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DIETARY RECONSTRUCTION AT BRONOCICE AND CORDED WARE SITES IN SOUTHEASTERN POLAND BY QUANTITATIVE ANALYSIS OF TRACE ELEMENT COMPONENTS

ABSTRACT

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Statistical analysis was performed on several trace element attributes found in human skeletal remains from Bronocice, Łękawa, Samborzec, Słonowice, Szarbia and Wójeczka. The Bronocice data comes from four cultures: Funnel Beaker, Lublin-Volhynian, Funnel Beaker-Baden and Corded Ware, thus it represents the largest sample of data for this analysis. The samples from other sites are from Corded Ware culture. One Bronze Age sample comes from Słonowice. The samples were analyzed in the Laboratory for Archaeological Chemistry at the University of Wisconsin-Madison by T. Douglas Price. The objective of this study is to determine the dietary practices of Neolithic populations in southeastern Poland and if the diets of these cultures varied through time.

Keywords: Statistical analysis, trace element attributes from human skeletal remains, Lublin-Volhynian culture, Funnel Beaker culture, Funnel Beaker-Baden culture, Corded Ware culture.
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INTRODUCTION

The State University of New York at Buffalo and the Polish Academy of Sciences conducted a cooperative archaeological project at the Bronocice site, Świętokrzyskie province, 1974–1978. Witold Hensel was the Director and Principal Polish investigator of this cooperative project and Sarunas Milisauskas was the Principal American investigator. Bronocice (50 21'00" N latitude, 20 19'30" E longitude) is located on the highest local elevation above the Nidzica River floodplain, near the small town of Działoszyce, Świętokryskie province (Figures 1 and 2). The site has a total area of 52 ha; its length is about 1600 m and its width varies from 300 to 500 m.

The excavations at Bronocice revealed a multiphase settlement occupation and one Corded Ware burial dating 3800–2600/2500 BC based on well-established ceramic typologies and radiocarbon dates, phases 1-7 (Table 1; Kruk and Milisauskas 1981; Milisauskas and Kruk 1984, 1989). In previous publications the temporal designations used were referred to BRI, Lublin Volhynian, BRII, BRIII, BR IV, and BRV.

The cultural deposits spanned 1100–1200 years of occupation and were associated with successive cultural groups including Funnel Beaker, Lublin-Volhynian, Funnel Beaker-Baden and Corded Ware. Human remains included articulated skeletons from burials and isolated human specimens from household pits. A mass grave containing the remains of seventeen Funnel Beaker-Baden individuals were recovered.

One Corded Ware burial was discovered at Bronocice that post-dated the last Funnel Beaker-Baden settlement. Other Corded Ware human samples for this study were obtained from Łękawa (excavations of K. Tunia), Samborzec (excavations of J. Kamieńska and A. Kulczycka-Leciejewiczowa), Słonowice (excavations of K. Tunia), Szarbia (excavations of B. Baczyńska) and Wójeczka (excavations of J. Kopacz). Bone samples for analysis were prepared by dr. Krzysztof Tunia.

For more than a thousand years the residents of Bronocice practiced agriculture and stock herding. The stock herding intensified during the later phases of occupation. Some

Table 1. Chronological Sequence at Bronocice

Phase	Culture	Dates BC cal.
1	Funnel Beaker	3800-3700
2	Lublin-Volhynian	3700-3650
3	Funnel Beaker	3650-3400
4	Funnel Beaker	3400-3100
5	Funnel Beaker-Baden	3100-2900
6	Funnel Beaker-Baden	2900-2700
7	Corded Ware	2600-2500

archaeologists postulate that Corded Ware populations were herders of domestic animals or even pastoralists while others argue that they practiced cultivation of crops.

Statistical analysis was performed on several trace element attributes from the human skeletal remains from Bronocice and five Corded Ware sites. The aim of this study is to investigate the dietary practices of Neolithic populations in southeastern Poland. We also examined if there were dietary differences between various cultures. The samples were analyzed in the Laboratory for Archaeological Chemistry at the University of Wisconsin-Madison by T. Douglas-Price.

The Ca/P ratio was used to assess the integrity of the bone and for evidence of major diagenesis. The ratio is approximately 2.0 in normal bone. The samples from southeastern Poland are somewhat high in Ca, indicative of the loss of organic material from the bone. Mg, Mn, Fe, Al, and Na are used as indicators of contamination since they normally are absent or in very low concentration in bone. The range of variation in these elements seems rather comparable across all the sites suggesting that there has been diagenesis, as is normal in buried bone. Elements most sensitive to diet are strontium and barium. Higher barium might suggest more marine diet or higher strontium might suggest less meat.

TRACE ELEMENT ANALYSIS

An initial test showed that the bones may have been susceptible to higher levels of diagenesis than normal (see T. Douglas Price *et al.* 1992 article on diagenesis; Tables 2, 3). As many of the calculations involved considered the comparative ratio of *Ba* to *Sr* to *Ca* in population subsets, *Ba/Sr* has been plotted against the *Ca/P* ratio, which was used to determine the relative level of diagenesis per specimen (Reiche *at al.* 2003). While indicators of diage-nesis may be high, it does not seem to exert any significant influence on the distribution of *Ba/Sr* values in the population (Fig. 1).

This study initially followed the methodology outlined by Burton and Wright (1995) and Burton (1996) in using *Ba*/*Ca* and *Sr*/Ca measures to analyze differences in biopurification of dietary *Ca* due to relative levels of plant, meat, and dairy components of the sample populations. Biopurification in this case refers to the process by which higher levels of Calcium are used in the creation of new bone in comparison with similar trace elements, such as Barium and Strontium, as calcium occurs in higher ratios as it moves up the food chain. These data were transformed to log values following Burton and Price (2002) in order to facilitate a normal distribution of the trace element values (Fig. 2).

By applying a simple two-sided *T*-test between each of the sample populations (samples separated by culture affiliation, and excluding those two cultures which had insufficient sample sizes — the Lublin-Volhynian and Bronze Age groups) the *Sr* / *Ca* ratio was found to differ at a highly significant level ($p < .001$) between FB and FB-Baden groups, and slightly less significant ($p < .001$) between FB-Baden and Corded Ware groups, although *not*

Table 2. Bone Samples from Sites Used for Trace Element Analysis

ID	UW	Site	Unit	Culture	Chronology	Burial	Bone	Age Class	Age	Sex
1	1093	Bronocice	A1	3	3100-2700	16	rib	juvenis	7	
2	1094	Bronocice	B1	3	3100-2700	13-5	tibia	juvenis	4.5	
3	1096	Bronocice	B1	3	3100-2700	14	rib	adultus	32.5	M
4	1101	Bronocice	A3	3	3100-2700	24	rib	adultus	19	F
5	1102	Bronocice	B1	3	3100-2700	13-1	rib	adultus	19	F
6	1103	Bronocice	B6	3	3100-2700	22	rib	adultus	32.5	M
7	3006	Bronocice	B1	3	3100-2700	10	rib	adultus	30	F
8	3007	Bronocice	Bd	3	3100-2700	21	rib	juvenis	8.5	
9	3008	Bronocice	B1	3	3100-2700	13-2	rib	juvenis	5	
10	3009	Bronocice	B1	3	3100-2700	13-3	rib	juvenis	10	
11	3010	Bronocice	B1	3	3100-2700	13-4	rib	adultus	18	M
12	3011	Bronocice	B1	3	3100-2700	13-6	rib	adultus	25	M
13	3012	Bronocice	B1	3	3100-2700	13-7	rib	juvenis	3.5	
14	3013	Bronocice	B1	3	3100-2700	13-10	rib	juvenis	5	
15	3014	Bronocice	B1	3	3100-2700	13-11	rib	juvenis	0.6	
16	3015	Bronocice	B1	3	3100-2700	13-12	rib	juvenis	7.5	
17	3016	Bronocice	B1	3	3100-27000	13-13	rib	juvenis	15	
18	3017	Bronocice	B1	3	3100-2700 13-14	13-14	rib	juvenis	7	
19	3018	Bronocice	B1	3	3100-2700	13-15	rib	juvenis	8	
20	3019	Bronocice	B1	3	3100-2700	13-16	rib	juvenis	3	
21	3020	Bronocice	B1	3	3100-2700	13-17	rib	juvenis	0.8	
22	1095	Bronocice	C2	1	3650-3100	9	long bone	adultus	35.9	
23	1097	Bronocice	C5	1	3650-3100	17	long bone	senilis	50	M
24	1098	Bronocice	C5	1	3650-3100	19	rib	adultus	35.9	M
25	1099	Bronocice	C1	1	3650-3100	15	rib	adultus	18	F
26	1100	Bronocice	C2	1	3650-3100	5	long bone	adultus	35.9	
27	3001	Bronocice	C2	1	3650-3100	4	femur	adultus	35.9	
28	3002	Bronocice	C5	1	3650-3100	18	rib	adultus	35	M
29	3003	Bronocice	C5	1	3650-3100	20	rib	adultus	35.9	F
30	1104	Bronocice	B1	4	2700-2400	11	rib	senilis	50	M
31		Słonowice		4	2700-2400	2=3	rib			
32		Szarbia		4	2700-2400	3=8	rib	maturus	45	F
33		Łękawa		4	2700-2400	3	rib	adultus	25	M
34		Wójeczka		4	2700-2400	1=1	rib			
35		Wójeczka		4	2700-2400	2=2	rib	adultus	35.9	M
36		Wójeczka		4	2700-2400	3=3	clavicle	senilis	50	M
37		Samborzec		4	2700-2400	19	rib			
38		Samborzec		4	2700-2400	21	rib	senilis	60.9	M
39		Samborzec		4	2700-2400	23	rib	maturus	45.9	F
40	3004	Bronocice	C2	2	3700-3650	6=1	rib	adultus	30	M
41	3005	Bronocice	C2	2	3700-3650	6=2	rib	adultus	35	F
42		Słonowice		5	1700-1500	16=10	rib	maturus	45.9	M

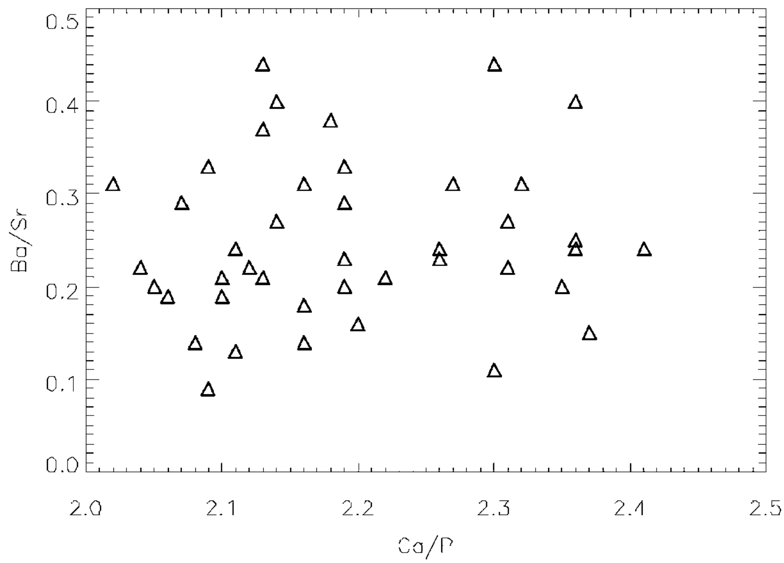

Fig. 1. Ba/Sr variation plotted against Ca/P measure of diagenesis. While several of the points lie outside of the normally accepted range, we can rule out a predictable influence of diagenesis

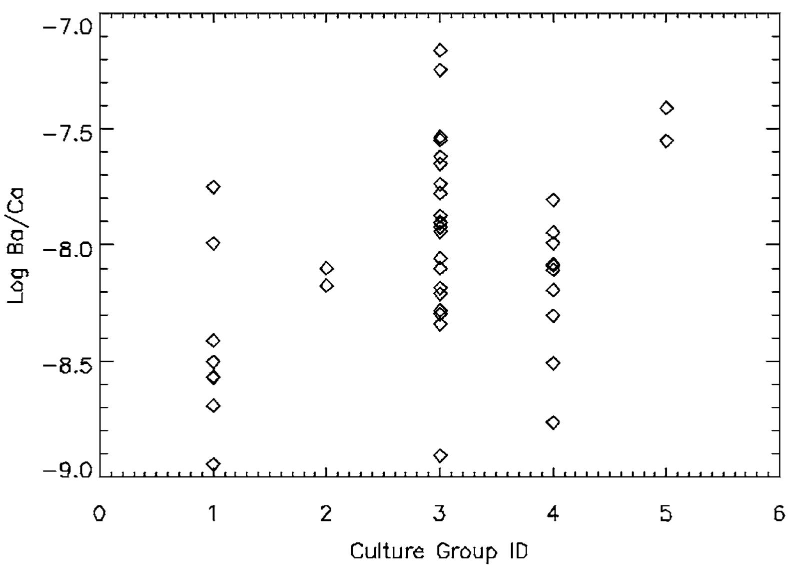

Fig. 2. Log of Ba/Ca plotted per each sample, grouped by Culture Group affiliation. The third group (FB-Baden) is by far the most diverse. (1) Funnel Beaker (2) Lublin-Volhynian (3) FB-Baden (4) Corded Ware (5) Bronze Age

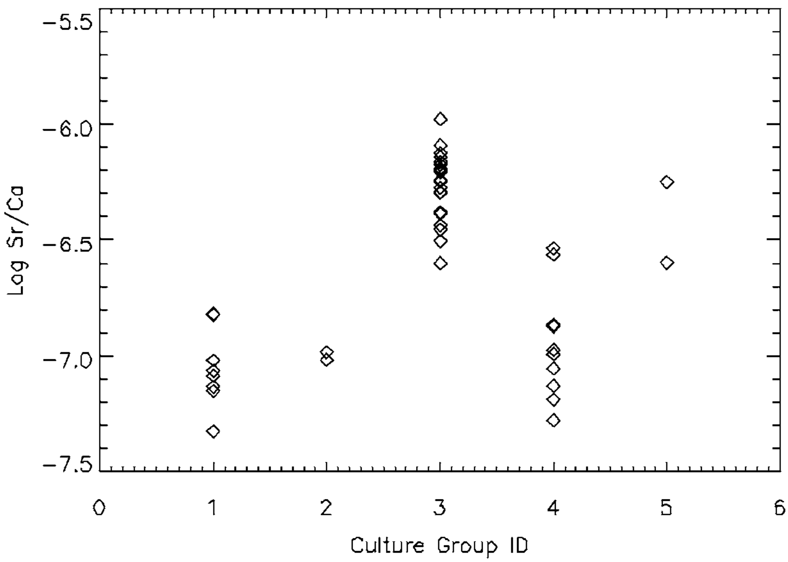

Fig. 3. Log Sr/Ca values. The value range is much tighter for each Cultural Group. (1) Funnel Beaker (2) Lublin-Volhynian (3) FB-Baden (4) Corded Ware (5) Bronze Age

between FB and the Corded Ware culture, despite the fact that the two are not sequential, and the two are interceded by a cultural group (FB-Baden) which differs significantly (Fig. 3).

It is difficult to make a recommendation with regards to the interpretation of these differences between populations. If we omit the case that is due to diagenesis then we can consider the trace element variation in the samples caused by living dietary influences.

Following the cautioning of Burton and Wright (1995) and Burton (1996), meat is demonstrably low in calcium, and if secondary products (i.e. milk/dairy) are not consumed and the diet has access to plant resources which are high in calcium, then dietary increases in as significant a range as from 0 to 70% meat in the diet will be masked. By implication, trends in *Sr/Ca* and *Ba/Ca* that may lend an apparent interpretation to an increase in meat consumption could also be the result of an increase of high calcium plants or a change in preparation habits with either food. In addition, the influence of region of origin on diet cannot be ruled out.

Initial exploration of the distributions revealed that **Ba/Ca** values for the FB-Baden group in particular were extremely varied in comparison with other groups, although all groups clustered more neatly in **Sr/Ca** values than **Ba/Ca** values. In exploring this variation, a trend was noticed in which age seemed to exert an unusually strong influence on the Log **Ba/Ca** value. The plot on the following page demonstrates the visual divide between the older individuals of the FB-Baden group (Figs. 4–7).

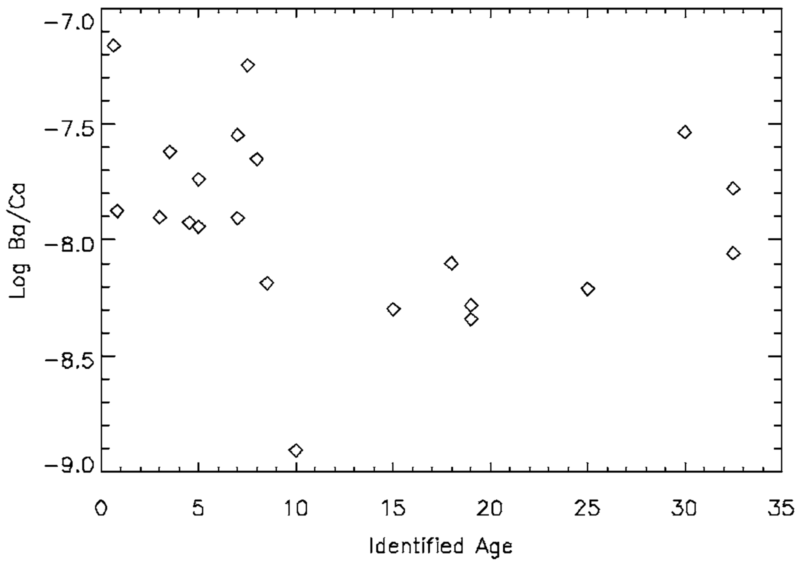

Fig. 4. Log Ba/Ca plot values for all individuals of the FB-Baden group. There is a clear split between the youngest and oldest individuals and the individuals aged between 10 and 25, termed the Barium depletion feature

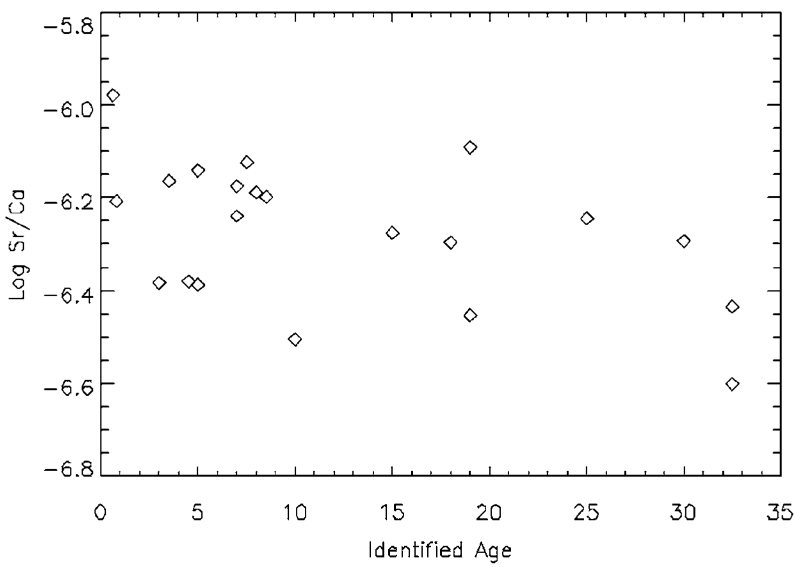

Fig. 5. Log Sr/Ca plot values for each of the individuals of the FB-Baden group. The clear variation due to age in the Br/Ca plot is not apparent here

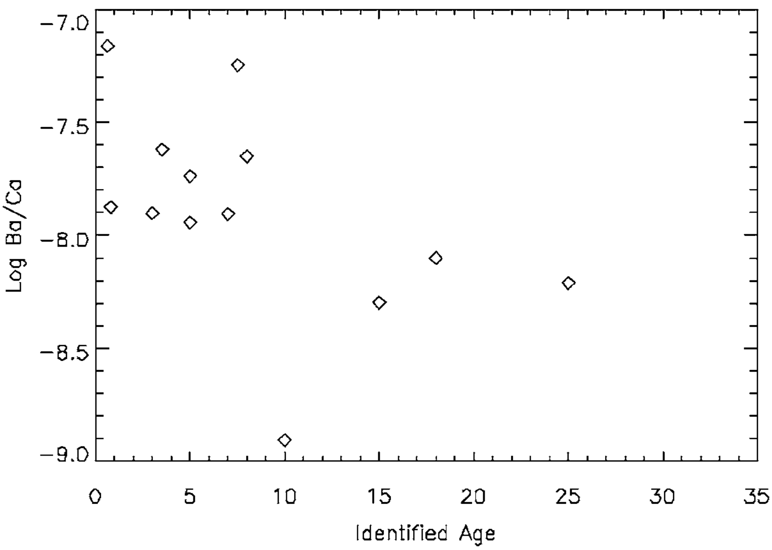

Fig. 6. Log Ba/Ca values plotted against age. In this case, only individuals buried in Grave 13 have been included. There is no overlap in Log Ba/Ca values between the 10 and over group and the under 10 group

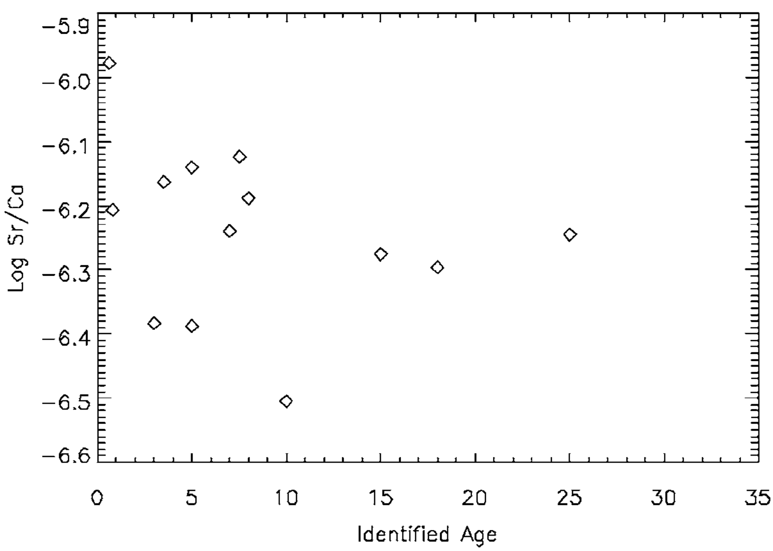

Fig. 7. Log Sr/Ca values plotted against age, with only individuals from Grave 13 included. While there is a general downward trend in the Strontium data, there is no clear depletion feature, as with the Ba/Ca group

Following the cue from visualization, this relationship was investigated statistically. With a division set between individuals aged over 10 and individuals aged 10 and under, a *T*-test of variance of sample means proved to be significant at $p < .001$. This differed from the earlier *T*-test between populations as the assumption of equal variance did not hold (Levine's Test provided an α value at 0.1, making this assumption problematic). A regression function fitted to age as the explanatory variable for Log *Ba/Ca* was significant, but only at $p < .1$, and a more suitable regression was sought.

Upon further examination, this difference seemed most significant in the members of the mass burial of Grave 13. These individuals have been separated out below:

If we follow Burton, Price, and Middleton (1999), then for biopurification of dietary Calcium to explain variation between sample populations, this biopurification should impact *Ba* and *Sr* values similarly. This may hold somewhat for the entire cultural populations being compared (as was done above), but it does not hold for the sub-population of FB-Baden, and especially not for the population of Grave 13. As the age-divisions of population of Grave 13 are also significantly different from one another ($p < 0.001$), other means must be sought to explain this difference.

Following Burton, Price, and Middleton (1999) the adjustment of only barium (and not strontium) in one sub-population should caution against an interpretation of Ba/Ca as an indicator of increased biopurification of calcium. Both Burton, Price, and Middleton (1999) and Burton and Price (1999) describe three different factors which may affect the correlation:

1) Regional variability of food source. This can be due either to the mobility of a group itself — migration — or of that group's food source — from exchange of grain to ranging of herds and can be somewhat analogous to strontium isotopes in migration studies (see also Burton *et al.* 2003).

2) A diet that has a large marine component.

3) The effects of diagenesis.

As the results of the analysis are contingent upon the hypothesis (garnered from visual exploration of the data) that the *Sr/Ca* and *Ba/Ca* values are correlated in some cases and not others, this assumption must be tested quantitatively.

Fitting a regression to the relationship between *Sr/Ca* and *Ba/Ca* values produced an R^2 coefficient of .86 for Burton, Price, and Middleton (1999), which the authors interpreted as strong enough to suggest biopurification as a suitable cause for *Ba* and *Sr* elevation in their dataset. By comparison, the overall R^2 value for the entire set of trace element data from Bronocice is 0.379 and for Group 3 specifically (FB-Baden) it is a mere 0.272, with neither case being significant at $p < 0.05$.

In order to explore whether or not the biopurification hypothesis might hold up between any of the sample populations, a regression was attempted between *Sr/Ca* and *Ba/Ca* for the other two culture groups with a significant sample size. In the case of the Funnel Beaker (Culture 1) sample population, the R^2 for the correlation between *Sr/Ca* and *Ba/Ca*

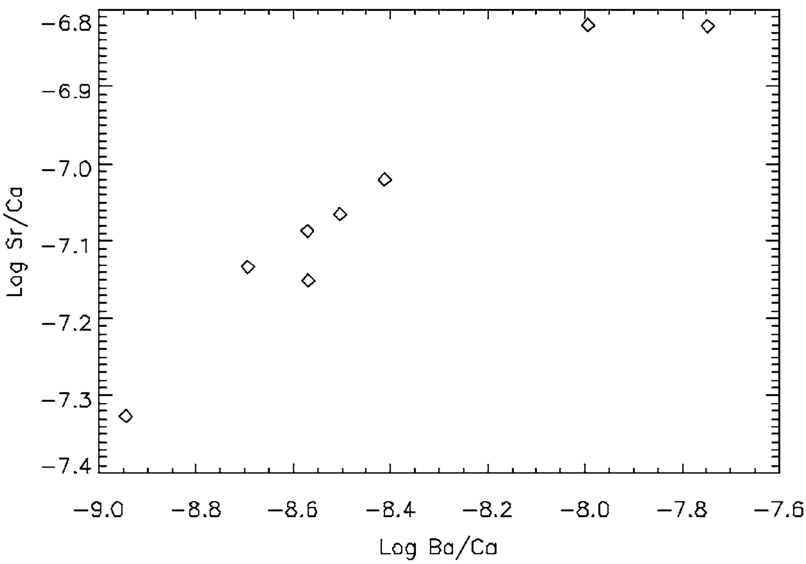

Fig. 8. Plot of Log Sr/Ca against Log Ba/Ca for all individuals of the Funnel Beaker sample population, demonstrating the high correlation between the Strontium and Barium values in this case

(*Log* values) is 0.935 — and significant at $p < .001$. While it was expected that there may be a similarly strong correlation between *Log Sr/Ca* and *Log Ba/Ca* values within the Corded Ware population, this correlation proved to be a rather insignificant one with R^2 at 0.156 and $p > 0.1$ (Fig. 8).

The lack of correlation between *Sr/Ca* and *Ba/Ca* in the FB-Baden group makes it impossible for us to conclude that biopurification is the source of the difference between it and the preceding Funnel Beaker population, and similarly the lack of correlation between *Sr/Ca* and *Ba/Ca* in both the FB-Baden and the following Corded Ware group prevent us from pinpointing biopurification as well. However, it is certainly likely that something about diet composition changed after the Funnel Beaker period, since this strong correlation between *Sr/Ca* and *Ba/Ca* is never present again (at least not in this sample).

Age and gender groups within other cultures and for the entire population set were tested using the two sided *T*-test method as well, but no general gender or age differences in diet were found to be significant at $p < 0.05$. Other measures, including Zn/Sr ratios (after Szostek *et al.* 2003) were also considered and found to be insignificant measures of change for these populations.

CONCLUSIONS

As mentioned previously, it is possible that some differences may be due to diagenesis and the local impacts of the soil on the skeletal remains over the years between the deaths of these individuals and the laboratory analysis of the trace element components. If this is not the case, we can draw different conclusions from the data: biopurification, migration, differences in diet between cultures, *etc.* are all implicated as possible explanations of the trace element variation.

We can say for certain that there is something different about the younger individuals in Grave 13 when compared with the older individuals in Grave 13, but we cannot determine on the basis of this analysis whether this is due to regional differences in diet, or a change in dependence on marine food sources (usually strongly correlated with a sharp barium depletion feature). Previously, we have speculated that Grave 13 individuals were non-local (Pipes et al. 2010). Similarly, the strong correlation in *Sr*/Ca and *Ba*/Ca in the Funnel Beaker population may suggest that this group was more sedentary and less likely to consume foods from different regions, whereas the following Funnel Beaker-Baden and Corded Ware groups may have either moved more frequently or consumed more food from different source regions or environments. Most likely the diet of Funnel Beaker-Baden and Corded Ware populations was different from the Funnel Beaker population. The higher values of strontium of the Funnel-Beaker population would suggest less meat consumption. By now these people were using cattle for traction and dairy products and sheep for wool production. The so-called secondary products of animals were more important than in the past. The early Corded Ware populations were probably of non-local origin and their low strontium values might suggest greater emphasis on meat consumption, especially if they practiced pastoral economy.

As previously mentioned Funnel Beaker-Baden and Corded Ware populations had greater mobility and practiced herding of animals or even pastoral economy. Due to ecological changes during the early Funnel Beaker-Baden (Phase 5) occupation, there may have been an increase in stock breeding and the appearance of transhumance, because the expanded forest-steppe environment was more suitable for herding. The herds may have been divided into two groups, with the majority of the cattle and sheep being driven to summer pastures. The villagers probably kept some cattle, as well as goats and pigs, around the settlement in order to supply milk, cheese and meat for day-to-day use. The seasonal movements of herds could have given rise to a specialized group of herders.

Kadrow (1994) suggests that the early Corded Ware populations practiced pastoralism in southeastern Poland. Around 2700–2600 BC Funnel Beaker-Baden farmers were disappearing and thus later Corded Ware groups incorporated farming in their subsistence strategy. Pastoralists could not survive “without access to agricultural products” (Kadrow 1994:74).

While trace element analysis was common when the laboratory analysis was performed (Katzenberg and Harrison 1997), after much criticism (see Burton and Price 2002; Sandford and Weaver 2000) the field has largely embraced other avenues in paleodiet reconstruction (Meigs and Knudson 2004). These other types of analysis — e.g. stable isotope analysis (e.g. Knudson *et al.* 2004), or aggressive exploration for extant DNA in the samples, *etc.* — would all be helpful in discriminating among these possibilities. For example, trace element analysis has been successfully used in conjunction with other more recent advances to explore the possibility of residential mobility (Knudson and Price 2007). The different possibilities invoked by this analysis are worth exploring and it is hoped that future analysis of these samples may resolve some of these issues.

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Table 3. Trace Element Analysis of Bone Samples

ID	UW	Site	Unit	Culture	Chronology	Burial	Bone	Age Class	Age	Sex	al	ba	ca	fe	k	mg	mn	na	p	sr	zn	ca/p	ba/sr	ba/ca	sr/ca
1	1093	Bronocice	A1	3	3100-2700	16	rib	Juvenis	7		306	217	411424	457	458	1161	89	3118	174367	857	624	2.360	0.253	0.000527	0.002083
2	1094	Bronocice	B1	3	3100-2700	13-5	tibia	Juvenis	4.5		842	142	392214	837	817	1253	74	4756	176624	665	424	2.221	0.214	0.000362	0.001696
3	1096	Bronocice	B1	3	3100-2700	14	rib	Adultus	32.5	M	205	127	401440	330	412	1094	284	4135	170534	644	792	2.354	0.197	0.000316	0.001604
4	1101	Bronocice	A3	3	3100-2700	24	rib	Adultus	19	F	242	97	383286	485	649	1148	69	4544	166737	868	358	2.299	0.112	0.000253	0.002265
5	1102	Bronocice	B1	3	3100-2700	13-1	rib	Adultus	19	F	251	93	390447	249	623	1124	190	4410	164790	615	275	2.369	0.151	0.000238	0.001575
6	1103	Bronocice	B6	3	3100-2700	22	rib	Adultus	32.5	M	373	161	383745	365	629	1107	315	3961	169319	521	310	2.266	0.309	0.000420	0.001358
7	3006	Bronocice	B1	3	3100-2700	10	rib	Adultus	30	F	248	200	373753	632	472	820	1027	5264	180219	691	463	2.074	0.289	0.000535	0.001849
8	3007	Bronocice	Bd	3	3100-2700	21	rib	Juvenis	8.5		234	108	387793	282	478	833	160	3660	186608	788	359	2.078	0.137	0.000278	0.002032
9	3008	Bronocice	B1	3	3100-2700	13-2	rib	Juvenis	5		215	134	377394	69	435	1197	309	5160	179627	635	142	2.101	0.211	0.000355	0.001683
10	3009	Bronocice	B1	3	3100-2700	13-3	rib	Juvenis	10		174	52	384351	135	359	894	328	4264	183525	575	300	2.094	0.090	0.000135	0.001496
11	3010	Bronocice	B1	3	3100-2700	13-4	rib	Adultus	18	M	138	116	383142	55	436	1372	57	4768	174484	706	138	2.196	0.164	0.000303	0.001843
12	3011	Bronocice	B1	3	3100-2700	13-6	rib	Adultus	25	M	117	104	383083	67	397	1415	183	4755	177569	743	357	2.157	0.140	0.000271	0.001940
13	3012	Bronocice	B1	3	3100-2700	13-7	rib	Juvenis	3.5		126	189	384790	170	376	1206	94	5157	181882	810	314	2.116	0.223	0.000491	0.002105
14	3013	Bronocice	B1	3	3100-2700	13-10	rib	Juvenis	5		211	168	385387	179	591	1627	80	4811	187689	830	273	2.053	0.202	0.000436	0.002154
15	3014	Bronocice	B1	3	3100-2700	13-11	rib	Juvenis	0.6		153	296	381609	249	506	1256	373	4975	189204	967	332	2.017	0.306	0.000776	0.002534
16	3015	Bronocice	B1	3	3100-2700	13-12	rib	Juvenis	7.5		154	281	393622	53	497	1979	30	5338	188086	862	209	2.093	0.326	0.000714	0.002190
17	3016	Bronocice	B1	3	3100-27000	13-13	rib	Juvenis	15		139	103	413409	258	349	1790	264	4905	195841	778	965	2.111	0.132	0.000249	0.001882
18	3017	Bronocice	B1	3	3100-2700 13-14	13-14	rib	Juvenis	7		142	142	384368	102	503	1016	321	4905	186685	750	455	2.059	0.189	0.000369	0.001951
19	3018	Bronocice	B1	3	3100-2700	13-15	rib	Juvenis	8		158	198	416146	128	395	1873	133	5501	190250	854	271	2.187	0.232	0.000476	0.002052
20	3019	Bronocice	B1	3	3100-2700	13-16	rib	Juvenis	3		156	142	384307	164	449	942	110	4827	187996	649	253	2.044	0.219	0.000369	0.001689
21	3020	Bronocice	B1	3	3100-2700	13-17	rib	Juvenis	0.8		204	147	385960	527	436	1318	814	4527	183487	778	360	2.103	0.189	0.000381	0.002016
22	1095	Bronocice	C2	1	3650-3100	9	long bone	Adultus	35.9		253	89	400614	103	306	822	203	4024	170086	358	150	2.355	0.249	0.000222	0.000894
23	1097	Bronocice	C5	1	3650-3100	17	long bone	Senilis	50	M	426	78	410773	210	658	900	58	4405	170643	322	151	2.407	0.242	0.000190	0.000784
24	1098	Bronocice	C5	1	3650-3100	19	rib	Adultus	35.9	M	566	169	391679	519	572	757	1127	4207	165662	427	710	2.364	0.396	0.000431	0.001090
25	1099	Bronocice	C1	1	3650-3100	15	rib	Adultus	18	F	335	134	396770	304	541	763	54	3567	170863	433	218	2.322	0.310	0.000338	0.001091
26	1100	Bronocice	C2	1	3650-3100	5	long bone	Adultus	35.9		502	79	389861	169	540	806	454	3739	165197	333	178	2.360	0.237	0.000203	0.000854
27	3001	Bronocice	C2	1	3650-3100	4	femur	Adultus	35.9		247	51	390747	26	510	769	64	3466	178356	257	135	2.191	0.198	0.000131	0.000658
28	3002	Bronocice	C5	1	3650-3100	18	rib	Adultus	35	M	362	64	381970	282	361	740	90	4762	179264	305	166	2.131	0.210	0.000168	0.000798
29	3003	Bronocice	C5	1	3650-3100	20	rib	Adultus	35.9	F	293	75	395804	102	366	1042	13	4760	175384	331	159	2.257	0.227	0.000189	0.000836
30	1104	Bronocice	B1	4	2700-2400	11	rib	Senilis	50	M	261	119	385310	371	673	1175	372	5401	166961	543	635	2.308	0.219	0.000309	0.001409
31		Słonowice		4	2700-2400	2=3	rib				244	116	385542	122	155	967	86	4508	177049	308	108	2.178	0.377	0.000301	0.000799
32		Szarbia		4	2700-2400	3=8	rib	Matures	45	F	99	134	378262	545	154	911	360	5436	178901	548	673	2.114	0.245	0.000354	0.001449
33		Łękawa		4	2700-2400	3	rib	Adultus	25	M	269	118	384707	237	273	897	731	4628	175873	401	413	2.187	0.294	0.000307	0.001042
34		Wójeczka		4	2700-2400	1=1	rib				245	97	391969	637	346	866	303	4519	173094	406	642	2.264	0.239	0.000247	0.001036
35		Wójeczka		4	2700-2400	2=2	rib	Adultus	35.9	M	357	79	392500	128	261	768	226	4272	170181	296	126	2.306	0.267	0.000201	0.000754
36		Wójeczka		4	2700-2400	3=3	clavicle	Senilis	50	M	112	60	383744	19	236	801	172	4201	177545	331	220	2.161	0.181	0.000156	0.000863
37		Samborzec		4	2700-2400	19	rib				116	129	381520	415	140	968	72	4677	179334	350	268	2.127	0.369	0.000338	0.000917
38		Samborzec		4	2700-2400	21	rib	Senilis	60.9	M	124	105	380514	267	344	988	89	6206	177475	262	621	2.144	0.401	0.000276	0.000689
39		Samborzec		4	2700-2400	23	rib	Matures	45.9	F	68	160	392867	128	108	1213	164	4153	171106	367	181	2.296	0.436	0.000407	0.000934
40	3004	Bronocice	C2	2	3700-3650	6=1	rib	Adultus	30	M	128	112	398294	127	296	943	102	4510	184206	357	143	2.162	0.314	0.000281	0.000896
41	3005	Bronocice	C2	2	3700-3650	6=2	rib	Adultus	35	F	141	118	389314	151	253	1035	23	5120	177831	361	162	2.189	0.327	0.000303	0.000927
42		Słonowice		5	1700-1500	16=10	rib	Matures	45.9	M	128	232	383093	145	82	840	14	2820	179600	522	187	2.133	0.444	0.000606	0.001363
3		Słonowice		5	1700-1500	17=2	rib	Juvenis		M	38	202	383377	88	210	1121	14	2422	179409	740	155	2.137	0.273	0.000527	0.001930