Data Article

Stable isotope data and radiocarbon dates from Brazilian bioarchaeological samples: An extensive compilation

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\textbf{A B S T R A C T}

Three decades have passed since the publication in 1991 of the first use of stable isotope analysis applied to a Brazilian archaeological context. Despite being still mainly applied to palaeodiетary research, stable isotope analysis in archaeology has been diversified in Brazil. In the last five years, an increasing number of studies has addressed various issues. Such issues are related to population mobility, social differentiation, health and children care, changes and resilience of cultural practices, and identification of the origin of enslaved populations brought by force from the African continent, among others. However, research in this area is still incipient when compared to the large territory of Brazil (WGS 84: -33° to 5°N, -73° to -34°E), the diversity of socio-cultural contexts of pre-colonial and indigenous societies, and the country's historical formation process. In terms of radiocarbon dates, data are also sparse and lack essential information as the material used for dating, as this information could be related to necessary corrections, e.g., the marine
reservoir effect. The first radiocarbon dates of Brazilian archaeological material are reported, however, since the 1950s and have been more frequently reported in publications across Brazil since the installation of the first Brazilian radiocarbon laboratory (CENA/USP) in 1990 and the first Latin American 14C-AMS facility (LAC-UFF) in 2012. Thus, the purpose of this compilation was to gather all dispersed, and often fragmented, data from analyses of stable and radioactive (focusing on radiocarbon) isotopes carried out in Brazilian archaeological contexts. We compiled data from 1991 until the end of November 2021. The data included here contain information from 71 archaeological sites, 556 humans, 219 animals, and 2 plants. Isotopic analyses were performed on 832 organic samples, mainly paired δ13C and δ15N plus δ34S measurements, and on 265 mineral samples, mainly δ13C, δ18O and 87Sr/86Sr measurements. Sr concentrations for 49 mineral samples were also compiled. Radiocarbon or relative dates span from 18 kyr BP to the present. All data from this compilation are deposited in open access on the IsoArcH platform [https://doi.isoarch.eu/doi/2021.005]. This extensive work aims to point out the gaps in stable isotopes and radiocarbon dates provided for Brazilian archaeological contexts that could be further explored. Besides, it aims to promote easy access to numerous analyses that, otherwise, would be hard to obtain. Lastly, it seeks to broaden the interdiscipli-
ary collaboration in Brazil and strengthen the international collaboration among peers.

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Specifications Table

| Subject              | Archaeology                  |
|----------------------|-----------------------------|
| Specific subject area| Bioarchaeology              |
|                      | Biomolecular archaeology     |
|                      | Stable isotope analysis      |
|                      | Radiocarbon dating           |
| Type of data         | Table 1 – Summary of all the sites compiled in this dataset including IsoArcH Platform ID, names and references of the primary data (in brackets), Geographic localization with the Brazilian State and coordinates (latitudes and longitudes in WGS 84), Relative Age with the lower and the upper limits and age system, and number of samples (Human, Animal, Plant). Site ID corresponds to number shown on the map of Figure 1.|
| How data were acquired| Figure 1 – Map showing all archaeological sites included in this dataset. A key to the sites IDs is provided in Table 1 as Site ID. Data were collected from international, regional, and local journal articles, book chapters, research reports, master dissertations, and doctoral thesis, released between 1991 and the end of November 2021. Access to the literature was primarily through digital repositories. The language of most of the studies is Brazilian Portuguese.]|
| Data format          | Raw                         |
| Parameters for data collection | This compilation includes all data that are reported with the individual references and isotopic and/or radioactive values of each sample. |

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### Description of data collection

A systematic literature review was conducted using Google Scholar, the Brazilian repository of scientific articles Scielo (https://www.scielo.br/), the Brazilian repository of researchers CV Plataforma Lattes (https://lattes.cnpq.br/), and each different repository of masters dissertations and doctoral thesis of each Brazilian university with graduate programs in archaeology. In addition, we conducted personal communication with researchers and university library staff asking for works deposited only in their personal and/or institutional libraries, obtaining manuscripts inaccessible otherwise. Works published until 24 November 2021 are included in this compilation.

### Data source location

This dataset contains information on stable isotope analyses and/or radiocarbon dates from 71 archaeological sites, 777 individuals, 556 humans, 219 animals and 2 plants; data contain 1097 isotope analyses, 832 were organic samples, mainly C, N and S measurements, and for 265 mineral samples, mainly C, O and Sr measurements, from present day Brazil (WGS 84: -33° to 5°N, -73° to -34°E). Samples have radiocarbon or relative dates showing a chronology between 18 kyr BP and nowadays.

### Data accessibility

Repository: IsoArch (https://isearch.eu/) [1]
DOI of the dataset: 10.48530/isoarch.2021005
Direct URL of the dataset: https://doi.org/10.48530/isoarch.2021005

Data is available under the Creative Commons BY-NC-SA 4.0 license.

### Value of the Data

- Until the present date, no one has done a compilation of these stable isotopes and radioactive analyses in the context of Brazilian archaeology. We compiled data from 1991 until the end of November 2021.
- The purpose of this compilation was to gather all dispersed, and often fragmented, data from analyses of stable and radioactive (focusing on radiocarbon) isotopes carried out in Brazilian archaeological contexts.
- The present compilation brings together all data on stable isotopes and radiocarbon dates on bioarchaeological samples scattered in the country published in different supports.
- Most of the compiled data in this dataset are difficult to be accessed because they have not been published in peer-review journals, as they comprise master dissertations, doctoral thesis, and research reports. When published in articles, these data appear in local journals, often limiting the reading by non-Brazilian Portuguese readers.
- This dataset will turn these data more accessible to the academic community. By this compilation, the scientific community will get easier access to stable and radioactive isotope data on bioarchaeological samples from Brazil.

### 1. Data Description

The dataset includes data from 71 archaeological sites, 777 individuals, 556 humans, 219 animals and 2 plants from all over Brazil (Fig. 1 and Table 1). In total, isotopic analyses are reported for 832 organic samples, mainly paired $\delta^{13}C$ and $\delta^{15}N$ plus $\delta^{34}S$ measurements, and for 265 mineral samples, mainly $\delta^{13}C$, $\delta^{18}O$ and $^{86}Sr/^{87}Sr$ measurements. Collagen quality criteria (collagen yield, carbon and nitrogen contents, and atomic carbon-to-nitrogen ratio) were included when available. Sr concentrations for 49 mineral samples were also compiled when reported. Samples date from 18 kyr BP to nowadays. Data are made available in IsoArch (https://doi.isearch.eu/doi/2021.005.), an open-access and collaborative isotope database for bioarchaeological samples (https://isearch.eu/) [1].
Fig. 1. – Map showing all archaeological sites included in this dataset. A key to the sites IDs is provided in Table 1 as Site ID.

All primary data sources compiled in this dataset are listed in Table 1. The bibliographical references of the primary data sources, for each archaeological site, are refer in brackets on the column Site Name in Table 1 and in extensive form in the References. The geographical position of all archaeological sites where the data originated from are shown in Fig. 1 and Table 1.

In IsoArcH, data are organized in Excel sheets by the level of the information, from the archaeological site itself to the individual samples from this location. Geographical and bib-
Table 1
Summary of all the sites compiled in this dataset including IsoArcH Platform ID, names and references of the primary data (in brackets), Geographic localization with the Brazilian State and coordinates (latitudes and longitudes in WGS 84), Relative Age with the lower and the upper limits and age system, and number of samples (Human, Animal, Plant). Site ID corresponds to number shown on the map of Figure 1.

| IsoArcH platform ID | Site ID | Site Name [Reference]                  | Brazilian State | Latitude (WGS 84) | Longitude (WGS 84) | Relative Age | Age System | Total number of analyzed specimens |
|---------------------|---------|----------------------------------------|-----------------|------------------|-------------------|-------------|------------|-----------------------------------|
|                     |         |                                        |                 | Lower Limit      | Upper Limit       |             |            | Human    | Animal | Plant |
| 1                   | 50      | Armação do Sul [4–6]                   | Santa Catarina  | -27.75089        | -48.502028        | 3065        | 1275       | cal BP   | 48     | 18    |
| 2                   | 34      | Capelinha 1 [7,8]                      | São Paulo       | -24.83575        | -48.243917        | 10180       | 6850       | cal BP   | 1      | 1     |
| 3                   | 66      | Pontal da Barra - PSG-07 [9–11]        | Rio Grande do Sul | -31.77954        | -52.234708        | 2027        | 1016       | cal BP   | 1      | 10    |
| 4                   | 35      | Forte Marechal Luz [12–15]            | Santa Catarina  | -26.16642        | -48.529331        | 1178        | 739        | cal BP   | 32     | 5     |
| 5                   | 48      | Praia da Tapera [5,6,14,15]            | Santa Catarina  | -27.68625        | -48.571667        | 1280        | 935        | cal BP   | 44     | 9     |
| 6                   | 32      | Moraes [7,16]                          | São Paulo       | -24.27407        | -47.394661        | 6775        | 4887       | cal BP   | 21     | 17    |
| 7                   | 31      | Piaçaguera [16]                        | São Paulo       | -23.86211        | -46.3622          | 5894        | 5314       | cal BP   | 13     | 3     |
| 8                   | 64      | Jabuticabeira II [16–19]               | Santa Catarina  | -28.59028        | -48.960083        | 3137        | 1524       | cal BP   | 79     | 7     |
| 9                   | 63      | Galheta IV [16]                        | Santa Catarina  | -28.56649        | -48.788581        | 2010        | 2014       | BC/AD    | 7      | 13    |
| 10                  | 43      | Porto Rio Vermelho I - SC-PRV-01 [4,5] | Santa Catarina  | -27.52283        | -48.423078        | 4950        | 3652       | cal BP   | 1      |       |
| 11                  | 47      | Canto da Lagoa I - SC-CL-01 [4,5]      | Santa Catarina  | -27.61189        | -48.479757        | 1535        | 1140       | cal BP   | 1      |       |
| 12                  | 44      | Porto do Rio Vermelho II - SC-PRV-02   | Santa Catarina  | -27.5234         | -48.423717        | 1826        | 994        | cal BP   | 16     | 18    |
| 13                  | 49      | Alfredo Wager - Alto Jararaca [4,5]    | Santa Catarina  | -27.69597        | -49.332072        | 1700        | 1550       | cal BP   | 1      |       |
| 14                  | 40      | Ribeirão da Herta - SC-VI-16 [4,5]     | Santa Catarina  | -26.70293        | -49.302214        | 1310        | 1280       | cal BP   | 1      |       |
| 15                  | 53      | São Joaquim - SC-RA-01                 | Santa Catarina  | -28.29249        | -49.937575        | 1270        | 1169       | cal BP   | 1      |       |
| 16                  | 54      | São Joaquim - SC-RA-03                 | Santa Catarina  | -28.29249        | -49.937575        | 1268        | 1159       | cal BP   | 1      |       |
| 17                  | 55      | São Joaquim - SJ-04 [4,5]              | Santa Catarina  | -28.29249        | -49.937575        | 1305        | 1157       | cal BP   | 1      |       |
| 18                  | 56      | São Joaquim - SC-RA-05 [4,5]           | Santa Catarina  | -28.29249        | -49.937575        | 1305        | 1270       | cal BP   | 1      |       |
| 19                  | 57      | São Joaquim - SC-RA-06 [4,5]           | Santa Catarina  | -28.29249        | -49.937575        | 1267        | 1157       | cal BP   | 1      |       |
| 20                  | 51      | Urubici [4,5]                          | Santa Catarina  | -28.00713        | -49.589467        | 1830        | 1710       | cal BP   | 1      |       |

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| IsoArcH platform ID | Site ID | Site Name [Reference] | Brazilian State | Latitude (WGS 84) | Longitude (WGS 84) | Lower Limit | Upper Limit | Age System | Human | Animal | Plant |
|---------------------|---------|-----------------------|----------------|------------------|-------------------|-------------|-------------|------------|-------|--------|-------|
| 21                  | 60      | Caieira [5, 18]       | Santa Catarina  | 28.4501          | -48.771661        | 3731        | 515         | cal BP     | 10    |        |       |
| 22                  | 61      | Carniça [5, 18]       | Santa Catarina  | 28.53999         | -48.810836        | 3971        | 2153        | cal BP     | 7     |        |       |
| 23                  | 62      | Congonhas [5, 18]     | Santa Catarina  | 28.56612         | -49.000269        | 3727        | 3179        | cal BP     | 9     |        |       |
| 24                  | 52      | Imbituba - Vila Nova [5] | Santa Catarina  | 28.26242         | -48.690056        | 8000        | 1000        | cal BP     | 1     |        |       |
| 25                  | 65      | Garopaba [5]          | Santa Catarina  | 28.62514         | -48.892356        | 8000        | 1000        | cal BP     | 1     |        |       |
| 26                  | 58      | Imaruí [5]            | Santa Catarina  | 28.363           | -48.793667        | 8000        | 1000        | cal BP     | 1     |        |       |
| 27                  | 46      | Pontal das Almas [5]  | Santa Catarina  | 27.59539         | -48.459222        | 8000        | 1000        | cal BP     | 15    |        |       |
| 28                  | 45      | Rio Lessa [5]         | Santa Catarina  | 27.57742         | -48.519167        | 8000        | 1000        | cal BP     | 4     |        |       |
| 29                  | 42      | Porto Belo - Praia do Embrucho [5] | Santa Catarina  | 27.14675         | -48.459222        | 8000        | 1000        | cal BP     | 1     |        |       |
| 30                  | 41      | Laranjeiras [5]       | Santa Catarina  | 26.99722         | -48.590861        | 8000        | 1000        | cal BP     | 1     |        |       |
| 31                  | 39      | Morro do Ouro [5, 20] | Santa Catarina  | 26.31463         | -48.828           | 4824        | 4101        | cal BP     | 26    |        |       |
| 32                  | 36      | Enseada [5]           | Santa Catarina  | 26.23331         | -48.498972        | 4514        | 1178        | cal BP     | 17    |        |       |
| 33                  | 38      | Espinheiro [5, 21]    | Santa Catarina  | 26.28761         | -48.798611        | 3337        | 933         | cal BP     | 4     |        |       |
| 34                  | 59      | Cabeçuda [18, 22]     | Santa Catarina  | 28.4395          | -48.82975         | 5079        | 3972        | cal BP     | 5     |        |       |
| 35                  | 29      | Sernambetiba [18, 23] | Rio de Janeiro  | 22.66639         | -43.004139        | 1571        | 1748        | cal BP     | 6     |        |       |
| 36                  | 37      | Rio Comprido [20]     | Santa Catarina  | 26.25729         | -48.807511        | 3835        | 3640        | cal BP     | 16    |        |       |
| 37                  | 25      | Lapa do Santo [24, 25] | Minas Gerais    | 19.50405         | -44.03045         | 9889        | 9540        | cal BP     | 25    | 8      |       |
| 38                  | 26      | Lapa das Boleiras [24] | Minas Gerais    | 19.52056         | -44.068228        | 9540        | 9030        | cal BP     | 2     |        |       |
| 39                  | 22      | Santana do Riacho [24] | Minas Gerais    | 19.17381         | -43.694306        | 10000       | 1           | cal BP     | 1     |        | 18    |
| 40                  | 24      | Cuvieri [24]          | Minas Gerais    | 19.47849         | -44.010025        | 6186        | 1           | cal BP     | 1     |        | 18    |

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| IsoArcH platform ID | Site ID | Site Name [Reference] | Brazilian State | Latitude (WGS 84) | Longitude (WGS 84) | Relative Age | Total number of analyzed specimens |
|---------------------|--------|-----------------------|-----------------|-------------------|-------------------|--------------|-----------------------------------|
| 41                  | 16     | Lapa do Boquete [24]  | Minas Gerais    | −15.10219         | −44.223167        | 8000         | 6                                  |
| 42                  | 18     | Abrigo Malhador [24]  | Minas Gerais    | −15.13814         | −44.253667        | 898          | 8                                  |
| 43                  | 17     | Lapa dos Bichos [24]  | Minas Gerais    | −15.13396         | −44.247711        | 11650        | 5                                  |
| 44                  | 1      | Gruta das Caretas [26]| Amapá           | −0.076103         | −51.511506        | 80           | 21                                |
| 45                  | 2      | Gruta do Pocinho [26] | Amapá           | −0.2094444        | −51.4686          | 676          | 15                                |
| 46                  | 3      | Marajoara complex [2,26]| Pará            | −0.716667         | −48.523333        | 1600         | 8                                  |
| 47                  | 33     | Estreito [7]          | Paraná          | −24.67425         | −48.856628        | 4011         | 2                                  |
| 48                  | 30     | Pretos Novos cemetery [14,27,28]| Rio de Janeiro| −22.896          | −43.192944        | 1769         | 3                                  |
| 49                  | 15     | Catedral da Sé de Salvador – Churchyard [14,28]| Bahia           | −12.97328         | −38.511806        | 1550         | 12                                |
| 50                  | 4      | Marajó [2,26]         | Pará            | −0.966667         | −49.566667        | 400          | 2                                  |
| 51                  | 7      | Bacanga [29,30]       | Maranhão        | −2.57877          | −44.2818934       | 1840         | 1                                  |
| 52                  | 5      | Paço do Lumiar [29,30]| Maranhão        | −2.493647         | −44.1107695       | 1190         | 1                                  |
| 53                  | 6      | Panaquatira [29,30]   | Maranhão        | −2.530786         | −44.0418751       | 1800         | 3                                  |
| 54                  | 67     | Pontal da Barra - PSG-01 [10,11]| Rio Grande do Sul| −31.77954       | −52.234708        | 1790         | 23                                |
| 55                  | 68     | Pontal da Barra - PSG-02 [10,11]| Rio Grande do Sul| −31.77954       | −52.234708        | 1816         | 5                                  |
| 56                  | 69     | Pontal da Barra - PSG-03 [10,11]| Rio Grande do Sul| −31.77954       | −52.234708        | 1403         | 8                                  |
| 57                  | 70     | Pontal da Barra - PSG-06 [10,11]| Rio Grande do Sul| −31.77954       | −52.234708        | 1575         | 1                                  |
| 58                  | 71     | Lagoa do Fragata - PSGLF-02| Rio Grande do Sul| −31.79306       | −52.3855278       | 2027         | 9                                  |
| 59                  | 12     | Pedra do Cachorro [31–34]| Pernambuco       | −8.575423         | −37.2467146       | 3967         | 3                                  |
| 60                  | 10     | Pedra do Tubarão - Cemitério do Caboclo [31]| Pernambuco       | −8.539167         | −36.8022222       | 1054         | 3                                  |

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Table 1 (continued)

| IsoArch platform ID | Site ID | Site Name [Reference] | Brazilian State | Latitude (WGS 84) | Longitude (WGS 84) | Relative Age | Total number of analyzed specimens |
|---------------------|---------|-----------------------|-----------------|-------------------|-------------------|--------------|-----------------------------------|
|                     |         |                       |                 |                   |                   | Lower Limit  | Upper Limit | Age System | Human | Animal | Plant |
| 61                  | 11      | Alcobaça [31]          | Pernambuco      | –8.54             | –37.1941667       | 958          | 798         | cal BP     | 1     |        |       |
| 62                  | 9       | Toca da Baixa dos Caboclos [3,35–37] | Piauí        | –8.45             | –42.0841667       | 524          | 1           | cal BP     | 4     |        |       |
| 63                  | 14      | Toca do Serrote do Tenente Luis [35–37] | Piauí    | –8.814405         | –42.4200562       | 915          | 304         | cal BP     | 2     |        |       |
| 64                  | 13      | Toca do Gongo I [35–37] | Piauí        | –8.653291         | –42.5303727       | 2000         | 2000        | BP         | 2     |        |       |
| 65                  | 19      | Buritizeiros [38,39]   | Minas Gerais   | –17.35885         | –44.9656645       | 7000         | 6000        | BP         | 1     |        |       |
| 66                  | 20      | Santana do Riacho I [38,40] | Minas Gerais | –19.16859         | –43.6920965       | 10000        | 8000        | BP         | 5     |        |       |
| 67                  | 21      | Santana do Riacho III [38,40] | Minas Gerais | –19.16859         | –43.6920965       | 3000         | 2000        | BP         | 2     |        |       |
| 68                  | 8       | São Miguel do Tapuio [38] | Piauí        | –5.60482          | –41.3798965       | 2500         | 2000        | BP         | 1     |        |       |
| 69                  | 23      | Botocudos – Mutum [41] | Espírito Santo | –19.28058         | –40.9018158       | 1663         | 1954        | BC/AD      | 1     |        |       |
| 70                  | 27      | Botocudos - Rio Doce [41] | Minas Gerais | –19.64434         | –42.4868145       | 1464         | 1802        | BC/AD      | 2     |        |       |
| 71                  | 28      | Botocudos - Cachoeiro de Itapemirim [41] | Espírito Santo | –20.82703         | –41.1269521       | 1668         | 1954        | BC/AD      | 1     |        |       |
hiographical information of the archaeological sites is compiled. Also, information about the archaeological context of the samples is detailed like chronology, funerary patterns and bioarchaeological attributes like sex, age, stature, and others. For the samples themselves, the description is very detailed with information about the sampled skeletal part, bone level preservation, taphonomy features, etc. In the last sheets all the descriptions and results of the measurements are assembled. The all-compiled data is easily accessible, visualized and downloaded through the platform website. All the variables which appear in the dataset are explained in a detailed way in the IsoArch platform (https://isoarch.eu) [1].

We intend to update the Brazilian isotopic database in IsoArch gradually as the new publications releases. The IsoArch platform is a dynamic repository and new data can be added without any problem.

2. Experimental Design, Materials and Methods

Most of the data compiled here have not been published in peer-review, as they comprise master dissertations, doctoral thesis, and research reports. When published in articles in local journals, they are often limiting the reading by non-Brazilian Portuguese readers. On the other hand, peer-reviewed articles in English are also hard access for Brazilian researchers or Brazilian-Portuguese readers.

Data were carefully curated through a systematic literature review. The platforms and repositories used included Google Scholar, the Brazilian repository of scientific articles Scielo (https://www.scielo.br/), the Brazilian repository of researchers CV Plataforma Lattes (https://lattes.cnpq.br/), and each different repository of masters and doctoral dissertations or thesis of each Brazilian university with graduate and postgraduate programs in archaeology. In addition, we conducted personal communication with researchers and university library staff asking for works deposit only in their personal and/or institutional libraries, obtaining manuscripts inaccessible otherwise.

This compilation was carried out by gathering data from 33 publications that reported stable isotopes and/or radiocarbon data for archaeological contexts in Brazil between 1991 and 24 November 2021. Such works consist of:

- Peer-reviewed papers published in English in international scientific journals,
- Peer-reviewed papers published in Portuguese in Brazilian or international scientific journals,
- Non-peer-reviewed manuscripts available in special editions of Brazilian scientific journals,
- Book chapters,
- Research and technical reports in Portuguese, Spanish or English,
- Master dissertations in Archaeology written in Portuguese, and
- Doctoral thesis in Archaeology written in Portuguese, English or other languages.

These works were accessed or obtained through:

- Google Scholar (https://scholar.google.com/),
- A Brazilian repository of scientific articles named Scielo (https://www.scielo.br/),
- The Brazilian repository of researcher’s CVs, named Plataforma Lattes (https://lattes.cnpq.br/),
- Digital repositories of dissertations and thesis from Brazilian universities with graduate and postgraduate programs in Archaeology,
- Personal communication with universities libraries staff who has publications in their institutional libraries.
- Personal communication with researchers who has publications in their personal libraries.

Samples used to perform isotopic analyses in Brazilian Archaeology are mostly from human skeleton fragments. However, the reported isotopic data are, in most of the cases, not accompanied by a bioarchaeological and funerary description of the individuals. Such insufficiency of information limits the accurate archaeological interpretation of the isotopic data.
Unfortunately, some do not include tables with summarized data. Instead, data are reported on graphs or charts, where one could get a glimpse of the available data. We include one work of this type in the references [42], however, we decided not to include it in the presented dataset.

Ethics Statement

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

CReDiT Author Statement

Caroline Borges: Investigation, Conceptualization, Methodology, Data Curation, Writing–original draft preparation, Reviewing & editing; Ingrid Chanca: Conceptualization, Writing – original draft preparation, Reviewing & editing; Kevin Salesse: Conceptualization, Data Curation, Visualization, Writing – review & editing

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 work reported in this article.

Data Availability

Stable and radiogenic isotope data from Brazilian bioarchaeological samples: a synthesis (Original data) (IsoArcH).

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