[Supplementary material]

All things bright: copper grave goods and diet at the Neolithic site of Osłonki, Poland

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Table S1. Stable carbon and nitrogen isotope ratio results of humans, alongside description of individual burial goods.

LAB ID	Burial No.	Age	Sex	Burial goods	Copper in burial?	Collagen yield (%)	C (%)	N (%)	$\delta^{13}C$	$\delta^{15}N$	C:N
OSH 1	33	35–45	M	Antler axe (perhaps heavily repaired and reworked T-axe); necklace of ~60 shell beads; three perforated amber	N	9.2	42.5	15.2	−20.1	8.4	3.3

				pieces; miniature wide-mouthed vessel.							
OSH 2	38	25–35	M	None.	N	10.5	42.7	14.9	−20.4	8.5	3.3
OSH 3	53	-	-	Round copper pendant with two perforations of the Stollhoff type; necklace with ~55 copper beads; fragment of amber; bone point with two perforations.	Y	11.2	43.1	13.8	−20.1	7.8	3.3
OSH 4	35	25–35	M	None.	N	13.1	42.0	14.2	−20.1	9.1	3.2
OSH 5	64	25–35	F	Three copper beads; miniature ceramic vessel with four symmetrical	Y	12.7	44.9	17.1	−20.0	9.1	3.2

				appliques; ~20 shell beads.							
OSH 6	21	25–30	F	Base of small ceramic vessel.	N	9.1	41.8	16.0	−19.9	8.7	3.3
OSH 7	40	1–2 years	-	Two hip belts with ~300 shell beads.	N	8.2	44.3	16.6	−20.0	8.3	3.2
OSH 8	23	20–30	M	Tubular bone bead with perforation.	N	8.0	45.7	11.8	−20.1	8.0	3.2
OSH 9	54	25–35	F	Necklace with ~15 copper beads; two trapezoidal plaques and two rectangular plaques with curled ends; two elongated plaques with five perforations each; diadem with six strips of copper, wrapped and fastened with wire rivets; seven	Y	9.9	42.9	12.7	−20.2	8.4	3.2

				copper pendants. Two calcite beads in necklace; strand of ~65 shell beads.							
OSH 10	61	30–40	F	None.	N	10.3	42.8	14.5	−20.7	8.7	3.3
OSH 11	12	30–40	F	None.	N	14.0	41.5	16.7	−20.3	8.5	3.3
OSH 12	18	Old	F?	Copper pendant; cheek-pieces of ~20 copper beads. hip belt with ~95 shell beads	Y	13.9	42.0	15.2	−19.7	8.4	3.3
OSH 13	32	20–30	F	None.	N	9.3	43.9	13.9	−20.8	7.5	3.2
OSH 14	26	35–45	M	Antler T-axe; antler dagger; two boar tusks; antler punch/retoucher; two bone chisels; two bone drill; 26	N	9.5	42.8	12.2	−20.4	8.3	3.1

				retouched blades of Baltic, Jurassic, and chocolate flint.							
OSH 15	81	20–30	F	Ceramic vessel.	N	7.2	43.1	14.8	−20.2	9.3	3.3
OSH 16	6	40–50	M	~50 cylindrical copper beads; nine copper pendants (five trapezoidal, four narrow, with looped ends. Two perforated animal teeth; shell beads; flat bone point with perforation.	Y	6.8	46.0	14.2	−20.2	8.4	3.3
OSH 17	48	18–22	F	Binocular copper pendant; four loose copper beads; necklace with ~34 copper beads, six calcite beads as part of necklace; hip belt	Y	4.7	47.2	15.0	−20.2	8.8	3.3

				of one calcite bead and ~450 shell beads.							
SO 1	39	30–40	F	None.	Y	3.0	43.9	14.8	−19.7	8.6	3.2
SO 2	42	30–35	M	Four belemnite beads.	N	4.6	44.5	13.2	−20.7	7.8	3.3
SO 3	67	20–25	M	None.	N	5.4	42.8	11.6	−20.6	8.6	3.4
SO 4	73	25–35	F	None.	N	6.2	41.9	12.7	−20.3	8.3	3.3
SO 5	72	15–19	M	Diadem of 54 cylindrical copper beads; necklace of five trapezoidal pendants with repousse ornament. tool of chocolate flint; seven shell beads in necklace.	Y	6.8	40.8	12.9	−19.7	8.9	3.3

SO 6	22	30–40	M	None.	N	5.7	45.1	13.1	−20.5	8.5	3.3
SO 7	24	25–35	F	One copper bead; one fragment of copper strip. Two miniature ceramic vessels (amphora, bowl); bone point; one shell bead.	Y	11.2	47.0	14.3	−20.0	9.2	3.3
SO 8	1	17–25	F	~40 copper beads.	Y	9.6	43.2	14.7	−19.7	9.1	3.3
SO 9	69	40–50	M	Large ceramic bowl.	N	7.1	46.3	14.6	−20.6	8.1	3.3
SO 10	80	17–25	M	Necklace of copper strip and several copper beads; antler T-axe fragment; bone point with two perforations; fish-vertebra bead; seven	Y	6.8	44.7	16.3	−19.5	8.7	3.3

				retouched blades of Baltic flint.							
SO 11	27	14–17	F	None.	N	9.4	43.4	15.8	−20.6	7.9	3.3
SO 12	55	40–50	M	None.	N	8.4	41.5	14.2	−20.1	9.2	3.3
SO 13	63	40–50	M	Antler axe.		8.0	44.6	17.0	−20.5	8.8	3.2

Table S2. Stable carbon and nitrogen isotope ratio results of fauna.

LAB ID	Species	Element sampled	Collagen yield (%)	C (%)	N (%)	$\delta^{13}C$	$\delta^{15}N$	C:N
OS 1	Sheep/goat	Femur	7.2	44.7	13.0	6.7	−19.9	3.3
OS 2	Cattle	Metacarpal	11.1	46.2	14.3	4.6	−20.0	3.2
OS 3	Cattle	Metatarsal	12.5	47.1	15.2	4.8	−21.1	3.2
OS 4	Pig	Humerus	7.9	46.2	13.1	7.1	−20.1	3.3
OS 5	Cattle	Femur	9.3	46.9	16.8	5.2	−21.1	3.3
OS 6	Pig	Ulna	8.3	46.9	13.4	6.6	−20.3	3.3
OS 7	Red deer	Antler	4.0	46.7	16.5	2.5	−22.1	3.3
OS 8	Wild boar	Un. Id	8.5	44.0	17.0	6.5	−20.5	3.2
OS 9	Beaver	Un. Id	3.8	45.4	13.7	8.5	−20.5	3.3
OS 10	Red deer	Un. Id	7.4	40.5	16.2	5.5	-20.4	3.3
OS 11	Sheep/goat	Un. Id	7.1	45.9	14.9	5.7	−20.4	3.3

OS 12	Turtle	Un. Id	8.9	44.5	13.5	6.5	−23.2	3.3
OS 13	Sheep/goat	Un. Id	9.5	47.1	13.5	4.5	−20.2	3.3
OS 14	Pig	Pelvis	-	-	-	-	-	-
OS 15	Cattle	Scapula	8.8	45.0	16.7	4.8	−20.9	3.3
OS 16	Cattle	Ulna	7.9	42.8	14.6	5.7	−20.1	3.3
OS 17	Cattle	Metatarsal	4.9	43.7	13.6	6.3	−20.4	3.2
OS 18	Cattle	Metatarsal	5.6	46.7	12.3	5.6	−20.7	3.3
OS 19	Cattle	M/p shaft	3.9	48.2	12.8	5.3	−20.6	3.3
OS 20	Cattle	Femur	6.4	47.1	16.0	5.6	−20.2	3.3
OS 21	Cattle	Metatarsal	7.0	45.2	16.1	5.7	−20.2	3.3
OS 22	Pig	M/p	9.5	41.0	14.1	6.6	−20.6	3.3
OS 23	Sheep/goat	Radius/ulna	4.7	44.5	14.9	5.5	−20.1	3.3
OS 24	Pig	Ulna	-	-	-	-	-	-
OS 25	Red deer	Antler	8.6	41.8	14.9	3.4	−20.9	3.2
OS 26	Pig	Radius	3.9	43.6	15.3	6.1	−20.8	3.3
OS 27	Roe deer	Scapula	8.1	46.9	13.6	4.4	−21.6	3.2
OS 28	Roe deer	Antler	9.5	44.1	12.7	5.2	−21.2	3.2
OS 29	Roe deer	Scapula	10.4	42.2	13.7	4.8	−21.5	3.2
OS 30	Pig	M/p	4.3	44.8	16.7	6.3	−21.0	3.2
OS 31	Sheep/goat	Distal tibia	4.6	46.2	15.2	6.2	−20.0	3.2
OS 32	turtle	Corapace/plaston	2.3	45.8	13.6	7.5	−24.1	3.3

OS 33	Red deer	Scapula	9.4	45.3	15.1	5.7	−20.9	3.4
OS 34	Wild pig	-	9.1	45.2	14.6	5.7	−21.3	3.6
OS 35	Goat	Frontal	9.7	43.2	14.4	5.8	−19.7	3.2
OS 36	Cattle	Tibia	4.1	46.1	13.2	6.6	−20.0	3.1
OS 37	Cattle	Radius	5.2	45.4	14.6	7.1	−20.1	3.3
OS 38	Cattle	Proximal m/c	9.4	46.8	14.4	6.2	−20.4	3.2
OS 39	Cattle	Proximal radius	9.2	45.8	15.3	6.9	−20.3	3.4
OS 40	Sheep/goat	Tibia	7.4	41.5	15.6	5.7	−20.6	3.2
OS 41	Sheep/goat	Radius	6.8	42.8	14.2	5.4	−20.1	3.2
OS 42	Sheep/goat	Tibia	9.3	40.9	15.6	5.7	−19.9	3.2
OS 43	Pig	Metatarsal	5.2	40.8	14.5	7.2	−20.9	3.2
OS 44	Pig	Distal humerus	8.5	43.2	14.8	8.1	−20.6	3.2
OS 45	Pig	Distal humerus	8.9	45.8	13.2	5.9	−19.7	3.3
OS 46	Pig	Distal humerus	7.6	46.7	12.0	8.0	−20.9	3.2
OS 47	Sheep	Occipital	4.5	46.7	15.3	7.8	−20.3	3.2
OS 48	sheep	Occipital	5.5	42.0	12.8	7.8	−20.1	3.1
OS 49	Pig	Distal humerus	2.9	43.1	13.2	7.8	−21.1	3.2
OS 50	Pig	Tibia	6.4	44.9	14.2	9.2	−21.0	3.1
OS 51	Cattle	Tibia	4.7	40.7	16.5	7.4	−20.5	3.2
OS 52	Sheep/goat	Distal femur	3.9	43.5	12.4	5.1	−20.2	3.3
OS 53	Sheep/goat	Distal femur	4.1	46.6	13.4	5.3	−20.1	3.1

OS 54	Sheep/goat	Distal femur	8.0	47.1	16.8	5.4	−20.1	3.3
OS 55	Sheep/goat	Distal femur	10.3	42.7	14.6	5.6	−20.1	3.2
OS 56	Cattle	Metatarsal	2.8	41.2	16.1	7.1	−20.7	3.2
OS 57	Cattle	Humerus	8.7	42.2	14.2	6.9	−20.5	3.2
OS 58	Cattle	Metatarsal	5.2	40.7	13.8	5.8	−20.6	3.2
OS 59	Cattle	Metatarsal	10.1	45.3	17.0	6.5	−20.8	3.2
OS 60	Cattle	Distal radius	3.8	46.9	16.4	6.3	−20.5	3.3
OS 61	Cattle	Metacarpal	5.2	44.4	16.2	6.2	−20.7	3.5
OS 62	Cattle	Metatarsal	8.5	42.5	15.3	7.3	−20.9	3.4
OS 63	Cattle	Distal tibia	9.5	41.8	14.6	5.5	−20.8	3.2
OS 64	turtle (emys)	Carapace	7.3	44.8	12.8	7.1	−25.5	3.3
OS 65	Cattle	Metacarpal	6.3	46.2	11.9	5.5	−20.8	3.5
OS 66	Cattle	Metacarpal	12.1	41.1	16.7	5.8	−20.7	3.4
OS 67	Cattle	Metacarpal	8.9	41.7	14.2	6.4	−20.5	3.5
OS 68	Sheep/Goat	Distal tibia	10.7	48.0	12.1	5.7	−20.1	3.2
OS 69	Pig	Radius	6.0	48.5	15.4	8.5	−21.8	3.3
OS 70	Cattle	Distal tibia	2.8	43.2	15.8	4.2	−21.2	3.3
OS 71	Pig	Distal humerus	3.8	42.5	15.9	8.5	−21.2	3.4
OS 72	Cattle	Metatarsal weathered	11.2	41.1	12.9	6.3	−20.8	3.4
OS 73	Cattle	Metatarsal	3.8	42.5	15.9	5.1	−20.9	3.7
OS 74	Pig	Ulna	3.9	44.1	15.6	5.8	−23.0	3.5

OS 75	Wild pig	Distal tibia	7.4	42.6	13.5	4.7	−21.2	3.3
OS 76	Cattle	Scapula	4.7	44.9	12.3	6.8	−20.3	3.2
OS 77	turtle (emys)	Carapace	9.1	40.6	13.4	6.3	−25.1	3.2
OS 78	Cattle	Humerus/femur	5.9	47.1	13.7	5.5	−20.6	3.5
OS 79	Cattle	Proximal radius	5.1	43.8	15.5	5.8	−20.1	3.2
OS 80	Roe deer	Distal radius	8.5	42.6	15.8	4.1	−21.0	3.5
OS 81	sheep	Radius/ulna	14.8	45.8	13.9	5.6	−19.7	3.2
OS 82	Goat	Occupital	8.4	44.7	14.7	5.1	−19.9	3.2
OS 83	Pig domestic	Distal tibia	6.4	42.4	13.0	6.1	−20.5	3.3
OS 84	Pig domestic	Ulna	9.7	41.3	11.9	6.7	−20.8	3.4
OS 85	Goat	Occupital	7.5	42.6	14.9	5.1	−19.6	3.3
OS 86	Goat	Occupital	7.6	43.0	11.9	5.2	−19.0	3.2
OS 87	Sheep/goat	Proximal radius	8.9	44.1	12.6	5.4	−19.6	3.3
OS 88	Cattle	Distal humerus	11.9	48.1	13.2	5.1	−20.7	3.8
OS 89	Cattle	Distal tibia	8.5	44.9	15.3	5.6	−21.0	3.4
OS 90	Cattle	Humerus/femur shaft	7.9	43.2	14.2	4.7	−20.4	3.5
OS 91	Cattle	Metacarpal	8.1	45.1	15.4	5.9	−20.5	3.5
OS 92	Wild pig	-	9.0	45.9	15.4	6.3	−21.0	3.3
OS 93	Pig	Metacarpal	7.3	44.7	11.4	8.5	−21.4	3.4
OS 94	Red deer	Radius	9.0	46.1	16.3	7.4	−20.2	3.2
OS 95	Red deer	Metacarpal prox.	3.8	44.4	11.8	5.5	−20.5	3.5

OS 96	Wild pig	Distal radius	15.1	46.0	13.2	4.9	−21.4	3.3
OS 97	Horse	Phalanx 3	12.7	46.2	12.6	3.9	−22.3	3.4
OS 98	Cattle	Tibia	3.9	48.0	14.0	5.2	−20.4	3.3
OS 99	Sheep/goat	Radius	9.3	43.6	13.5	6.3	−19.9	3.3
OS 100	Sheep/goat	Prox. Tibia	4.9	45.8	14.6	5.8	−20.2	3.4
OS 101	Cattle	Metacarpal	4.1	44.1	16.4	6.1	−21.3	3.5
OS 102	Cattle	Femur	3.6	43.2	17.3	6.8	−20.7	3.4
OS 103	Sheep/goat	Humerus.	6.3	42.7	13.9	5.2	−20.1	3.5
OS 104	Sheep/goat	Humerus.	3.1	44.2	15.8	6.4	−20.8	3.4
OS 105	Pig domestic	Radius	9.5	46.2	13.4	7.5	−20.4	3.4
OS 106	Roe deer	-	9.3	45.9	16.2	6.3	−20.1	3.3
OS 107	Sheep/goat	Femur.	4.4	47.2	16.7	7.1	−20.5	3.2
OS 108	Dog	Mandible	8.4	42.8	12.4	7.8	−19.6	3.3
OS 109	Sheep/goat	Metatarsal proximal	9.4	44.3	15.2	6.7	−21.1	3.0
OS 110	Red deer	Antler	5.2	43.4	13.3	4.0	−22.0	3.2
OS 111	Emys turtle	Carapace	5.2	41.0	17.5	7.0	−24.2	3.4
OS 112	Sheep/goat	Proximal radius	5.7	45.6	13.8	4.9	−20.0	3.3
OS 113	Aurochs	Calcaneum	3.3	43.3	13.1	7.2	−20.4	3.2
OS 114	Roe deer	Distal tibia	8.5	40.8	13.0	5.0	−19.3	3.1
OS 115	Dog	?	8.1	43.1	12.9	8.6	−18.3	3.2
OS 116	Red deer	Antler	12.3	46.0	14.7	3.8	−20.4	3.3

OS 117	Sheep/goat	Tibia	5.7	47.0	14.6	4.9	−20.8	3.1
OS 118	Wild pig	Distal humerus	12.3	46.2	12.8	4.9	−20.7	3.3
OS 119	Sheep/goat	Distal tibia	4.9	43.9	14.9	4.7	−20.3	3.3
OS 120	Pig	Metatarsal	9.2	42.4	15.0	7.4	−20.7	3.4
OS 121	Roe deer	Metacarpal	7.4	44.3	14.9	5.3	−20.8	3.4
OS 122	Red feer	Mandible	9.4	43.2	14.0	4.2	−20.1	3.2
OS 123	Cattle	Proximal m/c	5.4	40.8	14.9	6.3	−20.0	3.3
OS 124	Cattle	Radius/ulna	5.2	41.5	12.5	5.9	−20.1	3.3
OS 125	Cattle	Ulna.	13.1	41.5	13.8	6.1	−20.7	3.2
OS 126	Cattle	Mandible	5.8	46.5	14.1	6.9	−20.2	3.3
OS 127	Cattle	Metacarpal	3.4	46.6	16.4	5.5	−22.4	3.3
OS 128	Pig domestic	Distal humerus	10.5	43.6	16.3	8.5	−20.3	3.2
OS 129	Goat	Proximal radius	5.1	44.1	12.5	6.1	−20.2	3.3
OS 130	Cattle	Distal humerus	9.3	40.2	15.8	6.7	−20.7	3.4

Table S3. Radiocarbon dating of human burials at Osłonki 1, calibrated using OxCal v.4.2.2 and IntCal13 to 95.4 per cent confidence (Reimer *et al*. 2013; Bronk Ramsey 2019).

Phase	Burial	Radiocarbon age	±	OxA	Cal BC
Early	35	5488	33	30075	4445–4261
Classic	1	5260	30	30345	4229–3985
	6	5241	29	30344	4227–3972
	18	5416	29	30346	4338–4236
	22	5246	32	30072	4228–3973
	26	5332	32	30074	4310–4040
	48	5393	32	30076	4338–4076
	53	5329	31	30077	4257–4049
	54	5402	30	30347	4338–4175
	72	5313	33	30080	4245–4043
	73	5288	31	30081	4233–4001
Late	24	5440	33	30073	4347–4244
	55	5446	32	30078	4350–4247
	61	5287	32	30079	4233–4000
	80	5317	32	30082	4244–4045

References

BRONK RAMSEY, C. 2019. OxCal 4.3. Available at https://c14.arch.ox.ac.uk/oxcal/OxCal.html (accessed 19 May 2020).

REIMER, P.J. *et al*. 2013. IntCal13 and Marine13 radiocarbon age calibration curves 0–50 000 years cal BP. *Radiocarbon* 55: 1869–87. https://doi.org/10.2458/azu_js_rc.55.16947