	–	17	13	6	0.50	III2
278	1BIIa	–	–	–	–	+	–	–	–	–	B+O	yellow	–	14	9	5	0.28	III3
279	1BIIa	–	–	+	–	–	–	–	–	+	–	,,	–	15	9	6	0.71	–
280	1BIIa	–	–	+	–	–	–	–	+	–	–	,,	–	14	11	6	0.73	V6
281	1BIIa	–	–	+	–	–	–	–	–	+	–	,,	–	8.	11	6	0.22	V8
282	1BIIa	–	–	+	–	–	–	–	–	+	–	white	–	9.	13	6	0.23	–
283	1BIIa	–	–	+	–	–	–	–	–	+	–	cream-coloured--yellow	–	7.	11	6	0.24	–
284	1BIIa	–	–	+	–	–	–	–	–	–	B+O	yellow + white	–	6.	8	4	0.09	–
285	1BIIa	–	–	+	–	–	–	–	–	–	T+O	yellow + cream--coloured-yellow	–	8.	13	6	0.27	VI25
286	1BIIa	–	–	+	–	–	–	+	–	–	–	honey yellow	–	8.	12	6	0.19	–
287	1BIIa	–	–	+	–	–	–	–	+	–	–	,, ,,	–	10.	15	7	0.41	V7
288	1BIIa	–	–	+	–	–	–	+	–	–	–	,, ,,	–	9.	13	6	0.30	–
289	1BIIa	–	–	+	–	–	–	–	–	–	T+O	yellow + white	–	8.	13	7	0.26	–
290	1BIIa	–	–	+	–	–	–	–	–	+	–	milk-yellow	–	10.	7.	5	0.19	–
291	1BIIa	–	–	–	+	–	–	–	+	–	–	yellow	–	8.	12	5	0.19	–
292	1BIIa	–	+	–	–	–	–	–	–	+	–	milk-yellow	–	7.	13	8	0.29	–
293	1BIIa	+	–	–	–	–	–	–	+	–	–	yellow	–	13	9	8	0.40	–
294	1BIIa	–	+	–	–	–	–	–	+	–	–	,,	–	17	12	7	0.54	VI47
295	1BIIa	–	+	–	–	–	–	–	–	–	T+C	yellow + white	–	18	14	6	0.58	III17
296	1BIIa	–	+	–	–	–	–	+	–	–	–	yellow	–	17	12	6	0.57	III9
297	1BIIa	–	+	–	–	–	–	–	–	–	C+O	light-yellow + + white	–	17	12	7	0.56	III5
298	1BIIa	–	+	–	–	–	–	+	–	–	–	yellow	–	16	13	5	0.46	III11
299	1BIIa	–	+	–	–	–	–	+	–	–	–	,,	–	14	10	6	0.38	III7
300	1BIIa	–	+	–	–	–	–	+	–	–	–	,,	–	13	10	5	0.28	III6
301	1BIIa	–	+	–	–	–	–	–	–	+	–	cream-coloured--yellow	–	17	12	7	0.51	VI39
302	1BIIa	–	+	–	–	–	–	–	+	–	–	light-yellow	–	13	9	7	0.32	III10
303	1BIIa	–	+	–	–	–	–	+	–	–	–	,, ,,	–	13	9	6	0.23	III8
304	1BIIa	+	–	–	–	–	–	–	–	–	T+C	,, ,,	–	17	12	9	0.75	–
305	1BIIa	+	–	–	–	–	–	–	–	–	T+O	light-yellow + + cream-coloured-yellow	–	17	15	8	0.77	–

Specification 2 condt.

Nr inv.	Class, variety	Phase of working					Succinite					Colour of succinite	Measurments, mm				Weight, grams	Plate figure
		Ia	Ib	II	III	Fin.	T	C	B	O	X		diam.	lght.	wid.	thick.		
306	1BIIa	+	–	–	–	–	–	–	–	–	T+O	,,	–	6.	10	6	0.16	–
307	1BIIa	–	+	–	–	–	–	–	+	–	–	yellow	–	12	10	5	0.32	–
403	1BIIa	–	–	+	–	–	–	–	+	–	–	honey yellow	–	22	18	8	1.14	II10
404	1BIIa	–	+	–	–	–	–	–	–	–	T+C	light-yellow + + yellow	–	26	18	9	1.31	10:4
405	1BIIa	–	–	+	–	–	–	–	–	+	–	cream-coloured--yellow	–	15	13	4	0.27	II5
406	1BIIa	–	–	+	–	–	–	–	–	–	B+O	light-yellow + + cream-coloured-yellow	–	17	15	5	0.47	–
407	1BIIa	+	–	–	–	–	–	+	–	–	–	dark-orange	–	15	13	7	0.53	10:5
308	1BIIb	–	+	–	–	–	+	–	–	–	–	honey yellow	–	18	14	5	0.78	II8
408	1BIIb	–	–	+	–	–	–	–	–	+	–	white	–	8.	12	6	0.20	–
309	1BIIIa	+	–	–	–	–	+	–	–	–	–	yellow	–	15	14	8	0.83	10:11
310	1BIIIb	–	+	–	–	–	–	+	–	–	–	honey yellow	–	13	13	6	0.55	II3
313	1BIV	–	–	–	+	–	–	–	–	+	–	cream-coloured--yellow	–	16	12	5	0.39	II7
		29	38	35	12	2	11	32	22	18	33						105.00	

403–408 — from author's surface investigations; rest — purchased

Specification 3. Niedźwiedziówka, site I. Early half-products (phase Ia) button-shaped beads with V perforation (1B* — class and variety unknown)

Nr inv.	Succinite					Colour of succinite	Measurements mm			Weight grams	Plate, figure
	T	C	B	O	X		lgth.	wid.	thick.		
355	–	+	–	–	–	yellow	30	25	7	3.29	VI26
356	–	–	–	–	T+O	honey yellow + white	24	21	8	2.70	VI12
357	–	+	–	–	–	yellow	27	19	12	2.22	VI14
358	–	–	–	–	C+B	honey yellow	24	18	14	3.11	VI28
359	–	–	+	–	–	yellow	24	16	7	1.19	VI16
360	–	–	+	–	–	honey yellow	25	13	7	1.37	VI2
361	–	–	+	–	–	,, ,,	18	16	7	1.05	VI27
362	–	–	–	–	B+O	honey yellow + yellow	17	15	8	0.89	VI30
363	–	–	–	+	–	white	19	14	9	1.07	VI10
364	–	–	–	–	B+O	honey yellow + white	17	14	7	0.98	VI31
365	–	+	–	–	–	honey yellow	21	17	11	1.17	VI21
366	–	+	–	–	–	cream-coloured-yellow	17	16	8	0.91	VI29
367	–	+	–	–	–	,, ,,	18	12	8	0.93	VI19
368	–	–	–	–	T+B	light-yellow + yellow	19	13	9	0.86	VI5
369	–	–	+	–	–	honey yellow	17	15	8	1.06	VI20
370	–	–	–	+	–	,, ,,	18	13	10	0.97	VI1
371	–	–	+	–	–	yellow	16	13	8	0.82	–
372	–	–	–	–	T+O	light-yellow + white	16	12	7	0.64	VI17
373	–	+	–	–	–	cream-coloured-yellow	15	14	11	1.20	VI8
374	–	–	–	–	C+B	yellow	16	11	8	0.47	–
375	+	–	–	–	–	light-yellow	16	13	8	0.59	VI7
376	–	–	–	–	C+O	honey yellow + cream	20	11	7	0.67	–
377	–	+	–	–	–	honey yellow	15	13	10	0.82	VI18
378	–	–	–	+	–	white	15	10	7	0.47	–
379	–	+	–	–	–	yellow	18	10	9	0.74	–
380	–	+	–	–	–	honey yellow	21	12	10	0.76	VI6
381	–	+	–	–	–	yellow	18	12	10	0.87	VI3
382	+	–	–	–	–	,,	17	12	8	0.54	VI4
383	–	+	–	–	–	honey yellow	15	13	7	0.51	VI9
384	–	+	–	–	–	light-yellow	15	11	9	0.58	–
	2	12	5	3	8					33.45	

All beads from purchase

Specification 4. Niedźwiedziówka, site I. Axe-shaped beads (1C)

Nr inv.	Class, variety	Phase of working					Succinite					Colour of succinite	Measurements, mm			Weight grams	Plate figure
		Ia	Ib	II	III	Fin.	T	C	B	O	X		lgth.	wid.	thick.		
317	1CIa	+	–	–	–	–	–	+	–	–	–	yellow	42	36	13	8.44	III35
318	1CIa	+	–	–	–	–	+	–	–	–	–	light-yellow	15.	22	9	1.71	V16
319	1CIa	–	–	+	–	–	–	+	–	–	–	,, ,,	18.	30	12	3.16	III30
320	1CIa	–	–	+	–	–	–	–	–	–	B+O	yellow + cream-coloured-yellow	20.	25	9	2.67	III41
321	1CIa	–	–	+	–	–	–	–	–	–	T+O	light-yellow + white	15.	22	8	1.17	V20
322	1CIa	–	–	+	–	–	+	–	–	–	–	light-yellow	13.	20	8	0.89	V27
323	1CIa	–	–	+	–	–	–	–	+	–	–	yellow	14.	22	9	1.37	V18
324	1CIa	–	–	+	–	–	–	+	–	–	–	honey yellow	15.	20	8	1.36	V26
325	1CIa	–	–	+	–	–	–	–	+	–	–	,, ,,	14.	22	10	1.24	V17
326	1CIa	–	–	+	–	–	–	+	–	–	–	,, ,,	13.	20	9	1.03	V21
327	1CIa	–	–	+	–	–	–	–	+	–	–	yellow	13.	19	10	1.14	V19
328	1CIa	–	–	+	–	–	–	+	–	–	–	honey yellow	13.	9.	9	1.10	–
329	1CIa	–	–	+	–	–	–	+	–	–	–	,, ,,	13.	12.	7	0.41	–
409	1CIb	–	–	+	–	–	–	+	–	–	–	,, ,,	21.	26	7	1.82	10:3
410	1CIIa	+	–	–	–	–	–	–	+	–	–	,, ,,	34	22	13	4.88	10:14
330	1CIIa	+	–	–	–	–	–	–	+	–	–	,, ,,	35	32	10	5.99	III40
331	1CIIa	+	–	–	–	–	–	+	–	–	–	yellow	34	27	10	4.98	III36
332	1CIIa	+	–	–	–	–	–	–	–	–	T+C	light-yellow + yellow	39	25	13	5.05	III38
333	1CIIa	+	–	–	–	–	–	–	+	–	–	yellow	37	21	12	4.26	III37
334	1CIIa	+	–	–	–	–	–	+	–	–	–	,,	34	23	12	4.94	III31
335	1CIIa	+	–	–	–	–	+	–	–	–	–	light-yellow	29	24	12	4.15	III39
336	1CIIa	+	–	–	–	–	–	–	–	–	T+B +O	yellow + white	24	21	11	3.09	V30
337	1CIIa	+	–	–	–	–	–	–	+	–	–	yellow	23	15	9	1.55	V28
338	1CIIa	+	–	–	–	–	–	–	+	–	–	,,	12.	20	9	1.49	V29
339	1CIIa	–	+	–	–	–	–	–	–	–	T+B +O	light-yellow + + yellow + white	35	23	11	6.08	III33
340	1CIIa	–	+	–	–	–	–	–	–	–	C+O	yellow + cream-coloured-yellow	28	21	9	3.13	III32
341	1CIIa	–	+	–	–	–	–	+	–	–	–	yellow	31	24	10	4.26	III34
342	1CIIa	–	+	–	–	–	–	–	–	+	–	white	22.	16	8	1.58	V31
343	1CIIa	–	+	–	–	–	+	–	–	–	–	yellow	21.	14	10	1.91	V32
344	1CIIa	–	+	–	–	–	–	+	–	–	–	,,	18.	13	8	1.23	V33
345	1CIIa	–	+	–	–	–	–	–	–	+	–	white + yellow	13.	9.	8	0.34	–
346	1CIIa	–	+	–	–	–	–	–	+	–	–	yellow	10.	10	8	0.57	–
347	1CIIa	–	+	–	–	–	–	+	–	–	–	,,	14.	13	9	0.62	–
348	1CIIa	–	–	+	–	–	–	–	+	–	–	,,	17.	22	8	1.84	V22
349	1CIIa	–	–	+	–	–	–	–	+	–	–	,,	13.	19	9	1.28	V24
350	1CIIa	–	–	+	–	–	–	–	–	–	T+C	light-yellow + + yellow	14.	17	10	1.41	V23
351	1CIIa	–	–	+	–	–	–	+	–	–	–	yellow	13.	13	6	0.75	V25
352	1CIIa	–	–	+	–	–	–	–	–	–	T+O	yellow + white	13.	13.	7	0.77	–
353	1CIIa	–	–	+	–	–	–	–	–	–	T+O	yellow + cream-coloured-yellow	12.	13	8	0.75	–
354	1CIIa	–	–	–	+	–	–	+	–	–	–	yellow	38	24	9	5.31	III25
		12	9	18	1	–	4	14	11	2	9					99.72	

409 and 410 — from author's surface investigations; rest — purchased

Specification 5. Niedźwiedziówka, site I. Half-products of ornaments appeared sporadicly (1EVI, 2BIII, 4BIa)

Nr inv.	Class, variety	Phase of working					Succinite					Colour of succinite	Measurements, mm				Weight, grams	Plate, figure
		Ia	Ib	II	III	Fin.	T	C	B	O	X		diam.	lght.	wid.	thick.		
311	1EVI	–	–	–	+	–	–	+	–	–	–	honey yellow	27	–	–	9	2.92	II21
312	2BIII	–	–	+	–	–	–	–	–	–	T+C	light-yellow + yellow	–	22.	8.	8	1.07	10:6
411	4BIa	–	–	–	+	–	–	–	–	–	T+O	light-yellow+white	36	–	–	7	1.95	II26
		–	–	1	2	–	–	1	–	–	2						5.94	

411 — from author's surface investigations; rest — purchased

Specification 6. Niedźwiedziówka, site I. Early half-products (phase Ia) of ornaments precisely undetermined (unknown class and variety) — group 7 (NOK)

Nr inv.	Succinite					Colour of succinite	Measurements, mm			Weight, grams	Plate, figure
	T	C	B	O	X		lght.	wid.	thick.		
385	–	+	–	–	–	yellow	30	22	15	3.42	VI24
386	–	–	+	–	–	,,	19	15	13	2.18	VI23
387	–	–	–	–	T+C	light-yellow + yellow	20	16	15	2.11	VI22
388	–	–	–	+	–	cream-coloured-yellow	17	15	12	0.67	–
389	–	–	+	–	–	honey yellow	17	12	12	1.37	VI13
390	–	–	+	–	–	,, ,,	15	11	9	0.57	–
391	–	–	–	–	T+C	light-yellow + cream-coloured-yellow	18	11	10	0.72	–
392	–	–	+	–	–	yellow	12.	7	5	0.12	–
412	–	–	+	–	–	honey yellow	18	17	7	1.48	10:7
413	–	–	+	–	–	dark-yellow	17	12	12	0.88	10:8
	–	1	6	1	2					13.52	

412, 413 — from author's surface investigations; rest — purchased

Specification 7. Wybicko, site I. Tubular cylindrical beads, long (1AIa)

Nr inv	Phase of working					Succinite					Colour of succinite	Measurements, mm		Weight, grams	Plate, figure
	Ia	Ib	II	III	Fin.	T	C	B	O	X		lgth.	diam.		
1	+	–	–	–	–	–	–	+	–	–	yellow	24	11	1.63	VII39
2	+	–	–	–	–	–	–	–	–	T+O	yellow + cream-coloured-yellow	20	14	2.19	VII43
3	+	–	–	–	–	–	–	–	–	T+O	UC + yellow	18	13	1.48	VII47
4	+	–	–	–	–	–	–	–	–	T+C +O	light-yellow + cream-coloured-yellow	26	12	1.47	VII46
5	+	–	–	–	–	–	–	–	–	T+O	,,	20	9	0.87	VII31
6	+	–	–	–	–	–	–	–	–	T+C	light-yellow + yellow	20	13	1.46	VII38
7	+	–	–	–	–	–	–	–	–	C+O	white	17	12	1.19	–
8	+	–	–	–	–	–	–	+	–	–	honey yellow	19	9	0.87	VII30
9	+	–	–	–	–	–	+	–	–	–	yellow	15.	10	0.94	VII29
10	+	–	–	–	–	+	–	–	–	–	,,	15.	11	0.80	–
11	+	–	–	–	–	–	+	–	–	–	,,	15.	11	0.78	–
12	+	–	–	–	–	–	–	+	–	–	,,	16.	10	1.02	–
13	+	–	–	–	–	–	–	+	–	–	,,	11.	15	1.33	–
14	+	–	–	–	–	–	–	–	–	T+C	,,	6.	15	0.72	–
15	+	–	–	–	–	+	–	–	–	–	UC	13.	11	0.75	–
16	+	–	–	–	–	–	–	+	–	–	yellow	14.	11	0.93	–
17	+	–	–	–	–	–	–	+	–	–	,,	10.	12	0.60	VII22
18	+	–	–	–	–	+	–	–	–	–	light-yellow	10.	9	0.43	–
19	+	–	–	–	–	–	–	+	–	–	yellow	9.	14	0.82	–
20	+	–	–	–	–	–	+	–	–	–	cream-coloured-yellow	6.	14	0.48	–
21	+	–	–	–	–	+	–	–	–	–	UC	5.	12	0.60	–
22	+	–	–	–	–	–	–	–	–	C+O	light-yellow + yellow	7.	10	0.30	–
23	+	–	–	–	–	–	–	–	–	T+B	yellow	13.	9	0.49	–
24	+	–	–	–	–	+	–	–	–	–	light-yellow	5.	10	0.25	–
25	+	–	–	–	–	–	–	+	–	–	,,	9.	11	0.35	–
26	+	–	–	–	–	+	–	–	–	–	UC	8.	9	0.35	–
27	–	+	–	–	–	+	–	–	–	–	light-yellow	22.	14	1.46	VII34
28	–	+	–	–	–	–	–	–	+	–	yellow	31	15	1.59	VII40
29	–	+	–	–	–	–	–	+	–	–	,,	15.	10	0.77	VII28
30	–	+	–	–	–	–	+	–	–	–	,,	13.	8	0.53	–
31	–	+	–	–	–	–	–	+	–	–	,,	10.	11	0.71	VII21
32	–	+	–	–	–	+	–	–	–	–	UC	9.	12	1.09	–
33	–	+	–	–	–	–	–	–	–	T+B	light-yellow + yellow	16.	12	1.00	VII32
34	–	+	–	–	–	–	+	–	–	–	yellow	11.	12	0.70	–
35	–	+	–	–	–	–	–	–	–	T+B	,,	12.	12	0.59	–

Specification 7 condt.

Nr inv.	Phase of working					Succinite					Colour of succinite	Measurements mm		Weight, grams	Plate, figure
	Ia	Ib	II	III	Fin.	T	C	B	O	X		lgth.	diam.		
36	–	+	–	–	–	–	+	–	–	–	yellow	12.	11	0.62	–
37	–	+	–	–	–	–	+	–	–	–	,,	6.	11	0.15	–
38	–	–	+	–	–	+	–	–	–	–	light-yellow	29	12.	2.08	VII44
39	–	–	+	–	–	+	–	–	–	–	,, ,,	20	10.	1.19	VII42
40	–	–	+	–	–	+	–	–	–	–	,, ,,	22	9	1.12	VII37
41	–	–	+	–	–	–	–	+	–	–	yellow	23.	13	0.86	VII33
42	–	–	+	–	–	+	–	–	–	–	light-yellow	25.	11	0.84	VII45
43	–	–	+	–	–	–	–	–	–	T+C	light-yellow + yellow	17.	13	0.97	VII25
44	–	–	+	–	–	–	+	–	–	–	yellow	24	14.	1.24	VII41
45	–	–	+	–	–	+	–	–	–	–	,,	18	14.	0.78	VII27
46	–	–	+	–	–	–	–	–	–	T+C	light-yellow + yellow	20.	14	0.88	VII35
47	–	–	+	–	–	–	–	+	–	–	honey yellow	18.	15	0.99	VII36
48	–	–	+	–	–	–	+	–	–	–	light-yellow	16.	13	1.15	–
49	–	–	+	–	–	+	–	–	–	–	honey yellow	15.	14	0.94	–
50	–	–	+	–	–	–	–	–	–	C+O	yellow + milk-yellow	15.	12	1.06	VII23
51	–	–	+	–	–	–	–	–	–	T+C	light-yellow + yellow	15.	15	0.78	–
52	–	–	+	–	–	–	–	–	–	T+O	yellow + cream-colou-red-yellow	14.	15	0.68	–
53	–	–	+	–	–	–	–	+	–	–	honey yellow	18.	9	0.48	VII26
54	–	–	+	–	–	+	–	–	–	–	yellow	17.	10	0.58	–
55	–	–	+	–	–	–	+	–	–	–	honey yellow	13.	10	0.43	VII24
56	–	–	+	–	–	–	–	–	–	UV	UC	15.	13	0.90	–
57	–	–	+	–	–	–	+	–	–	–	yellow	17.	11	0.52	–
58	–	–	+	–	–	+	–	–	–	–	,,	10.	10	0.39	–
59	–	–	+	–	–	+	–	–	–	–	light-yellow	11.	10	0.30	–
60	–	–	+	–	–	–	–	–	–	T+B	light-yellow + cream--coloured-yellow	16.	12	0.60	–
61	–	–	+	–	–	–	–	+	–	–	yellow	12.	10	0.35	–
62	–	–	+	–	–	+	–	–	–	–	,,	12.	9	0.24	–
63	–	–	+	–	–	+	–	–	–	–	light-yellow	10.	12	0.42	–
64	–	–	+	–	–	+	–	–	–	–	yellow	9.	9	0.27	–
65	–	–	+	–	–	–	–	+	–	–	,,	7.	12	0.21	–
66	–	–	+	–	–	–	–	–	+	–	cream-coloured-yellow	10.	10	0.23	–
67	–	–	+	–	–	–	–	+	–	–	honey yellow	11.	9	0.16	
68	–	–	+	–	–	–	–	–	+	–	cream-coloured-yellow	9.	10	0.20	–
69	–	–	+	–	–	+	–	–	–	–	light-yellow	11.	9	0.26	–
70	–	–	+	–	–	–	+	–	–	–	yellow	11.	7	0.16	–
71	–	–	+	–	–	–	+	–	–	–	,,	9.	7	0.23	–
72	–	–	+	–	–	+	–	–	–	–	light-yellow	11.	10	0.47	–
73	–	–	+	–	–	+	–	–	–	–	yellow	5.	11	0.17	–
74	–	–	+	–	–	+	–	–	–	–	,,	6.	10	0.10	–
	26	11	37	–	–	24	13	16	3	17				55.54	

All beads from purchase

Specification 8. Wybicko, site I. Tubular cylindrical beads, short (1AIb)

Nr inv.	Phase of working					Succinite					Colour of succinite	Measurements, mm		Weight, grams	Plate, figure
	Ia	Ib	II	III	Fin.	T	C	B	O	X		lght.	diam.		
204	–	–	–	+	–	+	–	–	–	–	light-yellow	9	15	1.10	13:2
205	–	–	+	–	–	–	+	–	–	–	yellow	9	13	0.55	13:1
206	–	–	+	–	–	–	–	+	–	–	,,	9	15	0.47	13:10
	–	–	2	1	–	1	1	1	–	–				2.12	

All beads from purchase

Specification 9. Wybicko, site I. Button-shaped beads (buttons) with V-perforation (1B)

Nr inv.	Class, variety	Phase of working					Succinite					Colour of succinite	Measurements, mm				Weight, grams	Plate, figure
		Ia	Ib	II	III	Fin.	T	C	B	O	X		diam.	lgth.	wid.	thick.		
99	1BIa	+	–	–	–	–	–	–	–	–	T+C	yellow	17	–	–	8	0.89	13:11
100	1BIa	+	–	–	–	–	–	+	–	–	–	,,	15	–	–	7	0.58	13:12
101	1BIa	–	+	–	–	–	–	–	+	–	–	,,	12	–	–	4	0.22	13:9
102	1BIa	–	+	–	–	–	–	+	–	–	–	,,	21	–	–	7	0.91	13:17
103	1BIa	–	–	+	–	–	–	–	–	–	T+O	light-yellow + + yellow	16	–	–	6	0.38	13:16
104	1BIa	–	–	+	–	–	–	–	+	–	–	yellow	18	–	–	6	0.64	13:13
105	1BIa	–	–	+	–	–	–	–	+	–	–	,,	16.	–	–	7	0.37	13:7
106	1BIa	–	–	+	–	–	–	–	+	–	–	,,	18.	–	–	8	0.40	13:3
107	1BIa	–	–	+	–	–	–	–	+	–	–	,,	14.	–	–	5	0.19	13:6
108	1BIa	–	–	+	–	–	–	+	–	–	–	light-yellow	15.	–	–	5	0.22	13:8
109	1BIb	+	–	–	–	–	+	–	–	–	–	light-red	14	–	–	5	0.48	13:15
110	1BIb	–	+	–	–	–	–	–	+	–	–	honey yellow	16.	–	–	8	0.57	13:14
111	1BIb	+	–	–	–	–	–	–	+	–	–	yellow	13	–	–	6	0.42	13:5
112	1BIb	–	+	–	–	–	–	–	–	–	T+O	light-red + + yellow	15.	–	–	5	0.36	13:4
113	1BII	+	–	–	–	–	+	–	–	–	–	UC	–	21	18	8	1.62	VIII52
114	1BII	+	–	–	–	–	–	–	–	–	T+B	light-yellow + + yellow	–	20	18	12	2.24	VIII51
115	1BII	+	–	–	–	–	–	–	+	–	–	yellow	–	20	15	8	1.00	VIII50
116	1BII	+	–	–	–	–	–	+	–	–	–	,,	–	23	15	11	1.58	VIII43
117	1BII	+	–	–	–	–	–	+	–	–	–	,,	–	18	14	8	0.72	VIII56
118	1BII	+	–	–	–	–	–	–	+	–	–	,,	–	21	18	7	1.11	VIII53
119	1BII	+	–	–	–	–	–	+	–	–	–	,,	–	17	14	9	1.03	VIII45
120	1BII	+	–	–	–	–	–	–	–	–	T+O	light-red + + white	–	15.	14	7	0.81	VIII47
121	1BII	+	–	–	–	–	–	–	+	–	–	yellow	–	17	14	5	0.59	VIII48
122	1BII	+	–	–	–	–	–	+	–	–	–	,,	–	13	11	8	0.44	VIII38
123	1BII	+	–	–	–	–	–	+	–	–	–	,,	–	21	13	8	0.88	VIII54
124	1BII	+	–	–	–	–	–	+	–	–	–	,,	–	20	12	7	0.92	VIII55
125	1BII	+	–	–	–	–	–	–	–	–	T+C +O	yellow + white	–	18	15	11	1.18	VIII44
126	1BII	+	–	–	–	–	–	–	+	–	–	yellow	–	16	14	10	0.89	VIII46
127	1BII	+	–	–	–	–	–	–	–	–	C+O	light-yellow + + yellow	–	14	13	6	0.56	VIII49
128	1BII	+	–	–	–	–	–	–	+	–	–	yellow	–	16	13	10	0.98	VIII36
129	1BII	+	–	–	–	–	–	+	–	–	–	,,	–	15	9	8	0.49	VIII41
130	1BII	+	–	–	–	–	–	+	–	–	–	light-yellow	–	14	12	8	0.51	VIII37
131	1BII	+	–	–	–	–	+	–	–	–	–	,,	–	18.	11	8	0.68	VIII39
132	1BII	+	–	–	–	–	–	–	+	–	–	yellow	–	10.	13	8	0.49	VIII40
133	1BIIa	+	–	–	–	–	+	–	–	–	–	light-yellow	–	25	22	10	1.87	VIII42
134	1BIIa	+	–	–	–	–	–	–	+	–	–	yellow	–	19	16	9	1.41	VIII35
135	1BIIa	+	–	–	–	–	–	–	+	–	–	,,	–	21	14	9	1.47	VIII30
136	1BIIa	+	–	–	–	–	–	–	+	–	–	,,	–	20	16	7	0.97	VIII31
137	1BIIa	+	–	–	–	–	+	–	–	–	–	,,	–	15	12	8	0.61	VIII14
138	1BIIa	+	–	–	–	–	–	+	–	–	–	,,	–	17	14	9	1.06	VIII28
139	1BIIa	+	–	–	–	–	–	–	+	–	–	,,	–	21	18	8	1.04	VIII24
140	1BIIa	+	–	–	–	–	–	+	–	–	–	honey yellow	–	22	16	9	1.28	VIII34
141	1BIIa	+	–	–	–	–	–	–	–	+	–	yellow	–	15	13	7	0.62	VIII16
142	1BIIa	+	–	–	–	–	–	+	–	–	–	dark-yellow	–	17	13	7	0.65	VIII20
143	1BIIa	+	–	–	–	–	–	+	–	–	–	,,	–	18	14	9	1.01	VIII26
144	1BIIa	+	–	–	–	–	–	–	–	+	–	,,	–	15	13	7	0.67	VIII17
145	1BIIa	+	–	–	–	–	–	+	–	–	–	dark-orange	–	17	15	7	0.96	VIII23
146	1BIIa	+	–	–	–	–	+	–	–	–	–	yellow	–	17	12	8	0.73	VIII15
147	1BIIa	+	–	–	–	–	+	–	–	–	–	UC	–	12.	16	7	0.66	VIII25
148	1BIIa	+	–	–	–	–	–	+	–	–	–	yellow	–	15	11	6	0.49	VIII13
149	1BIIa	+	–	–	–	–	–	+	–	–	–	,,	–	8.	14	7	0.31	VIII12
150	1BIIa	+	–	–	–	–	–	+	–	–	–	,,	–	23	18	9	2.07	VIII29
151	1BIIa	+	–	–	–	–	–	+	–	–	–	,,	–	22	14	8	0.90	VIII27
152	1BIIa	+	–	–	–	–	+	–	–	–	–	light-red	–	24	21	10	1.92	VIII32
153	1BIIa	–	+	–	–	–	–	+	–	–	–	dark-orange	–	21	13	7	0.94	VIII33
154	1BIIa	–	–	+	–	–	–	–	–	–	T+B	light-yellow + + yellow	–	14.	19	10	1.16	VIII22
155	1BIIa	–	+	–	–	–	–	–	–	–	C+O	milk-white	–	17	12.	7	0.54	VIII3

Specification 9. condt.

Nr inv.	Class, variety	Phase of working					Succinite					Colour of succinite	Measurements, mm				Weight, grams	Plate, figure
		Ia	Ib	II	III	Fin.	T	C	B	O	X		diam.	lgth.	wid.	thick.		
156	1BIIa	–	+	–	–	–	–	–	–	–	T+O	light-yellow + + white	–	17	14	6	0.63	VIII7
157	1BIIa	–	–	+	–	–	+	–	–	–	–	light-yellow	–	14.	12.	7	0.43	VIII21
158	1BIIa	–	–	+	–	–	–	–	–	+	–	dark-yellow	–	17	12	9	0.84	VIII18
159	1BIIa	–	+	–	–	–	–	–	+	–	–	yellow	–	19	11	7	0.54	VIII19
160	1BIIa	–	–	+	–	–	–	–	–	–	T+O	light-yellow + + white	–	11.	17	5	0.36	VIII8
161	1BIIa	–	–	+	–	–	–	–	+	–	–	yellow	–	13.	11.	7	0.45	VIII11
162	1BIIa	–	–	+	–	–	–	–	–	+	–	cream-coloured--yellow	–	10.	13	4	0.25	VIII1
163	1BIIa	–	–	+	–	–	–	–	–	–	C+O	yellow + cream--coloured-yellow	–	14.	14	5	0.26	VIII2
164	1BIIa	–	–	+	–	–	–	–	+	–	–	orange	–	12.	12	6	0.33	VIII4
165	1BIIb	+	–	–	–	–	+	–	–	–	–	yellow	–	32	13	10	1.80	VIII5
166	1BIIb	+	–	–	–	–	–	–	+	–	–	honey yellow	–	27	20	11	2.76	14:7
167	1BIIb	+	–	–	–	–	–	+	–	–	–	yellow	–	21	16	8	1.11	VIII6
168	1BIIb	+	–	–	–	–	–	+	–	–	–	honey yellow	–	16	12	6	0.52	14:8
169	1BIIb	+	–	–	–	–	–	–	–	–	T+B	light-yellow + + yellow	–	14	12	7	0.54	14:1
170	1BIIb	+	–	–	–	–	–	–	–	+	–	dark-beige	–	15	11	8	0.62	VIII9
171	1BIIb	+	–	–	–	–	–	–	–	+	–	cream-coloured--yellow	–	11	9	8	0.35	14:3
172	1BIIb	–	+	–	–	–	–	+	–	–	–	milk-yellow	–	11.	14	6	0.42	14:2
173	1BIIb	–	–	–	+	–	–	+	–	–	–	honey yellow	–	20	15	8	0.92	VIII10
174	1BIIIb	+	–	–	–	–	–	+	–	–	–	yellow	–	15	–	6	0.53	VII12
175	1BIIIb	+	–	–	–	–	–	+	–	–	–	,,	–	13	–	7	0.55	VII13
176	1BIIIb	–	+	–	–	–	–	–	–	–	T+O	light-yellow + + cream-coloured-yellow	–	11	–	7	0.48	VII20
177	1BIIIb	–	+	–	–	–	+	–	–	–	–	UC	–	12	–	6	0.35	VII11
		53	11	14	1	–	11	27	21	6	14						63.73	

All beads from purchase

Specification 10. Wybicko, site I. Early half-products (phase Ia) of ornaments precisely undetermined – group 7

Nr inv.	Probable final form	Succinite					Colour of succinite	Measurements, mm			Weight, grams	Plate
		T	C	B	O	X		lght.	wid.	thick.		
184	1B or 2BIa?	+	–	–	–	–	yellow	23	21	10	2.23	VII7
185	1BI, 1BII, 1BIV	–	+	–	–	–	honey yellow	21	17	10	1.45	VII8
186	1BII, 1BIV	–	+	–	–	–	,, ,,	22	12	9	1.08	VII5
187	1BI, 1BII, 1BIV	+	–	–	–	–	light-yellow	16	13	11	1.15	VII1
188	1BI, 1BII	–	–	+	–	–	yellow	19	15	13	1.72	VII3
189	1BII, 1BIV	–	+	–	–	–	honey yellow	18	13	9	0.87	VII4
190	1BII, 1BIV	+	–	–	–	–	yellow	21	12	9	1.31	–
191	1BII, 1BIV	–	–	–	–	T+C	light-yellow + cream-coloured-yellow	21	13	10	1.06	–
192	1BIII, 1BIV	–	–	+	–	–	honey yellow	16	15	7	0.67	–
193	1BII, 1BIV	–	+	–	–	–	light-yellow	16	14	11	1.09	–
194	1BII, 1BIII, 1BIV	+	–	–	–	–	yellow	14	11	10	0.80	–
195	1BII, 1BIV	+	–	–	–	–	UC	19	14	8	0.76	VII6
196	1BIII, 1BIV	–	+	–	–	–	yellow	13	11	9	0.54	–
197	1BII, 1BIV	–	–	–	–	C+O	yellow + white	18	13	11	1.05	VII9
198	1BIII, 1BIV	–	–	–	–	B+O	yellow + cream-coloured--yellow	14	11	7	0.58	–
199	1BI, 1BIII	–	–	+	–	–	yellow	13	13	8	0.59	VII10
200	1BI, 1BII, 1BIII	–	–	+	–	–	,,	13	12	8	0.59	VII2
201	1BI, 1BII	–	+	–	–	–	light-yellow	14	11	9	0.61	–
202	1BII, 1BIV	–	–	+	–	–	yellow	12	10	8	0.51	–
203	1BIV or 1EII?	–	+	–	–	–	honey yellow	13	8	6	0.36	–
		5	7	5	–	3					19.02	

All beads from purchase

Specification 11. Wybicko, site I. Axe-shaped beads (1C)

Nr inv.	Class, variety	Phase of working					Succinite					Colour of succinite	Measurements, mm			Weight, grams	Plate, figure
		Ia	Ib	II	III	Fin.	T	C	B	O	X		lgth.	wid.	thick.		
75	1CIa	+	—	—	—	—	—	—	—	—	T+C	yellow	16.	21	9	1.16	13:23
76	1CIa	+	—	—	—	—	+	—	—	—	—	light-yellow	13.	20	9	1.03	13:22
77	1CIa	—	—	+	—	—	—	+	—	—	—	yellow	38.	28	10	2.56	13:18
78	1CIa	—	—	+	—	—	+	—	—	—	—	light-yellow	32.	22	9	1.33	13:19
79	1CIa	—	—	+	—	—	+	—	—	—	—	honey yellow	28.	20	8	1.16	13:20
80	1CIa	—	—	+	—	—	+	—	—	—	—	,, ,,	26.	19	8	0.75	13:21
81	1CIa	—	—	+	—	—	—	—	+	—	—	,, ,,	12.	23	7	0.86	—
82	1CIa	—	—	—	+	—	—	+	—	—	—	yellow	8.	7	8	0.17	—
83	1CIIa	+	—	—	—	—	—	+	—	—	—	,,	26	19	10	0.54	14:14
84	1CIIa	+	—	—	—	—	+	—	—	—	—	light-red	25	19	10	2.23	14:15
85	1CIIa	+	—	—	—	—	+	—	—	—	—	yellow	20.	17	8	1.57	14:18
86	1CIIa	+	—	—	—	—	+	—	—	—	—	light-yellow	16.	14	7	0.89	14:10
87	1CIIa	+	—	—	—	—	+	—	—	—	—	,, ,,	17.	15	9	1.08	14:11
88	1CIIa	+	—	—	—	—	—	—	—	+	—	cream-coloured--yellow	13.	13	9	0.61	14:5
89	1CIIa	+	—	—	—	—	+	—	—	—	—	light-yellow	10.	13	9	0.64	—
90	1CIIa	+	—	—	—	—	+	—	—	—	—	yellow	11.	16	8	0.63	14:9
91	1CIIa	+	—	—	—	—	—	—	+	—	—	,,	14.	12	9	0.45	14:6
92	1CIIa	—	+	—	—	—	+	—	—	—	—	light-yellow	10.	14	7	0.39	14:4
93	1CIIa	—	+	—	—	—	—	—	—	—	T+O	light-yellow + + cream-coloured--yellow	10.	9	7	0.27	—
94	1CIIa	—	—	+	—	—	+	—	—	—	—	yellow	15.	21	8	1.59	14:17
95	1CIIb	—	—	+	—	—	+	—	—	—	—	,,	16.	19	8	1.32	14:16
96	1CIIb	—	—	+	—	—	+	—	—	—	—	,,	14.	17	8	1.16	14:13
97	1CIIa	—	—	+	—	—	—	+	—	—	—	,,	12.	16	7	0.78	14:12
98	1CIIa	—	—	+	—	—	—	+	—	—	—	honey yellow	8.	9	4	0.12	—
		11	2	10	1	—	14	5	2	1	2					23.29	

All beads from purchase

Specification 12. Wybicko, site I. Pendants (group 2)

Nr inv.	Class, variety	Phase of working					Succinite					Colour of succinite	Measurements, mm			Weight, grams	Plate
		Ia	Ib	II	III	Fin.	T	C	B	O	X		lgth.	wid.	thick.		
178	2BIa	—	+	—	—	—	—	+	—	—	—	yellow	22	14	7	1.13	VII14
179	2BIa	—	—	+	—	—	—	+	—	—	—	milk-yellow	17.	17	6	0.72	VII15
180	2A	—	—	+	—	—	—	—	+	—	—	honey yellow	20	14	8	0.99	VII17
181	2BV	—	+	—	—	—	+	—	—	—	—	,, ,,	15.	13	6	0.59	VII18
182	2BV	—	+	—	—	—	—	—	—	+	—	cream-coloured--yellow	9.	12	6	0.26	VII19
183	2BIa	+	—	—	—	—	—	—	+	—	—	dark-yellow	13.	15	8	0.61	VII16
		1	3	2	—	—	1	2	2	1	—					4.30	

All pendants from purchase

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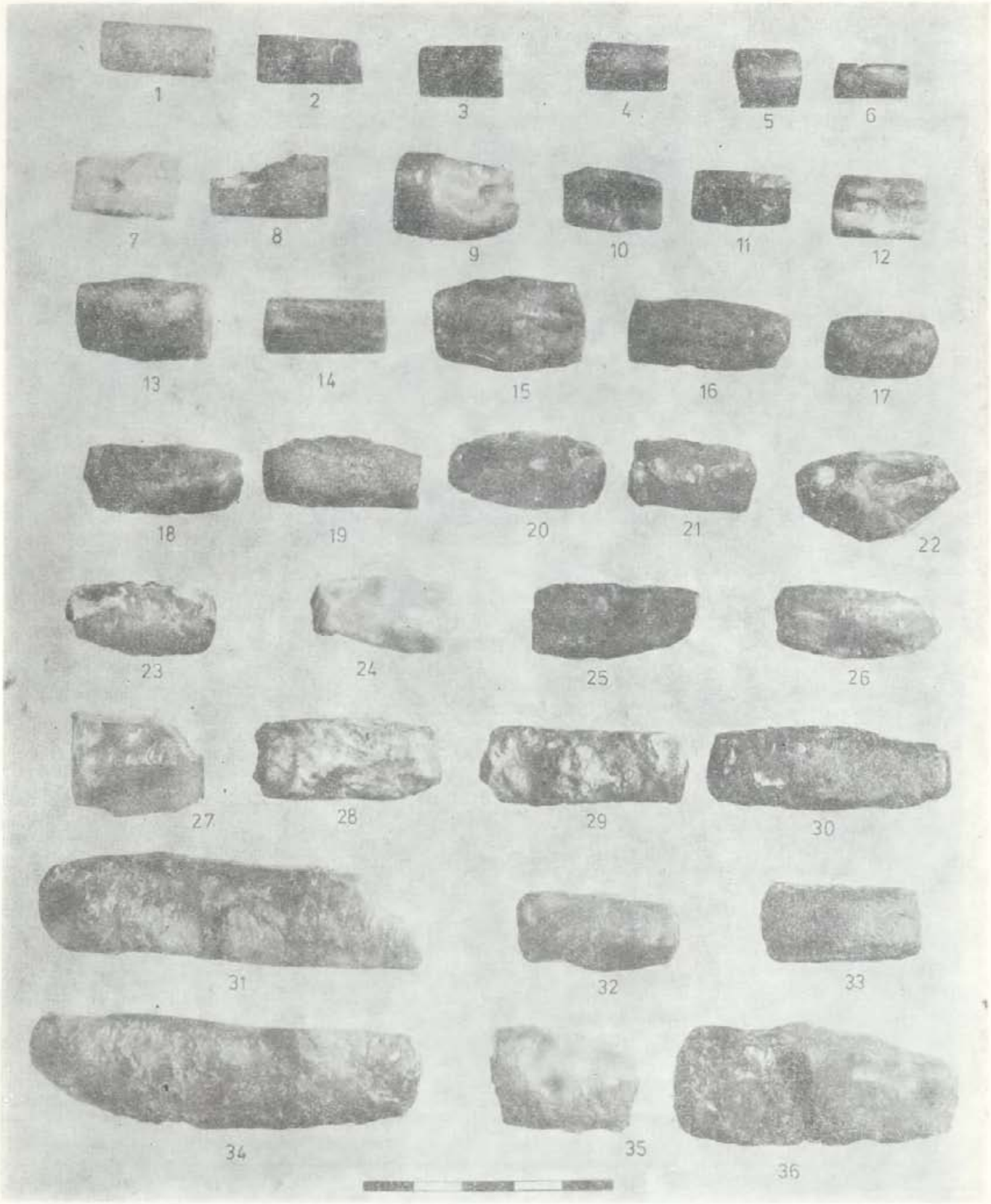

Plate I. Niedźwiedziówka, site I. Semi-products and final forms (*2*, *3*) of tubular, cylindrical beads, long (lAIa)

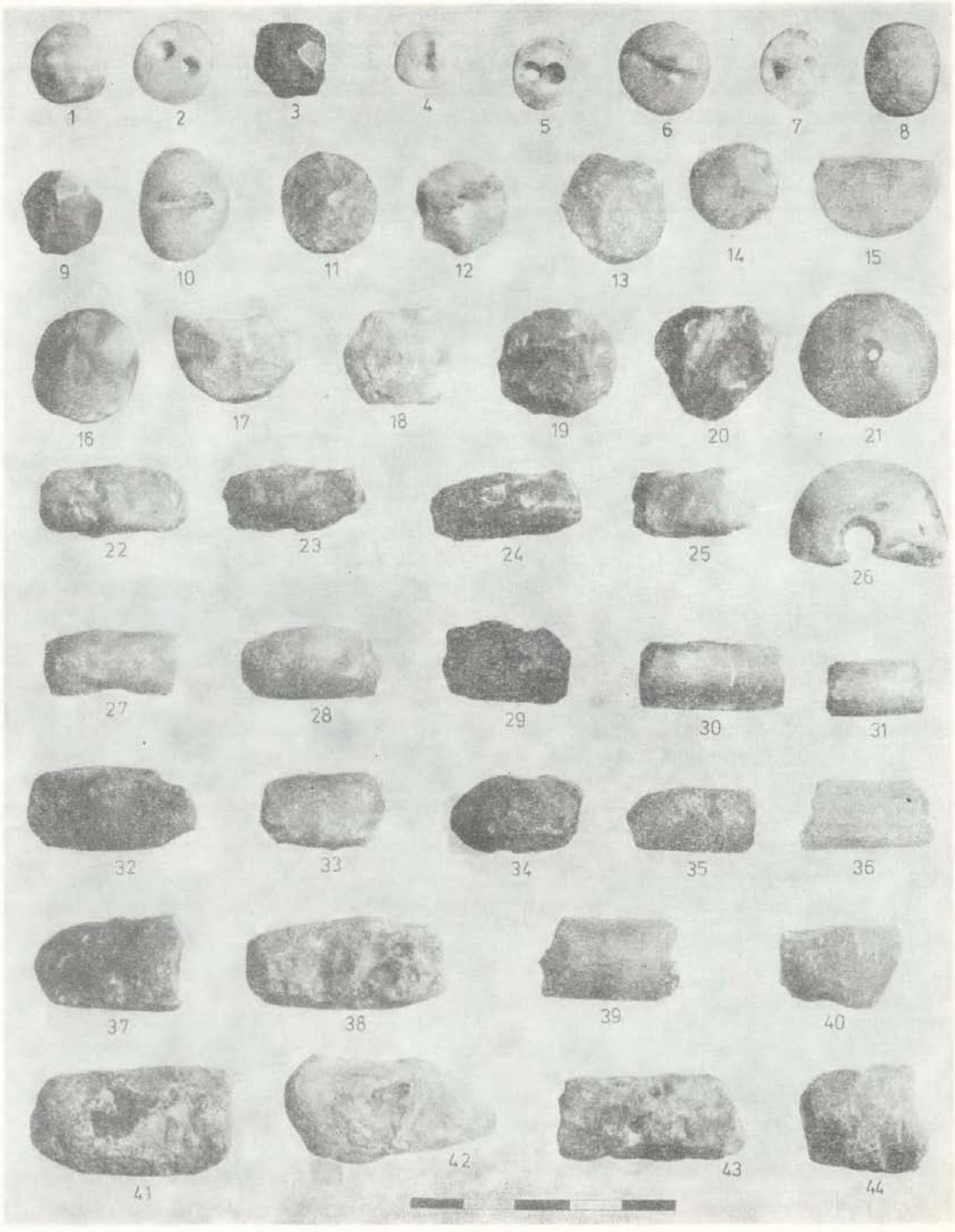

Plate II. Niedźwiedziówka, site I. Semi-products of various forms of amber ornaments

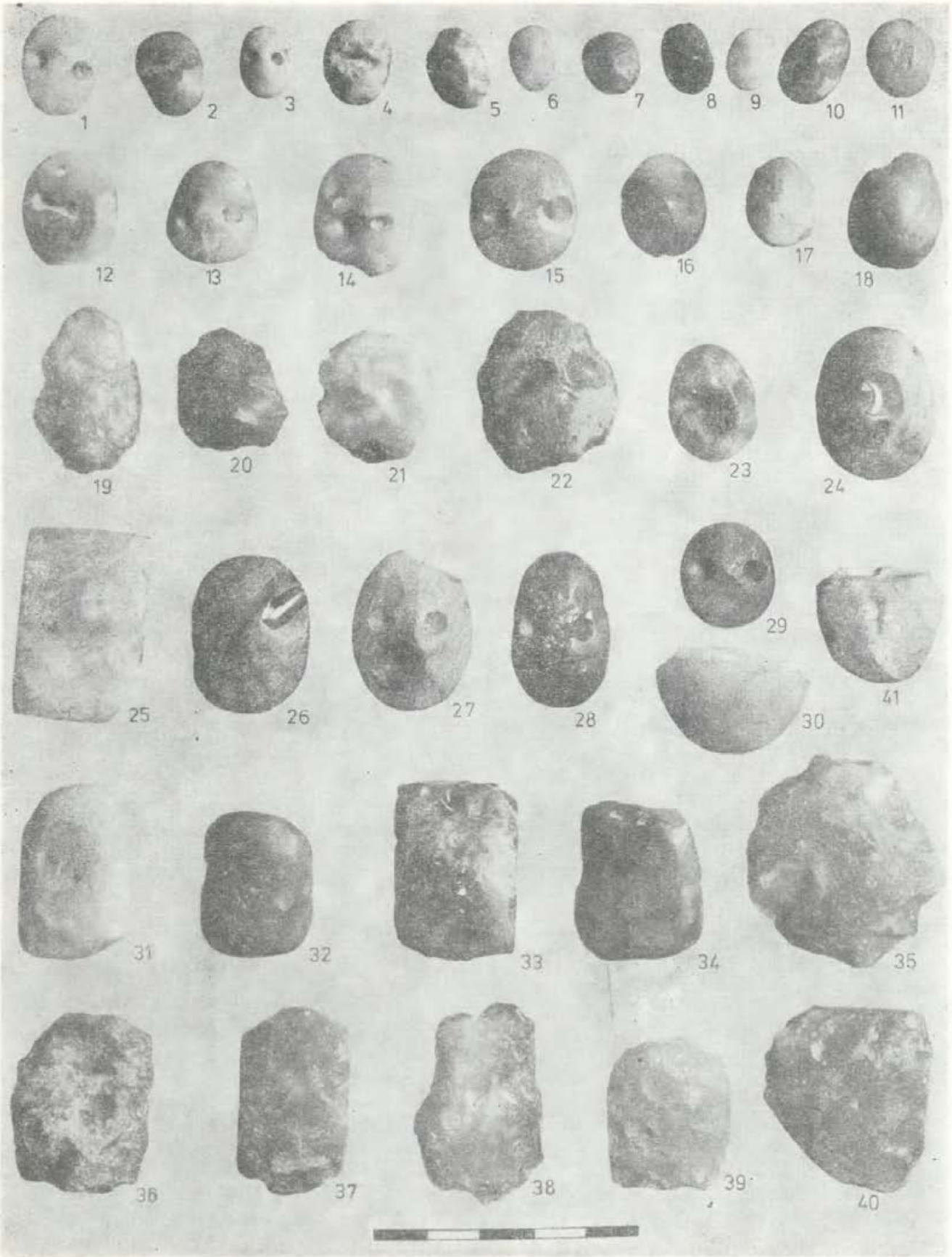

Plate III. Niedźwiedziówka, site I. Semi-products and final forms (*3*, *28*) of amber ornaments

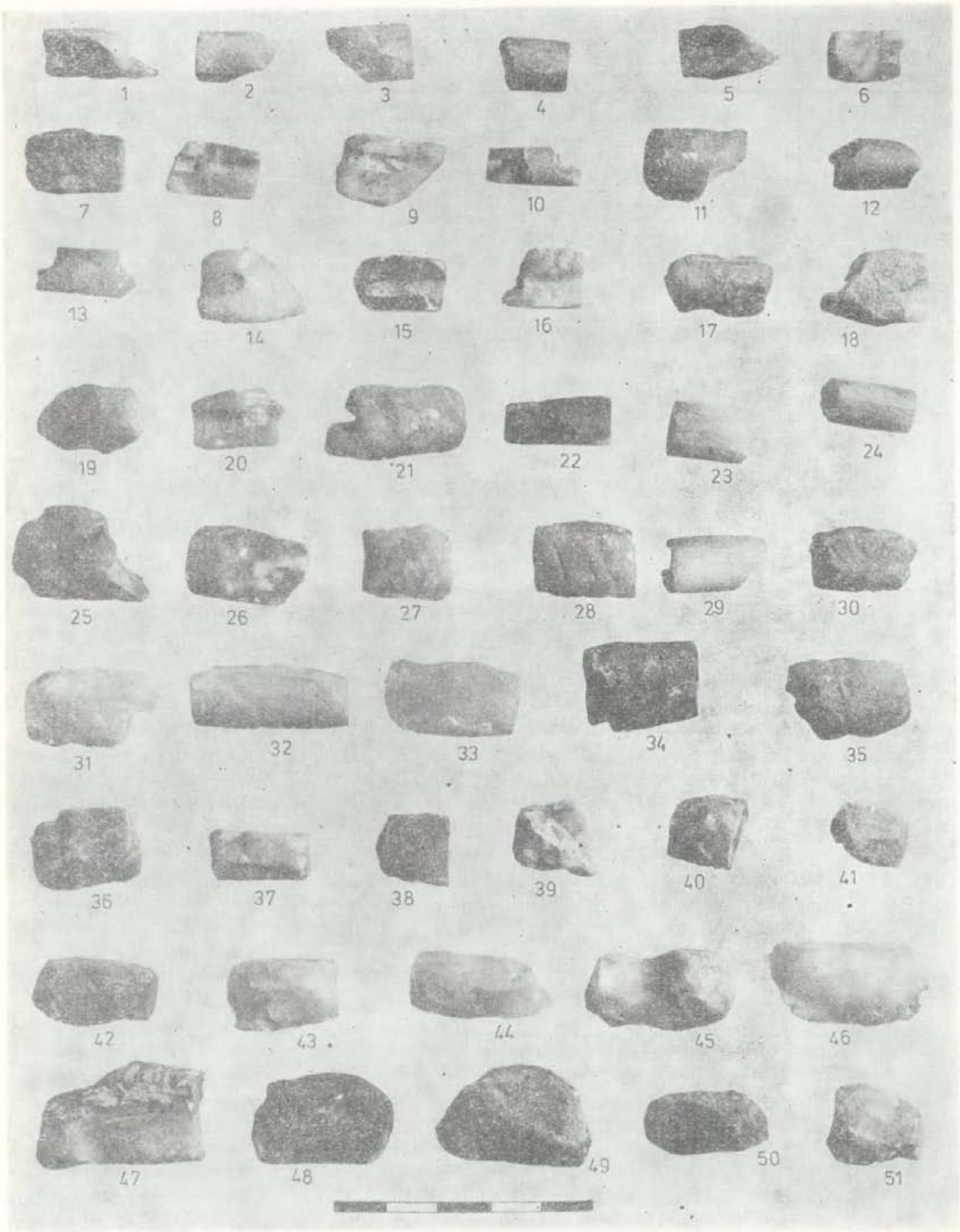

Plate IV. Niedźwiedziówka, site I. Semi-produced tubular, cylindrical beads, long (IAIa)

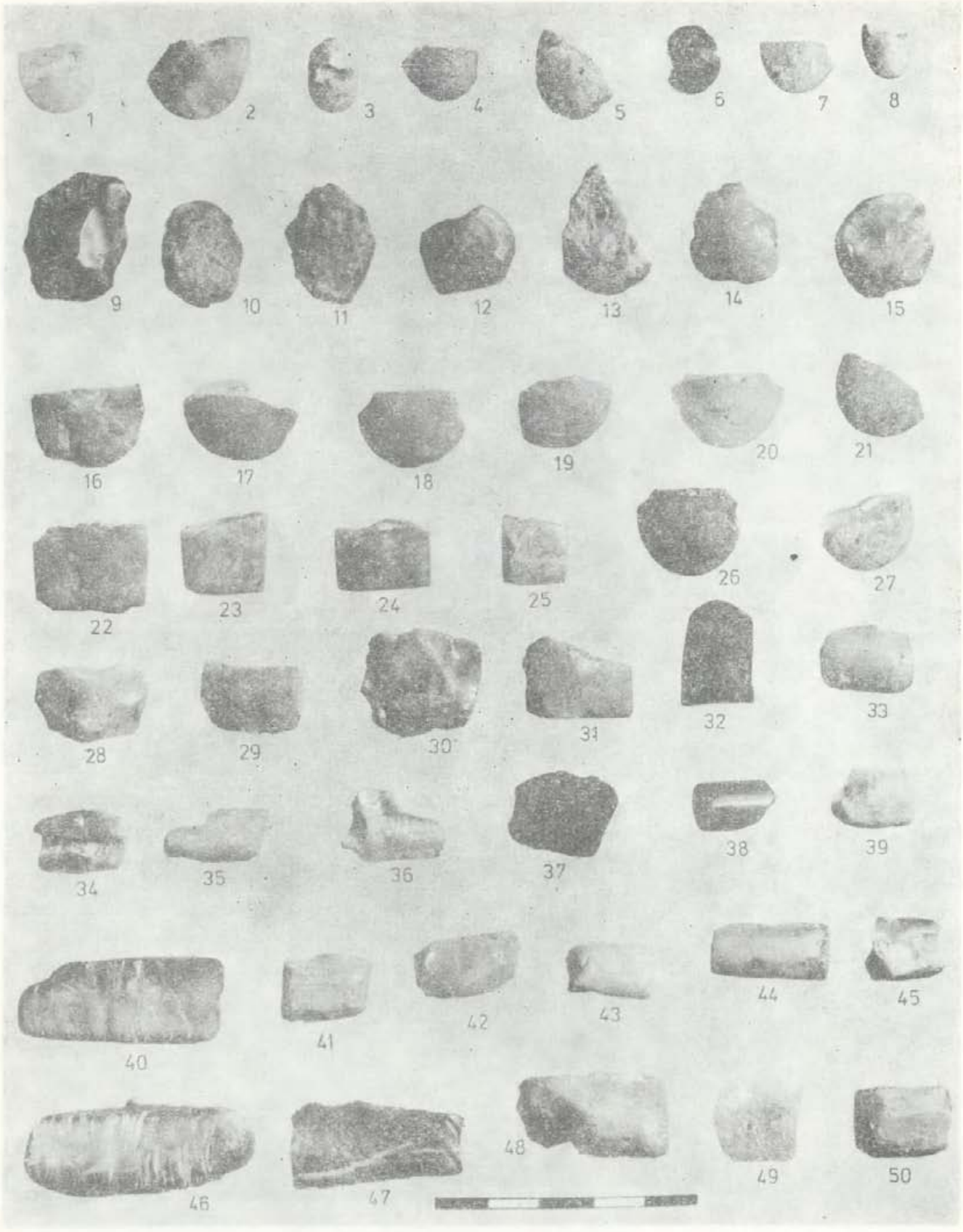

Plate V. Niedźwiedziówka, site I. Semi-products of various forms of amber ornaments

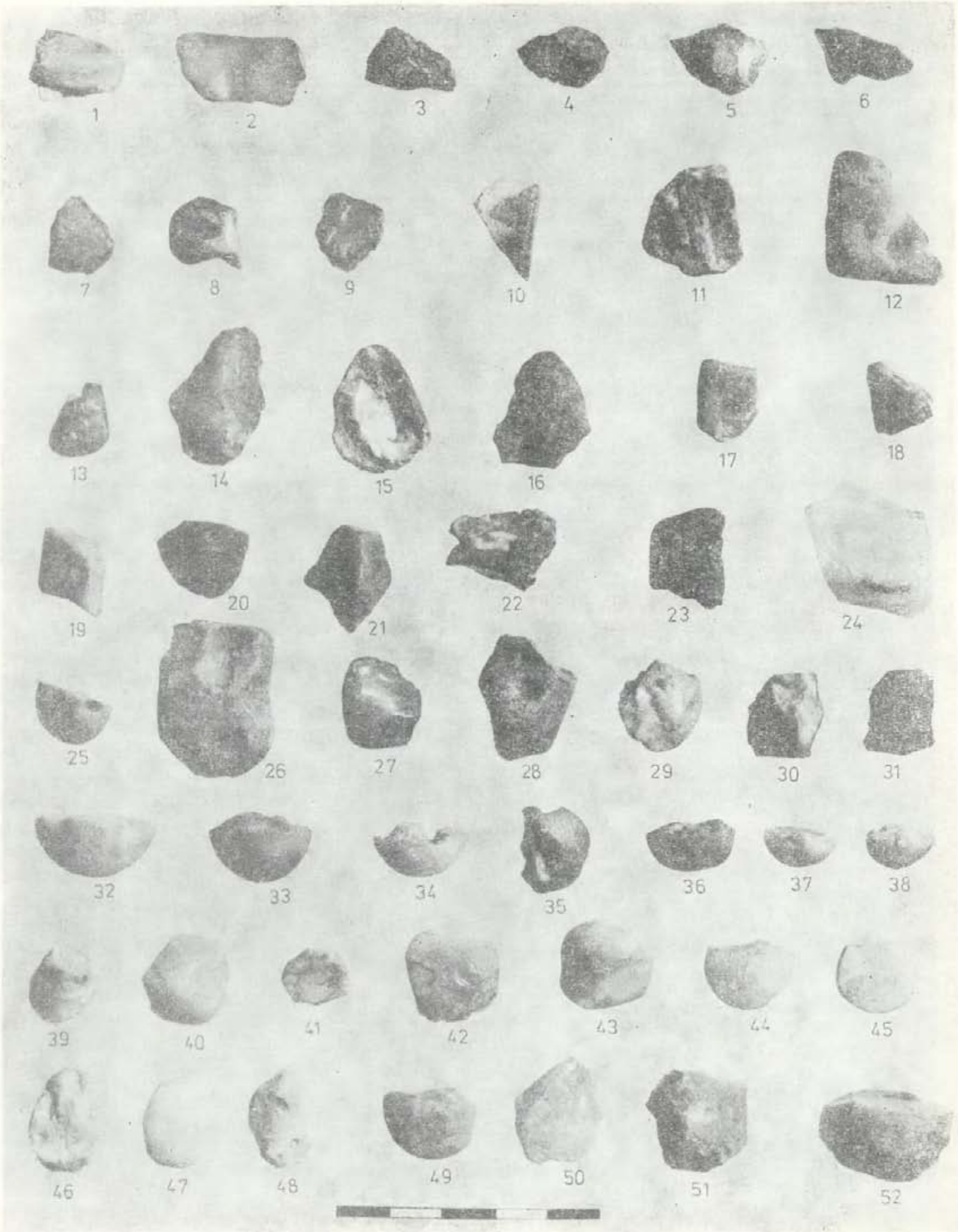

Plate VI. Niedźwiedziówka, site I. Semi-products of various forms of amber ornaments

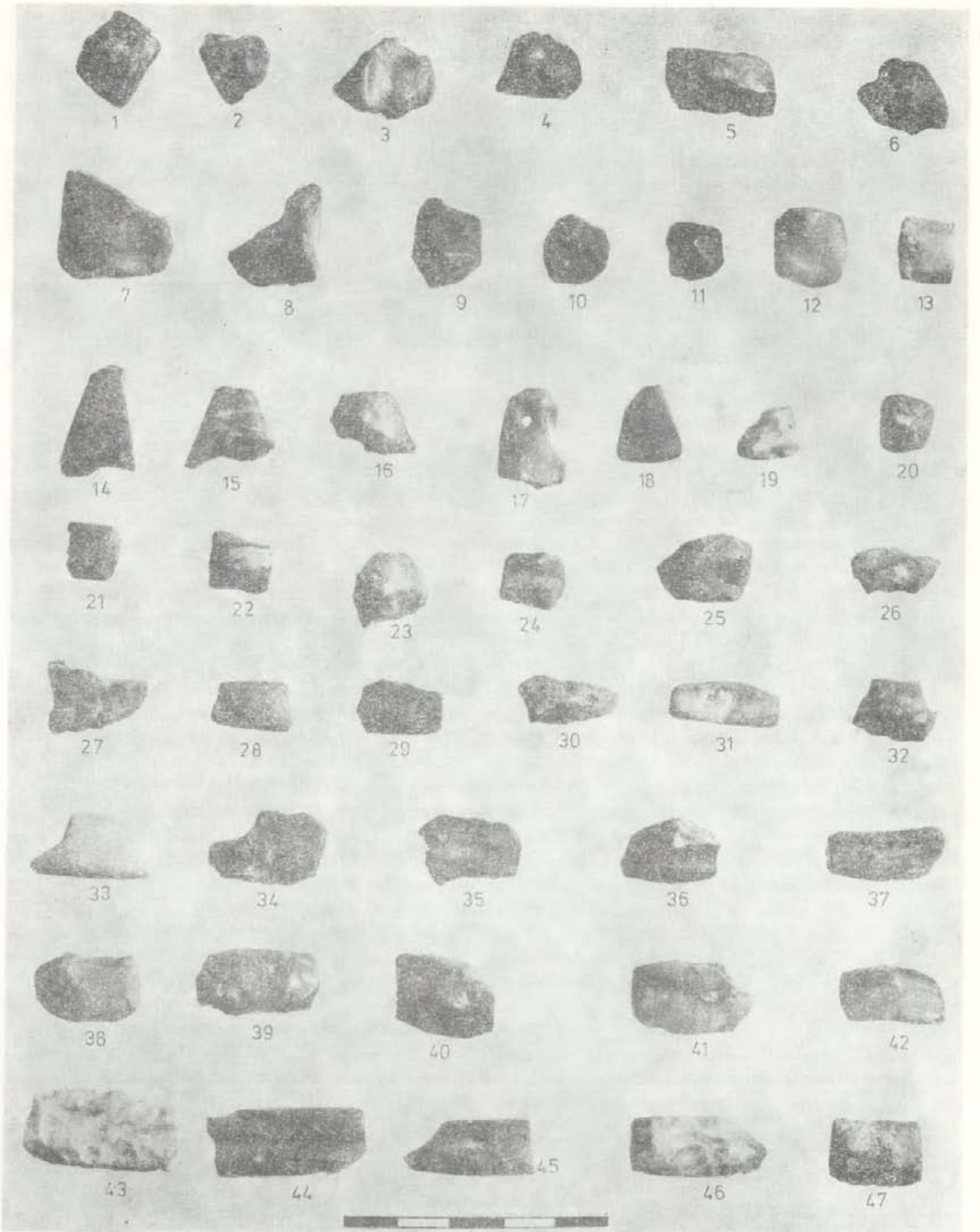

Plate VII. Wybicko, site I. Semi-products of various forms of amber ornaments

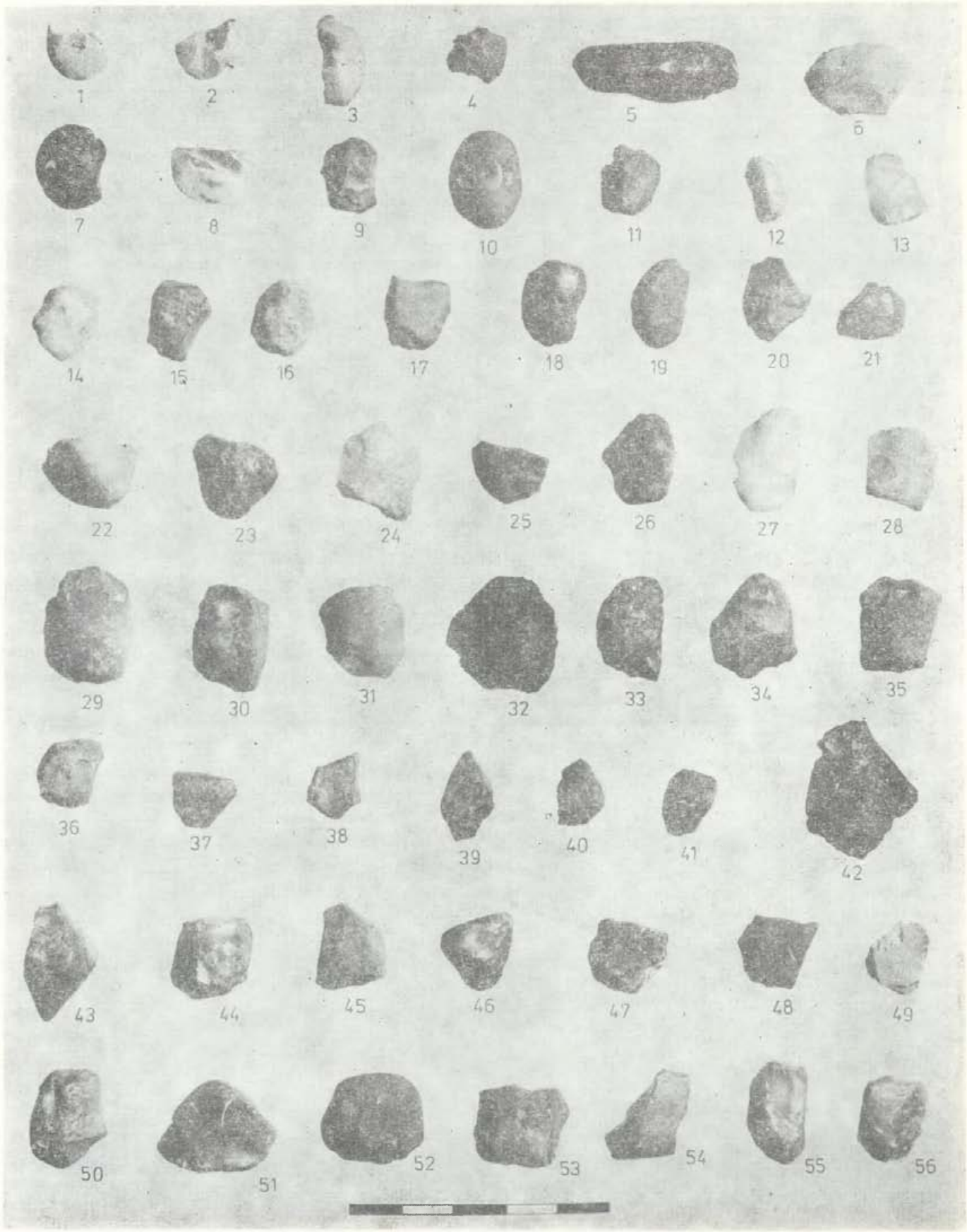

Plate VIII. Wybicko, site I. Semi-products of various forms of amber ornaments