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Robson, Harry Kenneth, Gron, Kurt Joseph, Gröcke, Darren R. et al. (2023) Carbon, nitrogen and sulphur isotope data of archaeological fish and mammal bone collagen from Lithuania. Data in Brief. 109065. ISSN: 2352-3409

https://doi.org/10.1016/j.dib.2023.109065

Data in Brief 48 (2023) 109065

Contents lists available at ScienceDirect

Data in Brief

journal homepage: www.elsevier.com/locate/dib

Data Article

Carbon, nitrogen and sulphur isotope data of archaeological fish and mammal bone collagen from Lithuania

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ARTICLE INFO

Article history:
Received 14 November 2022
Revised 8 March 2023
Accepted 10 March 2023
Available online 17 March 2023

Dataset link: Carbon, nitrogen and sulphur isotope data of archaeological fish and mammal bone collagen from Lithuania (Original data)

Keywords:
Stable isotope analysis
Bone collagen
Palaeodiet
Palaeoeconomy
Mesolithic
Subneolithic
Neolithic
Bronze age

ABSTRACT

Until relatively recently, stable sulphur isotope analysis of bone collagen was seldom undertaken in bioarchaeological research. With increasing frequency, its application has proven useful in reconstructing palaeodiets and palaeoecologies, as well as identifying potential migration and mobility patterns. Here, sulphur ($\delta^{34}S$) isotope analysis, together with carbon ($\delta^{13}C$) and nitrogen ($\delta^{15}N$), was performed on six fish and 34 mammal bone collagen samples from 14 prehistoric sites in Lithuania dating from the Late Mesolithic (*ca.* 7000–5000 cal BC) to the Late Bronze Age (*ca.* 1100–500 cal BC). We present the first $\delta^{34}S$ data from Lithuania, including coupled $\delta^{13}C$ and $\delta^{15}N$ data, offering a crucial dataset for future research to explore spatial and temporal variability in the region and beyond.

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https://doi.org/10.1016/j.dib.2023.109065

Specifications Table

Subject	Social Sciences - Archaeology
Specific subject area	Archaeology Bioarchaeology Stable isotope analysis Bone collagen Carbon Nitrogen Sulphur Palaeodiet Palaeoeconomy
Type of data	Table Figure
How data were acquired	Carbon, nitrogen and sulphur stable isotope measurements were obtained by Isotope Ratio Mass Spectrometry (IRMS). A Costech Elemental Analyser (ECS 4010) connected to a Thermo Scientific Delta V Advantage IRMS system was used to generate the δ^{13}C and δ^{15}N data. However, δ^{34}S data was generated using an IsoLink connected to a Thermo Scientific Delta V Plus IRMS.
Data format	Raw
Description of data collection	The bone samples were demineralised, and the collagen was extracted following a standard modified Longin method [1,2,3,4].
Data source location	Institution: Durham University City: Durham Country: United Kingdom Latitude and longitude for collected samples/data: Daktariškė 5 (55°47′54.82′’N, 22°23′15.68′’E), Donkalnis (55°48′26.95"N, 22°25′19.77"E), Kretuonas 1B (55°15′38.92"N, 26°5′58.18"E), Plinkaigalis (55°24′38.27"N, 23°38′48.67"E), Spiginas (55°46′3.93"N, 22°25′2.24"E), Šventoji 1 (56°1′1.92′’N, 21°5′21.85′’E), Šventoji 2 (56°0′53.75′’N, 21°5′10.22′’E), Šventoji 3 (56°0′57.18′’N, 21°5′13.20′’E), Šventoji 4 (56°0′53.23′’N, 21°5′5.87′’E), Šventoji 23 (56°0′1.68"N, 21°5′23.53"E), Šventoji 26 (56°0′8.08′’N, 21°5′27.29′’E), Šventoji 43 (55°58′50.43"N, 21°5′20.5"E), Turlojiškė (54°21′45.78"N, 23°18′3.47"E) and Žemaitiškė 2 (55°15′36.81′’N, 26°6′29.66′’E)
Data accessibility	This dataset is deposited in IsoArcH [5] (www.isoarch.eu) with the following Digital Object Identifier (DOI): https://doi.isoarch.eu/doi/2022.003 Data identification number: 10.48530/isoarch.2022.003 Data is available under the Creative Commons BY-NC-SA 4.0 license.

Value of the Data

- These data represent the first δ^{34}S values derived from prehistoric material from Lithuania, and can be utilised for future research to examine temporal and spatial variability in the region.
- These isotopic data will be useful to archaeologists, especially bioarchaeologists, examining palaeodiets and palaeoecologies dating to the Late Mesolithic, Subneolithic, Neolithic and Bronze Age throughout Europe.
- These data supplement the limited number of δ^{13}C and δ^{15}N data obtained previously from prehistoric fish bone collagen [see 6].
- These data can be compared with other data from prehistoric sites in Lithuania and beyond.

1. Objective

For more than 30 years, stable isotope analysis has been successfully employed in palaeodietary reconstructions. Its application to identify palaeomobility has, however, only recently gathered momentum. To determine the origin(s) of potential migrants and evaluate the extent of mobility amongst prehistoric communities in Lithuania, associated with the Comb Ware and Corded Ware cultures, the IZOMOB project (2020-2022) was launched. Sulphur (δ^{34}S), strontium (^{87}Sr/^{86}Sr) and oxygen (δ^{18}O) isotope analyses was undertaken on modern soil and water samples as well as a range of modern and prehistoric faunal and floral remains. This dataset is one output of that project.

2. Data Description

These data include carbon (δ^{13}C), nitrogen (δ^{15}N) and sulphur (δ^{34}S) stable isotope values extracted from fish and mammal bone samples. A number of taxa were sampled, including aurochs (*Bos primigenius*), domestic cattle (*Bos taurus*), common bream (*Abramis brama*), domestic dog (*Canis familiaris*), Eurasian beaver (*Castor fiber*), goat (*Capra* sp.), harp seal (*Pagophilus groenlandicus*), human (*Homo sapiens*), northern pike (*Esox lucius*) and wild boar (*Sus scrofa*), representing a range of behavioural life histories and habitat uses. The specimens date to the Late Mesolithic (*ca.* 7000–5000 cal BC), Subneolithic (*ca.* 5000–2900 cal BC), Neolithic (*ca.* 2900–1800 cal BC), Early Bronze Age (*ca.* 1800–1100 cal BC) and Late Bronze Age (*ca.* 1100–500 cal BC). The samples were derived from 14 prehistoric sites (i.e., Daktariškė 5, Donkalnis, Kretuonas 1B, Plinkaigalis, Spiginas, Šventoji 1, Šventoji 2, Šventoji 3, Šventoji 4, Šventoji 23, Šventoji 26, Šventoji 43, Turlojiškė and Žemaitiškė 2) in Lithuania (Fig. 1). The localities are represented by burial grounds, fishing stations, ritual depositions and settlement sites which have differing research histories. Excavations took place during the 20th and 21st centuries [see 6–11]. Samples were collected by one of us (GyP) and then submitted for isotopic analysis to the Stable Isotope

Fig. 1. Locations of the 14 prehistoric sites in Lithuania from where the samples were obtained.

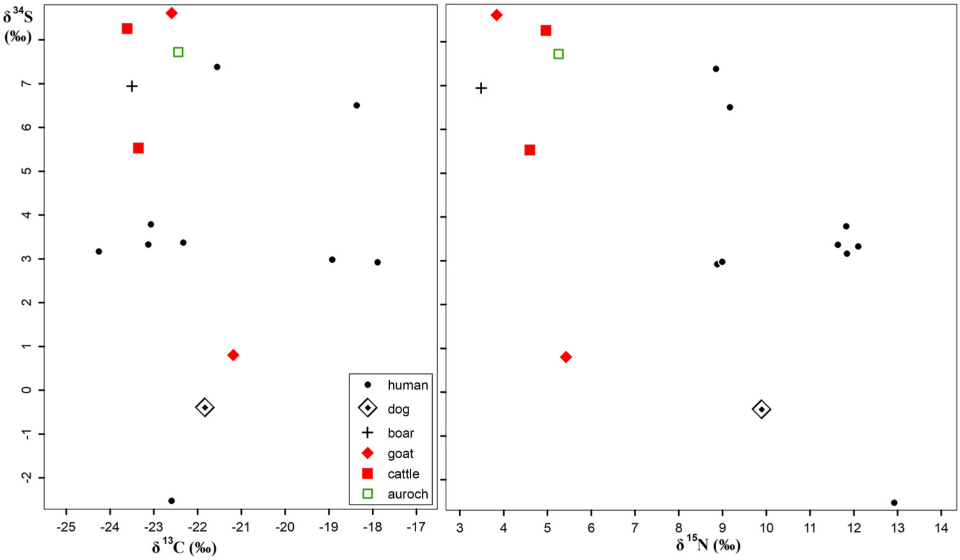

Fig. 2. Carbon (δ^{13}C), nitrogen (δ^{15}N) and sulphur (δ^{34}S) stable isotope data obtained on fish and mammal bone collagen.

Biogeochemistry Laboratory (SIBL), managed and operated by another one of us (DRG) in the Department of Earth Sciences, Durham University.

In total, 22 animal and 18 human bone samples were prepared for analysis. Of these, 27 produced sufficient quantities of well-preserved collagen for carbon and nitrogen stable isotope analysis, yielding atomic C:N ratios within the acceptable range of between 2.9 and 3.6 according to DeNiro [4]. A total of 16 samples yielded sufficient quantities of well-preserved collagen for sulphur stable isotope analysis, producing atomic C:S and N:S ratios within the acceptable ranges of between 600 ± 300 and 200 ± 100, respectively, according to Nehlich and Richards [12]. Four samples, however, yielded only enough collagen for a single sulphur measurement, consequently carbon and nitrogen stable isotope data from a previous study was utilised [8]. These data also yielded atomic C:N ratios which were within the acceptable range, indicating a low likelihood of diagenesis [4]. Stable isotope measurements were performed in the Stable Isotope Biogeochemistry Laboratory (SIBL) at Durham University using a Thermo IsoLink coupled to a Thermo Scientific Delta V Plus Advantage isotope ratio mass spectrometer. Sulphur isotope ratios are reported in standard delta (δ) notation in per mil (‰) relative to the VCDT scale. Correction of δ^{34}S was performed using four international standards (IAEA-S-1, IAEA-S-2, IAEA-S-3, NBS 127): this provided a linear range in δ^{34}S between -32.5‰ and +22.6‰. Analytical uncertainty of δ^{34}S is typically ±0.2‰ for replicate analyses of the international standards. Total sulphur is determined as part of the isotopic analysis (i.e., total peak area) using an internal standard, sulphanilamide (18.6196% sulphur). Further details on analytical procedures, standards and errors for carbon and nitrogen are reported in Walser *et al.* [13].

We obtained a grand total of 27 δ^{13}C and δ^{15}N values. In addition, 20 δ^{34}S values were obtained, making it the largest dataset of δ^{34}S values from prehistoric sites in Lithuania. The δ^{13}C and δ^{15}N values are plotted against the δ^{34}S values in Fig. 2. In Fig. 3 the dataset is compared with previously published data from Lithuania. Table 1 presents the data per sample, including sample number, site, grave number or individual, period, species or taxon, skeletal element, ontogentic age, context, excavation campaign and/or find number, %N, δ^{15}N, %C, δ^{13}C, %S, δ^{34}S, C:N, C:S and N:S. Summary statistics for the various groups and species or taxon are shown in Table 2. This dataset is deposited in IsoArcH [5] (www.isoarch.eu) with the following

Table 1

Fish and mammal bone samples and stable isotope data. Note that the data has been sorted alphabetically according to the site. Although the C:S ratio for one sample (HUM-08), a human humerus from Kretuonas 1B (Grave No. 3), was unacceptable according to the criteria defined by Nehlich and Richards [12], both the C:N and N:S ratios were within the acceptable ranges defined by DeNiro [4] and Nehlich and Richards [12]. As such, it was included here. Blank, no collagen preserved or no data. *, mean of stable isotope data from NAU and UOY [see 8]. **, stable isotope data from NAU only [see 8].

Sample no.	Site, grave no./individual	Period	Species or taxon	Skeletal element, ontogenetic age, context, excavation campaign, find no.	%N	δ^{15}N (‰)	%C	δ^{13}C (‰)	%S	δ^{34}S (‰)	Atomic C:N	Atomic C:S	Atomic N:S
AN-01	Daktariškė 5	Subneolithic	*Esox lucius*	Cleithrum, sin., 60-70 cm in length, 2016 year, No. 2557					0.3	-0.1			
AN-02	Daktariškė 5	Subneolithic-Early Bronze Age	*Canis familiaris*	Radius, sin.	14.29	9.89	40.08	-21.84	0.31	-0.39	3.27	350.64	107.22
AN-03	Daktariškė 5	Subneolithic-Early Bronze Age	*Capra* sp.	Mandible, sin., adult	13.60	3.84	38.29	-22.59	0.26	8.61	3.28	395.47	120.42
AN-04	Daktariškė 5	Subneolithic-Early Bronze Age	*Bos taurus*	Femur, sin.	14.67	4.61	41.69	-23.35	0.27	5.53	3.31	407.42	122.93
AN-05	Daktariškė 5	Subneolithic-Early Bronze Age	*Bos primigenius*	Metacarpus, sin., 2016 year, No. 1797	14.90	5.26	41.91	-22.44	0.25	7.72	3.28	443.83	135.29
AN-06	Daktariškė 5	Subneolithic	*Sus scrofa*	Mandible, 10 months-year, 2016 year, No. 569	10.58	3.49	32.32	-23.49	0.18	6.94	3.56	482.36	135.36
AN-07	Daktariškė 5	Subneolithic-Early Bronze Age	*Castor fiber*	Fibula, dex., young, 2016 year, No. 1172	13.79	3.69	38.31	-22.02			3.24		
HUM-04	Donkalnis, Grave No. 1	Subneolithic	*Homo sapiens*	Femur diaphysis, 20-25 year-old female	13.84	11.84	37.99	-24.26	0.20	3.17	3.20	502.10	156.81
HUM-05	Donkalnis, Grave No. 6	Subneolithic	*Homo sapiens*	Fibula diaphysis, 35-40 year-old female	15.48	11.63	42.13	-22.32	0.21	3.37	3.17	545.11	171.69
HUM-06	Donkalnis, Grave No. 7	Late Subneolithic	*Homo sapiens*	Fibula diaphysis, >45 year-old male	9.65	10.61	28.29	-21.74			3.42		
HUM-07	Donkalnis, 5th individual	Late Mesolithic	*Homo sapiens*	J245D, ∼7 year-old individual					0.21	4.18			
AN-08	Kretuonas 1B	Subneolithic-Neolithic	*Esox lucius*	Precaudal vertebra, 80-100 cm in length									
AN-09	Kretuonas 1B	Subneolithic-Neolithic	*Bos primigenius*	2nd phalanx									

(*continued on next page*)

Table 1 (*continued*)

Sample no.	Site, grave no./individual	Period	Species or taxon	Skeletal element, ontogenetic age, context, excavation campaign, find no.	%N	δ^{15}N (‰)	%C	δ^{13}C (‰)	%S	δ^{34}S (‰)	Atomic C:N	Atomic C:S	Atomic N:S
AN-10	Kretuonas 1B	Subneolithic-Neolithic	*Sus scrofa*	Astragalus, sin.	8.48	4.84	25.10	-23.31			3.45		
AN-11	Kretuonas 1B	Subneolithic-Neolithic	*Castor fiber*	Tibia, dex., young	12.41	3.29	36.85	-22.72			3.46		
AN-12	Kretuonas 1B	Subneolithic-Neolithic	*Cyprinidae,* cf. *Abramis brama*	1 x precaudal vertebra; 3 x caudal vertebrae									
HUM-08*	Kretuonas 1B, Grave No. 3	Subneolithic	*Homo sapiens*	Humerus diaphysis, 50-55 year-old male	13.90	11.80	38.70	-22.80	0.11	5.97	3.20	945.43	291.18
HUM-17	Plinkaigalis, Grave No. 241	Neolithic	*Homo sapiens*	Femoral distal epiphysis, 50-55 year-old female	10.36	8.85	29.24	-21.55	0.22	7.39	3.29	360.77	109.64
HUM-18	Plinkaigalis, Grave No. 242	Neolithic	*Homo sapiens*	Upper dex. molar (M2), root, >40 year-old female									
HUM-01	Spiginas, Grave No. 1	Subneolithic	*Homo sapiens*	Femur diaphysis, 35-45 year-old male	10.21	11.83	29.52	-23.07	0.18	3.79	3.37	429.74	127.39
HUM-02	Spiginas, Grave No. 3	Late Mesolithic	*Homo sapiens*	Fibula diaphysis, indeterminate female	14.84	12.10	41.96	-23.13	0.24	3.33	3.30	469.20	142.24
HUM-03	Spiginas, Grave No. 4	Late Mesolithic	*Homo sapiens*	30-35 year-old female	15.02	12.92	41.78	-22.59	0.22	-2.53	3.24	509.59	157.15
AN-16	Šventoji 1	Subneolithic-Neolithic	*Canis familiaris*	Mandible, 1968 year	12.62	14.46	35.89	-16.38			3.32		
AN-18	Šventoji 2	Subneolithic-Neolithic	*Sus scrofa*	Femur, sin., adult	14.03	4.47	40.43	-21.47			3.36		
AN-19	Šventoji 2	Subneolithic-Neolithic	*Castor fiber*	Femur, sin., young	14.37	4.02	41.32	-22.56			3.35		
AN-20	Šventoji 3	Subneolithic-Neolithic	*Pagophilus groenlandicus*	Os temporale, sin., adult, 1972 year	14.46	9.51	40.80	-23.33			3.29		
AN-14	Šventoji 4	Subneolithic	*Esox lucius*	Dentary, sin., 90-100 cm in length, 2014 year, No. 1514 (1038)									
AN-15	Šventoji 4	Subneolithic	*Abramis brama*	Preopercular, subopercular, opercular, 2014 year, No's. 1218-1227	12.50	7.92	36.83	-23.94			3.44		
AN-17	Šventoji 4	Subneolithic-Neolithic	*Bos primigenius*	Maxilla, 2003 year	13.68	5.01	38.21	-22.66			3.26		

(*continued on next page*)

Table 1 (*continued*)

Sample no.	Site, grave no./individual	Period	Species or taxon	Skeletal element, ontogenetic age, context, excavation campaign, find no.	%N	δ^{15}N (‰)	%C	δ^{13}C (‰)	%S	δ^{34}S (‰)	Atomic C:N	Atomic C:S	Atomic N:S
HUM-09	Šventoji 23, single bone No. 1	Subneolithic	*Homo sapiens*	13-18 year-old individual									
HUM-10	Šventoji 23, single bone No. 2	Subneolithic	*Homo sapiens*	20-30 year-old individual									
HUM-12	Šventoji 26, single bone No. 1	Subneolithic	*Homo sapiens*	Femur diaphysis									
HUM-11	Šventoji 43, single bone No. 2	Subneolithic	*Homo sapiens*	Lower dex. molar									
AN-21	Turlojiškė	Late Bronze Age	*Esox lucius*	Dentary, dex., 70-80 cm in length, 1998 year	14.28	12.56	40.38	-16.70			3.30		
AN-22	Turlojiškė	Late Bronze Age	*Capra* sp.	Humerus, dex., >11-13 months, 1998 year, IV, I trench, C-11	13.39	5.42	36.31	-21.18	0.29	0.80	3.16	339.97	107.52
HUM-13	Turlojiškė, Grave No. 3	Late Bronze Age	*Homo sapiens*	Ulna diaphysis, 25-30 year-old male	14.08	9.17	39.03	-18.36	0.25	6.51	3.23	410.15	126.83
HUM-14**	Turlojiškė, Grave No. 4	Late Bronze Age	*Homo sapiens*	20-25 year-old male	15.40	9.40	43.40	-16.90	0.25	6.99	3.30	466.07	141.81
HUM-15	Turlojiškė, Grave No. 5	Late Bronze Age	*Homo sapiens*	"IIv, 6 perk.", 1999 year	14.09	8.88	40.00	-17.88	0.28	2.92	3.31	377.44	114.00
HUM-16	Turlojiškė, Grave No. 6	Late Bronze Age	*Homo sapiens*	"II v, 7 perk.", 1999 year	13.05	9.00	37.55	-18.92	0.28	2.98	3.36	356.75	106.30
AN-13	Žemaitiškė 2	Early Bronze Age	*Bos taurus*	M2	12.99	4.97	36.44	-23.60	0.29	8.26	3.27	340.39	104.03

Table 2
Summary statistics for the various groups and species (or taxon). Note that the human data has been disaggregated according to site. Standard deviations have only been calculated for $N > 2$. Blank, no data.

Group	*N*	Mean δ^{13}C (‰)	Max δ^{13}C (‰)	Min δ^{13}C (‰)	Range δ^{13}C (‰)	N	Mean δ^{15}N (‰)	Max δ^{15}N (‰)	Min δ^{15}N (‰)	Range δ^{15}N (‰)	N	Mean δ^{34}S (‰)	Max δ^{34}S (‰)	Min δ^{34}S (‰)	Range δ^{34}S (‰)
Homo sapiens	12	-21.13	-16.90	-24.26	7.36	12	10.67	12.92	8.85	4.07	12	4.01	7.39	-2.53	9.92
Donkalnis	3	-22.77	-21.74	-24.26	2.52	3	11.36	11.84	10.61	1.23	3	3.57	4.18	3.17	1.01
Kretuonas 1B	1	-22.80				1	11.80				1	6.00			
Plinkaigalis	1	-21.55				1	8.85				1	7.39			
Spiginas	3	-22.93	-22.59	-23.07	0.48	3	12.28	12.92	11.83	1.09	3	1.53	3.79	-2.53	6.32
Turlojiškė	4	-18.02	-16.90	-18.92	2.02	4	9.11	9.40	8.88	0.52	4	4.85	6.99	2.92	4.07
Semi-aquatic herbivores	3	-22.07	-22.72	-22.02	-0.70	3	5.85	4.02	3.29	0.73					
Castor fiber	3	-22.22	-22.72	-22.02	-0.70	3	6.50	4.02	3.29	0.73					
Terrestrial herbivores	6	-21.98	-21.18	-23.60	2.42	6	6.09	5.42	3.84	1.58	5	6.31	8.61	0.80	7.81
Bos primigenius	2	-22.28	-22.44	-22.66	0.22	2	5.88	5.26	5.01	0.25	1	7.72			
Bos taurus	2	-22.99	-23.35	-23.60	0.25	2	4.31	4.97	4.61	0.37	2	7.11	8.26	5.53	2.73
Capra sp.	2	-21.98	-21.18	-22.59	1.41	2	6.09	5.42	3.84	1.58	2	6.31	8.61	0.80	7.81
Marine carnivores	1	-23.33				1	9.51								
Pagophilus groenlandicus	1	-23.33				1	9.51								
Freshwater fish	2	-21.00	-16.70	-23.94	7.24	2	8.28	12.56	7.92	4.64	1	-0.13			
Abramis brama	1	-23.94				1	7.92								
Esox lucius	1	-16.70				1	12.56				1	-0.13			
Omnivores	5	-22.29	-16.38	-23.49	7.11	5	5.83	14.46	3.49	10.97	2	5.68	6.94	-0.39	7.33
Canis familiaris	2	-22.74	-16.38	-21.84	5.46	2	5.42	14.46	9.89	4.57	1	-0.39			
Sus scrofa	3	-22.01	-21.47	-23.49	2.02	3	6.42	4.84	3.49	1.35	1	6.94			

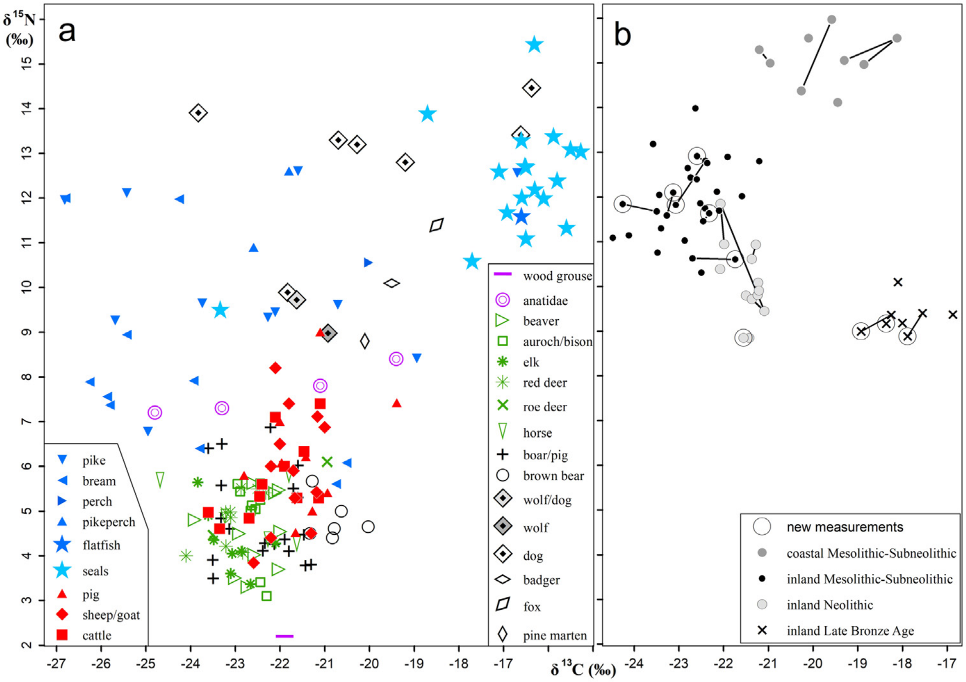

Fig. 3. Comparison of the carbon (δ^{13}C) and nitrogen (δ^{15}N) stable isotope data for fauna (a) and humans (b) obtained with previously published data from Lithuania [6,8,9,16]. Connecting lines, measurements made on different skeletal elements of the same individual. This variation likely reflects differences in the bone turnover rates between skeletal elements rather than inter-instrument variation between institutions [see 17].

Digital Object Identifier (DOI): https://doi.isoarch.eu/doi/2022.003; data identification number: 10.48530/isoarch.2022.003; data is available under the Creative Commons BY-NC-SA 4.0 license.

The humans (n = 12) had a broad range of δ^{13}C (-24.3‰ to -16.9‰), δ^{15}N (+8.9‰ to +12.9‰) and δ^{34}S (-2.5‰ to +7.4‰) values. There were two groups with one indicating the consumption of freshwater derived protein and the other demonstrating the consumption of C_4 foodstuffs, including millet [see 8], agreeing with their chronological affiliation (i.e., hunter-gatherer-fishers in the former and agriculturalists in the latter). Since all human δ^{34}S values were below +10.0‰, which is considered a minimum for the impacts of the sea spray affect [see 18], they indicate inland residency. This is perhaps not unexpected since the site closest to the coast yielding δ^{34}S values was 86 km away (i.e., Donkalnis), while the impacts of the sea spray affect are known up to *ca.* 30 km inland [18].

The semi-aquatic herbivores (n = 3), namely the Eurasian beaver, had a narrow range of δ^{13}C (-22.7‰ to -22.0‰) and δ^{15}N (+3.3‰ to +4.0‰) values, agreeing with their habitat use.

Similarly, the terrestrial herbivores (n = 6), including aurochs, domestic cattle and goat, had a narrow range of δ^{13}C (-23.6‰ to -21.2‰) and δ^{15}N (+3.8‰ to +5.4‰) values, though variable δ^{34}S (n = 5; +0.8‰ to +8.6‰) values. Despite this, taken together these data indicate that they were living in somewhat similar environments unaffected by the canopy effect [19] and/or a contribution of sea spray. Similarly, the site nearest the coast yielding δ^{34}S values was some 84 km away (i.e. Daktariškė 5).

The one marine carnivore in the dataset, a harp seal from Šventoji 3, had a δ^{13}C value of -23.3‰ and a δ^{15}N value of +9.5‰. These data indicate residency in a ^{13}C-enriched environment such as the Šventoji Palaeolake directly in front of the site or the nearby Baltic Sea [see 14,15].

Several common bream remains from Šventoji 4 were combined to ensure that enough collagen could be extracted for stable isotope analysis. The δ^{13}C (-23.9‰) and δ^{15}N (+7.9‰) values indicate residency in a similar environment to the harp seal from Šventoji 3. In contrast, a northern pike dentary from the wetland site of Turlojiškė had a δ^{13}C value of -16.7‰ and a δ^{15}N value of +12.6‰, which despite being notably higher than the common bream, indicated freshwater residency [see 20]. Only one fish bone, a northern pike cleithrum from Daktariškė 5, yielded sufficient quantities of collagen for a single sulphur measurement (-0.1‰), which likewise demonstrated residency in a freshwater environment.

While the two dog bones had divergent δ^{13}C (-21.8‰ and -16.4‰) and δ^{15}N values (+9.9‰ and +14.5‰), it is possible that both either consumed resources from a freshwater environment or perhaps from a fresh water in the case of the former, and an intermediary waterbody enriched in ^{13}C, such as the Baltic Sea [14,15], in the latter. The one sulphur measurement (-0.4‰) obtained from a dog from Daktariškė 5 demonstrated inland residency.

The wild boars ($n = 3$) had a narrow range of δ^{13}C (-23.5‰ to -21.5‰) and δ^{15}N (+3.5‰ to +4.8‰) values. Despite being derived from three different sites (i.e., Daktariškė 5, Kretuonas 1B and Šventoji 2), these data indicate little omnivory. The single sulphur measurement (+6.9‰) demonstrated inland residency.

3. Experimental Design, Materials and Methods

A range of species (or taxa) from each assemblage were selected for analysis. This ensured that the same individual was not sampled more than once. With regards to the human bone samples, all individuals were derived from different burials or in the case of the loose human bones from Šventoji 23 were clearly separated by ontogenetic age (Table 1).

The specimens were cleaned of obvious surface contamination using a diamond-tipped dental burr. Then, the samples were demineralised, and the collagen was extracted following a standard modified Longin method [1–4]. Stable isotope measurements were performed in the Stable Isotope Biogeochemistry Laboratory (SIBL) at Durham University — the analytical methods are described in more detail in Gröcke *et al.* [21].

Ethics Statements

This study does not involve any modern human or animal subject.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships which have or could be perceived to have influenced the data reported in this article.

Data availability

Carbon, nitrogen and sulphur isotope data of archaeological fish and mammal bone collagen from Lithuania (Original data) (IsoArcH)

CRediT Author Statement

Harry K. Robson: Conceptualization, Formal analysis, Investigation, Data curation, Writing – original draft, Writing – review & editing, Visualization, Project administration; **Kurt J. Gron:** Formal analysis, Investigation, Writing – review & editing; **Darren R. Gröcke:** Formal analysis, Investigation, Writing – review & editing; **Giedrė Piličiauskienė:** Resources, Writing – review & editing; **Gytis Piličiauskas:** Conceptualization, Resources, Writing – review & editing, Visualization.

Acknowledgment

We thank the Leverhulme Trust (Grant RPG-2016-081) for support during aspects of this research.

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