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Soil macrofauna communities in Brazilian land use systems

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Abstract

Background

Soil animal communities include more than 40 higher-order taxa, representing over 23% of all described species. These animals have a wide range of feeding sources and contribute to several important soil functions and ecosystem services. Although many studies have assessed macroinvertebrate communities in Brazil, few of them have been published in journals, and even fewer have made the data openly available for consultation and further use. As part of ongoing efforts to synthesize the global soil macrofauna communities, and to increase the amount of openly accessible data in GBIF and other repositories related to soil biodiversity, the present paper provides links to 29 soil macroinvertebrate datasets covering 42 soil fauna taxa, collected in various land use systems in Brazil. A total of 82,797 georeferenced occurrences of these taxa are presented, based on quantitative estimates performed using a standardized sampling method commonly adopted worldwide to collect soil macrofauna populations, i.e., the TSBF (Tropical Soil Biology and Fertility Programme) protocol. This consists in digging soil monoliths of 25 x 25 cm area, with hand-sorting of the macroinvertebrates visible to the naked eye from the surface litter and from within the soil at depths of 10 to 40 cm). The land use systems included anthropogenic sites managed with agricultural systems (e.g., pastures, annual and perennial crops, agroforestry), as well as planted forests, and native vegetation located mostly in the Southern Brazilian state of Paraná (96 sites), with a few additional sites in the neighboring states of São Paulo (21 sites) and Santa Catarina (5 sites). Important metadata on soil properties, particularly soil chemical analyses (mainly pH, C, P, Ca, K, Mg, Al contents, Exchangeable acidity, Cation Exchange Capacity, Base Saturation, and infrequently total N) and particle size distribution (mainly % sand, silt and clay, and infrequently soil moisture, bulk density), as well as on human management practices (land use and vegetation cover) are provided, in order to better estimate land use change impacts on biodiversity and ecosystem functioning.

New information

Quantitative estimates are provided for 42 soil animal taxa, for two biodiversity hotspots: the Brazilian Atlantic Forest and Cerrado biomes. Data are provided at the individual monolith level, representing sampling events ranging from February 2001 up to September 2016 in 122 sampling sites and over 1800 samples, for a total of 82,797 occurrences.

Keywords

soil macroinvertebrates, biodiversity, Atlantic forest, agriculture, land use impacts, bioindicators

Introduction

Worldwide, soils may host from 40 to 60% of the world's species (FAO 2020, Anthony et al. 2023), and are still considered one of the main biotic frontiers (Geisen et al. 2019). Neotropical regions are particularly biodiverse, and host numerous endangered hotspots (Myers et al. 2000). Furthermore, neotropical soils can support a megadiverse biota that drive ecosystem functioning affecting the delivery of essential ecosystem services, including crop production, biological pest control, nutrient cycling, seed dispersal, pollination, water storage and availability, pedogenesis, soil erosion control, and Carbon sequestration (Brown et al. 2015). Among these are the incredibly diverse soil microorganisms (Tedersoo et al. 2014, Torsvik and Øvreås 2002) as well as the soil fauna, that are usually classified according to their size into microfauna (microscopic animals <0.1 mm in diameter), mainly nematodes, tardigrades and rotifers), mesofauna (small animals from 0.1 to 2 mm in diameter, mainly mites and springtails), macrofauna (larger invertebrates visible to the naked eye; Ruiz et al. 2008), and the megafauna, i.e., vertebrates like moles, small rodents, and some snakes, for instance (Swift et al. 1979).

The soil and surface-litter dwelling macrofauna include the larger easily-visible invertebrate taxa (Ruiz et al. 2008), and represent from 23-27% of all described species (Decaëns et al. 2006, Anthony et al. 2023). Among these are more than 40 major taxonomic groups such as the well-known ants (Formicidae), termites (Isoptera), earthworms (Crassidellata), beetles and their larvae (Coleoptera), millipedes (Diplopoda), centipedes (Chilopoda), fly larvae (Diptera), spiders (Araneae), scorpions (Scorpiones), cicadas (Hemiptera: Auchenorrhyncha), crickets (Orthoptera), woodlice (Isopoda), and cockroaches (Blattaria) (Brown et al. 2018, Lavelle et al. 2022b). However, a large number of less well-known taxa are also part of the soil macrofauna (see Table 1), though they don't tend to be so commonly collected with the more widely used sampling methods (Gongalsky 2021).

Considering this wide range of taxa, and the taxonomic impediment afflicting many soil-dwelling animals (Decaëns et al. 2006), it not surprising that the overall richness of soil macroinvertebrates remains poorly known particularly in the tropics (Cameron et al. 2019, Guerra et al. 2020). This taxonomic richness also implies in a variety of morphological and functional adaptations developed to live in the soil, so that the soil macrofauna have evolved into a wide range of "functional groups", typically characterized by their food sources (Lavelle 1996). These include the detritivores, coprophages, xylophages, predators, parasites, phytophages, fungus-growers and fungivores, geophages, omnivores and the ecosystem engineers (Lavelle et al. 1997, Potapov et al. 2022b; see Table 1). Hence, their activities contribute to several important ecosystem services to human beings

(Brown et al. 2018, Lavelle et al. 2006). Furthermore, because of their high sensitivity to land use management and changes in vegetation cover and soil properties, they are frequently used as bioindicators of disturbance (e.g., Lavelle et al. 2021, Paoletti et al. 2007, Paoletti et al. 1996), and of soil quality and ecosystem service delivery (e.g., Velasquez and Lavelle 2019, Sofo et al. 2020, Rousseau et al. 2013, Franco et al. 2017, Bünemann et al. 2018).

The Atlantic Forest and the Cerrado (Brazilian Savannah) biomes are two global biodiversity hotspots in Brazil (Myers et al. 2000) highly threatened by urbanization and agricultural expansion (SOSMA/INPE 2021, Strassburg et al. 2017). These biomes (particularly the Cerrado) were also proposed by Guerra et al. (2022) as priority areas for soil biodiversity conservation. Combined, these regions are home to more than 60% of Brazil's population (IBGE 2023), and provide essential ecosystem services, particularly related to water availability and storage. Many of Brazil's main rivers are born in these biomes, and the Guarani aquifer, one of the largest in the world lays underneath them (Sindico et al. 2018). However, the richness of the soil fauna living in these biomes remains vastly unknown (Brown et al. 2015, Lewinsohn et al. 2005), despite the large number of active taxonomists in the region (Lewinsohn 2005), and the relatively large sampling effort (Araujo et al. 2020, Mathieu et al. 2022). This extends to the speciose soil macroinvertebrates, in which a large number of new taxa have been described over the last 10 years (CTFB 2023), with an additional large number of new species still to be found and described (Brown et al. 2015).

Brazil is the country with the highest number of sampling sites regarding soil macrofauna populations (Mathieu et al. 2023b), but many of the studies have not been published in peer-reviewed journals (Araujo et al. 2020), and almost none of them have provided open-access to the primary data collected on the soil fauna and environmental/soil attributes (see notable exceptions in Demetrio et al. (2021), Demetrio et al. (2020), Lavelle et al. (2022a)). Furthermore, little quantitative data is available in GBIF in terms of sampling events involving soil macroinvertebrate communities in the tropics, so a special call of SoilBON and the Colorado State University with support from GBIF (Guerra and Wall 2023) represented a unique opportunity to provide additional macrofauna data to GBIF. Increasing access to primary data allows for better comparability between studies, and for an improved understanding of soil macroinvertebrate communities in neotropical land use systems and vegetation covers. By quantifying the populations of various invertebrate taxa in different land uses, inferences can be made regarding the sustainability of land management practices, as well as of their potential contribution to ecosystem service provisioning (Velasquez and Lavelle 2019, Lavelle et al. 2021), such as through the use of various foodweb models (Potapov 2022).

General description

Purpose: In the present paper, we provide a suite of quantitative datasets on soil macrofauna communities collected using standard methods, in various Brazilian natural and anthropogenic ecosystems. The work was developed as part of the goals of two

internationally-funded projects, aiming to synthesize the results available on soil macroinvertebrate communities in Neotropical biomes, and another at the global level (Mathieu et al. 2022).

Additional information: Our efforts focused on collating soil macrofauna and soil analysis metadata, with a few sites in the Cerrado, but with most of them in the Atlantic Forest biome, where most of the studies on soil macrofauna have been made using standard sampling methods (Mathieu et al. 2023b). The datasets cover 122 sites in 23 Brazilian counties, most of them (96) in Southern state of Paraná, with five sites in Santa Catarina and 21 in the Southeastern state of São Paulo (Table 2). The combined 29 datasets include a total of 1,855 individual samples (monoliths = sampling events), with 82,797 occurrences from a wide range of land uses, e.g., native vegetation (grassland, forests), forestry plantations with various native (*Araucaria*, *Inga*, *Myrsine*) and exotic (*Acacia*, *Eucalyptus*, *Pinus*) tree species, all types of integrated management systems (agrosilvopastoral, silvopastoral, agropastoral and agroforestry), orchards, pastoral systems, urban areas and a variety of agricultural crops (mainly annual grain crops like soybean, maize, and wheat).

The information in the datasets included data on macrofauna abundance (number of individuals in all datasets and biomass in the majority of the datasets) of 42 soil macrofauna taxa (Table 1). When the taxa were not encountered, 0 was used as the value for the monolith data. This does not mean that the animal was necessarily absent from the site, but rather that it was not found with the sampling effort performed (determined by the number of monoliths and the number of times the site was sampled), using the standard sampling methodology for soil macrofauna communities (TSBF), as specified in the methods section. Most of the datasets also include a number of soil attributes, derived from chemical (pH, exchangeable acidity, Carbon, Phosphorus, Calcium, Magnesium, Potassium, Aluminum, Cation Exchange Capacity, Base Saturation in most cases, and rarely total Nitrogen) and physical analysis (particle size distribution; i.e., sand, silt, clay percentages, and infrequently soil moisture and bulk density) of soil samples taken at the same sites, generally from the same monoliths.

Project description

Title: The relationship between soil macrofauna biodiversity and ecosystem services delivery across land use systems in neotropical rainforest biomes (FaunaServices)

Personnel: The FaunaServicesproject PIs are Jerome Mathieu (Sorbonne Université, France) and Miguel Cooper (University of São Paulo, ESALQ campus, Brazil), assisted mainly by George G. Brown (Embrapa Forestry, Brazil), Wilian C. Demetrio (ESALQ-USP, Brazil) and Quentin Gabriac (France) for the gathering, processing and inclusion/ submission of soil macrofauna data. Additional official project participants include Marie L.C. Bartz (CARE-BIO and University of Coimbra, Portugal), Lucília P. Vargas (Embrapa Forestry, Brazil), Carlos Peres (University of East Anglia, England), Thibaud Decaëns (CEFE-Université Montpellier, France), Benjamin Pey (Université de Toulouse, France),

and Clara Peña Venegas (Sinchi, Colombia), though several other researchers from Brazil and abroad have been invited to contribute to the project goals.

Study area description: The area of focus of the project is mainly Atlantic Forest and Amazonia although a few datasets from other biomes of Brazil (e.g., Cerrado) have been included as well. In the current paper, we focus only on datasets from Brazil, but data is also available from other Amazonian countries (mainly Colombia, Peru and French Guyana).

Design description: The taxonomic focus of the project is on the soil macroinvertebrates, and their populations (abundance and biomass, when available), obtained using standardized quantitative measurements. Furthermore, additional soil physical and chemical data have been gathered in order to provide a more robust assessment of potential contributions of both the land use systems and the soil fauna towards the delivery of various ecosystem services, focusing primarily on:

1. water percolation and retention in soils, calculated from soil properties with equations from soil science, in particular pedotransfer functions (Medeiros et al. 2014);
2. plant productivity, derived from satellite data;
3. nutrient cycling, including mainly phosphorus and nitrogen and cation mineralization and availability;
4. organic matter stocks in the topsoil, calculated from soil C contents and bulk density;
5. biological control capacity, assessed using analysis of the foodweb structure of the macrofauna communities.

The project aims to provide key databases on lesser-known, underrepresented soil taxa, that can be used for a variety of other studies in the future, relating soil biodiversity with ecosystem functioning and with various drivers (both natural and anthropogenic) of biodiversity at different geographical/temporal scales. Data on the abundance and biomass (when present) of 42 soil macrofauna taxa were prepared in standard excel datasheets using the standard template of Mathieu et al. (2023a). These were then modified in order to follow Darwin Core standard variables, with the assistance of the Brazilian node of GBIF (SiBBr). Soil analysis metadata and information on the land use systems were also provided (see Table 3), although the template of Mathieu et al. (2023a) is much more extensive. The current datasets represent only around 25% of the available data on soil macrofauna communities from Brazil, and a large number of additional datasets (see Suppl. material 1) were prepared, but these have not yet been adapted to the Darwin Core.

Funding: The project is funded by a joint synthesis call between France and Brazil titled "Biodiversity in the neotropical realm", by CESAB/CEBA-FAPESP/CNPq, facilitated through the French FRB (Foundation for Research on Biodiversity) and the SinBiose programme of CNPq (Conselho Nacional de Desenvolvimento Científico e Tecnológico). On the French side the call is funded by CESAB and CEBA (Center for the study of

biodiversity in Amazonia) and on the Brazilian side by the CNPq (post-doctoral grant to WCD) and FAPESP (Fundação de Amparo à Pesquisa do Estado de São Paulo).

Sampling methods

Description: All sites (Table 2) were sampled using the standard method developed by the Tropical Soil Biology and Fertility Programme, published in Anderson and Ingram (1993), and also further proposed for soil macrofauna sampling by ISO (2011). This method was devised by Lavelle (1988) as a means of quantitatively estimating soil macroinvertebrate taxa at a particular site and moment in time (sampling event), and represents the most widely used method worldwide to quantitatively assess soil macrofauna communities with a single sweep (Mathieu et al. 2022). Clearly, more efficient methods exist to quantify populations of some of the soil and litter dwelling taxa individually (Gongalsky 2021), and although it is not the best or ideal method to evaluate the populations of social insects like the soil dwelling and/or nest-building Hymenopterans (Formicidae, Vespidae, Apiidae) or termites (Bignell 2009), it still represents the most efficient, cheap (cost-effective) and simple to apply method to obtain quantitative estimates of the soil macrofauna community as a whole.

Sampling description: The TSBF method consists in handsorting individual monoliths of soil 25 x 25 cm in area, by first collecting the surface litter (when present), and then manually removing all invertebrates visible to the naked eye (Ruiz et al. 2008) present in the litter and in soil layers typically down to 30 cm (Figs 1, 2). Various modifications of the method have been used, with focus on more surface-dwelling fauna (restricting sampling to the 0-10 cm depth) and/or by removing the soil layers without physically isolating the monolith from the surrounding soil (Aquino 2001, Brown et al. 2001) (Figs 3, 4). The invertebrates removed by hand (or with the help of tweezers and sometimes paintbrushes) are placed into individually labelled plastic vials (Fig. 5) with 70-99% ethanol. Higher concentrations are useful for posterior DNA extraction if molecular analyses are planned. Originally, earthworms were placed in dilute formalin solution (5-10%), but due to its carcinogenic properties (and difficulty in posterior DNA extraction), they are usually now killed and fixed in 80% ethanol. The fauna are identified in the laboratory with the aid of a stereomicroscope and grouped into the major taxa (Table 1), and subsequently quantified and weighed (fresh biomass of each major taxa altogether, after leaving to dry in paper towel for at most a couple of minutes). To facilitate comparisons between different studies, results are usually presented as number of individuals m^{-2} , although in the present datasets they are all given as number of individuals $monolith^{-1}$ ($sample^{-1}$). Two useful videos visually demonstrating the method step-by-step are available on YouTube in English (<https://youtu.be/PkZuW0rJtZI>) and Spanish (<https://www.youtube.com/watch?v=BZHbNLMpLRs>).

Additional samples are usually taken from the same monoliths or from their surroundings (e.g., individual or bulk samples) for soil chemical and physical analyses. Individualized soil samples are preferred as they can then be used to interpret local variability in abundance values of the various taxa. Samples are frequently taken at different depth increments

(usually of 10 cm thickness) like for the soil fauna, but are usually reported as a mean of all depth layers analysed. The soil variables (Table 3) include the standard list of attributes analysed in Brazilian soil analysis laboratories, e.g., pH, organic C (Walkley-Black), available P, Ca, K, Mg and Al contents, Exchangeable acidity, Cation Exchange Capacity, and Base Saturation, as well as particle size distribution (% sand, silt and clay). In some sites, total N (Kjehdhal), soil moisture and bulk density were also measured. All measurements followed standard methods described in Teixeira et al. (2017) and/or Marques and Motta (2003).

Quality control: All datasets were prepared as excel spreadsheets using a standard template (Mathieu et al. 2023a), which has the taxa in columns and the sites in rows, and includes metadata on a large number of environmental and human management-related variables. Since the GBIF Darwin Core focuses mostly on the taxonomic backbone and data related to abundance of the taxa encountered (sampling events), a macro was prepared in excel to facilitate the relocation of data on taxa from columns to rows. A similar process was done for the soil chemistry and physics data, which was included in a separate file (measurements table). Unfortunately, much of the environmental and management metadata was not transferable to the standard GBIF templates due to the lack of descriptor variables for them. Nevertheless, some of the more important ones such as vegetation cover and land use were included.

Geographic coverage

Description: The Atlantic Forest biomes spreads from Northeastern Brazil down to the Southernmost state of Brazil (Rio Grande do Sul), although the data in the present dataset are mainly from the southern state of Paraná (n=24 datasets), with only five having data from the neighboring states of São Paulo (n=4 datasets) and Santa Catarina (n=1 dataset). The Atlantic Forest includes several vegetation types (Oliveira-Filho and Fontes 2006), with the main representatives being:

1. Lowland and Montane rainforests (generally broadleaf and evergreen), particularly prevalent along the coastal plain, the piedmont and the Atlantic Coastal Mountain Range (“Serra do Mar”). Sites within this vegetation type were along the coast of Paraná (Antonina) and the Ribeira River Valley (Paraná and Santa Catarina).
2. Semideciduous and Deciduous seasonal forests, in which some tree species loose most or all of their leaves during the dry season, usually the winter in Brazil. These forests are found mainly in the inland and included many of the sites sampled in the states of São Paulo (Taciba, Florínea) and Paraná (Londrina, Campo Mourão, Cornélio Procópio, Jataizinho, Cafeara, Jaguapitã, Sertanópolis, Lerroville);
3. Mixed broadleaf and evergreen forest, with a variable proportion of *Araucaria angustifolia* trees, present particularly in higher elevations of the states of São Paulo, Minas Gerais and Rio de Janeiro, and throughout much of the states of Paraná and Santa Catarina as well as Northern Rio Grande do Sul. Sites within this ecoregion were mostly in Paraná (Pinhais, Lapa, Colombo, Curitiba, Ponta Grossa, São Jerônimo da Serra), and Santa Catarina (Canoinhas and Três Barras).

In the Cerrado biome, there are several vegetation types (Oliveira and Marquis 2002), of which the main ones are the grasslands (“dirty” and “clean”, implying areas with a few or no shrubs/small trees), scattered or more dense shrublands (called “Campo Cerrado” and Cerrado “sensu-strictu” in Portuguese), and forested areas with many trees and little (if any) grass undergrowth. Among the latter are dense forests like the “Cerradão”, semideciduous and deciduous forests, as well as gallery forests along the rivers. Among the grasslands are the high-altitude fields with many or few rocks generally on shallow soils (“Campo rupestre”), and the wet fields in lower areas with a high-water table (“Veredas”). These different plant physiognomies show variable grass and canopy cover (and consequently, dominant plant species), fire susceptibility, soil depth and available water. In the present datasets, two of the sites studied were located in ecotone region of the Cerrado with the Atlantic Forest biome (IBGE 2019) in the states of Paraná (Ponta Grossa) and São Paulo (Itatinga). These represent the southern-most portion of this biome (Ritter et al. 2010), and only “clean” grassland and Semideciduous seasonal forest were sampled in terms of the original vegetation, as well as derived anthropogenic ecosystems like pastures, exotic tree plantations, and annual crops.

Coordinates: -26.27261 and -22.39 Latitude; -53.887222 and -48.470277 Longitude.

Taxonomic coverage

Description: A total of 42 taxa were included in the present datasets (Table 1), most of which were arthropods (35 taxa), and of these, mainly soil or surface-litter dwelling insects (20 taxa). The remainder of the macroinvertebrates collected and reported were Annelids (3 taxa), predatory and entomopathogenic nematodes (2 taxa), 2 molluscs (snails and slugs) and the land planarians. Although some of the taxa reported are not typically considered to be soil animals, some of their representatives are frequently associated with the surface litter or the top-most soil layers, and therefore as they were collected in the samples, they are reported here. These include, for instance, some species of praying-mantis (Mantodea), caddisflies (Trichoptera), lacewings (Chrysopidae) and web-spinners (Embioptera). Because many larger potworms (Enchytraeida) were found in the samples, these were also collected, though it is well known that the TSBF handsorting method is not efficient at sampling these animals (Niva et al. 2015). Pseudoscorpions, mites, garden centipedes (Symphyla), and the Diplura, like the enchytraeids are normally considered as part of the soil mesofauna (Potapov et al. 2022a), but larger individuals are often quite easily visible to the naked eye (Ruiz et al. 2008), so they were included in the current samples. On the other hand, some of the other notable soil fauna representatives were not found in the present samples, e.g., the velvet-worms (Onychophora) and solitary bees (Apididae).

Traits coverage

The macroinvertebrate taxa collected perform various functions in the soil and have a variety of feeding sources, as exemplified in a broad sense in Table 1. Although the

datasets do not provide details regarding the traits of the animals collected, information from the table and from the animal's abundance and biomass can be used to assess potential impacts on soil properties and functions. Ecosystem engineers like earthworms, termites, ants, millipedes and beetle larvae (Brown et al. 2001) are important ecosystem service providers affecting particularly soil structure, and ultimately water availability and storage (Brown et al. 2018, Lavelle et al. 2016). Detritivore soil and litter-dwelling macroinvertebrates like millipedes, isopods, cockroaches, some beetle, earwig, fly larvae, booklice and earthworm species, act as major litter decomposers, by directly ingesting leaf-litter or bark or by catalysing microbial colonization and/or activity (Lavelle 1996, Potapov et al. 2022b). Predators, parasites and microbivores (e.g., bacterivores, fungivores) are important in controlling the populations of other soil organisms, providing pest control services, as well as impacting nutrient cycling (Lavelle et al. 2004, Lavelle 1996). Plant shoot, root or wood feeding animals affect primary productivity, and are often associated with plant pests in agricultural and forestry systems, while parasites like ticks (Ixodida) affect animal health and welfare (Potapov et al. 2022b).

Temporal coverage

Data range: 2001-2-20 - 2016-9-16.

Usage licence

Usage licence: Creative Commons Public Domain Waiver (CC-Zero)

Data resources

Data package title: Soil macrofauna biodiversity across land use systems in Neotropical biomes

Resource **link:** https://www.gbif.org/dataset/search?offset=0&publishing_org=bcbe7ef4-5cc8-4197-bccc-1e279fb498a7

Alternative identifiers: <https://collectory.sibbr.gov.br/collectory/public/show/dp76>

Number of data sets: 29

Data set name: Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil

Download URL: <https://doi.org/10.15468/xjqhra>

Data format: Darwin Code Archive

Data format version: 1.3

Description: Soil macrofauna communities were evaluated in a number of land use systems on private farms in Jaguapitã, Paraná, Brazil. Sampling was performed in March and September 2004 in nine land uses: 1) a 15-year old pasture (JM) previously sown with *Paspalum* sp., and recently renovated with *Cynodon* sp. grass; 2) a 15-year old degraded pasture of *Paspalum* sp.; 3) a >15-year old pasture of *Paspalum* sp., recently renovated with *Urochloa brizantha*; 4) a degraded >15-year old *Paspalum* sp. pasture; 5) a six-year old soybean cropping system, established over an old *Paspalum* sp. pasture; 6) a 2-year old soybean cropping system after long-term *Paspalum* sp. pasture; 7) a recently renovated *Urochloa brizantha* + *Urochloa decumbens* pasture after several years of annual grain cropping; 8) and 9) two recently established (1 year old) sugarcane plantations, converted from >15 year old pastures. In each land use, 25 samples were taken in a square grid of 5x5 samples, with 10 m between sampling points. Of the total, five samples (along the diagonal) were taken down to 30 cm depth, and the remaining only to 0-10 cm depth. Samples were taken using the standard methodology of the Tropical Soil Biology and Fertility Programme (TSBF), where soil and litter fauna were hand-sorted from monoliths of 25x25 cm, and the abundance of a total of 42 taxa was assessed.

Column label	Column description
datasetName	Name of the dataset including information on the biome, locality, county, country and year where the sampling was performed
basisOfRecord	specific nature of the data collected
samplingProtocol	method used for sampling the soil macrofauna community
sampleSizeValue	size of the sample (in square meters)
sampleSizeUnit	unit of sample (in this case m2)
eventID	identifier for the broader Event that groups this sampling event
eventDate	year and month of the sampling, in the format yyyy/month/day
country	country where sampling occurred
stateProvince	state where samplin occurred
county	municipality where sampling occurred, providing the full, unabbreviated name of the smaller administrative region of the sample locality
locality	full, anabbreviated name of the location where samples were taken
decimalLatitude	geographic latitude in decimal degrees, using the spatial reference system given in geodeticDatum (WGS84) of closest known location of the sampling site; when exact coordinates of a particular sample (monolith) was not know, the coordinates are for the overall site (land use system)

decimalLongitude	geographic longitude in decimal degrees, using the spatial reference system given in geodeticDatum (WGS84) of closest known location of the sampling site; when exact coordinates of a particular sample (monolith) was not know, the coordinates are for the overall site (land use system)
habitat	biome according to the Brazilian classification and type of main land use system; in the present case samples were taken only in the Atlantic Forest and Cerrado biome, while main land use systems included mostly agricultural (pastoral, agropastoral, silvopastoral, agrosilvopastoral, annual crops, perennial crops), silvicultural (tree plantations), urban and native vegetation (natural regeneration, forest, grassland)
eventRemarks	season of the sampling event (wet or dry, depending on the precipitation of the month of sampling; wet means more than 100 mm, dry means less than 100 mm rainfall in the month), and Köppen's climate classification, according to Alvares et al. (2013)
year	year when sampling event occurred
month	month of the year when sampling event occurred
scientificName	highest level of taxonomic detail provided
lifeStage	life stage of the invertebrate sampled; in some cases larvae rather than adults were collected (e.g., for Coleoptera, Diptera and Lepidoptera)
occurrenceID	identifier for the occurrence
occurrenceStatus	presence/absence of the taxa in the sample
individualCount	number of individuals sampled (in the individual monolith/sample)
dynamicProperties	includes the relative abundance of each taxon within the sample and the total fresh weight (biomass in grams, if measured) of all the individuals of each taxon weighed together
kingdom	taxonomic kingdom
phylum	taxonomic Phylum
class	taxonomic Class of the invertebrates collected
order	taxonomic Order of the invertebrates collected
family	taxonomic Family of the invertebrates collected
taxonRank	rank of the taxon provided
higherClassification	identity of the most detailed taxonomic level provided for the invertebrates collected
vernacularName	common name of the invertebrate collected
measurementID	an identifier for the sampling event that includes the particular location (in this case, the individual sample/monolith) where the measurement was made
measurementType	identifies the particular soil measurement variable evaluated
measurementValue	individual quantitative value of the particular soil variable measured
measurementUnit	unit of the variable measured

measurementMethod	method used to obtain each soil variable measured
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Data set name: Soil macrofauna communities in various land use systems in Santo Inácio, Paraná, Brazil

Download URL: <https://doi.org/10.15468/dgjpjs>

Data format: Darwin Core Archive

Data format version: 1.2

Description: Soil macrofauna communities were evaluated in a number of land use systems on a private farm (Estância JAE) in Santo Inácio, Paraná, Brazil. Sampling was performed in October 2013 and January 2014 in seven land uses: 1) an agrosilvopastoral system with *Eucalyptus urograndis* tree rows and *Urochloa ruziziensis* pasture and annual crops (soybean, maize, oats, wheat) planted in the interrow; 2) a silvopastoral system with rows of *Corymbia maculata* trees and the interrow planted with *Urochloa ruziziensis*; 3) a permanent pasture of *Urochloa* sp.; 4) a sugarcane plantation with conventional tillage; 5) an agropastoral system with soybean in the summer and *Urochloa ruziziensis* pasture in the winter; 6) a 20-year old *Eucalyptus* sp. plantation; and 7) a native Atlantic Forest fragment, nearby a stream. Samples were taken using the standard methodology of the Tropical Soil Biology and Fertility Programme (TSBF), where soil (down to 20 cm depth) and litter fauna were hand-sorted from monoliths of 25x25 cm, and the abundance of a total of 42 taxa was assessed.

Column label	Column description
idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"	idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"

Data set name: Soil macrofauna communities in native Atlantic Forest fragments with different disturbance levels in Londrina, Paraná, Brazil

Download URL: <https://doi.org/10.15468/6rxpw9>

Data format: Darwin Core Archive

Data format version: 1.3

Description: Soil macrofauna communities were evaluated in a three semi-deciduous seasonal Atlantic Forest fragments with different levels of disturbance in Londrina, Paraná, Brazil. Sampling was performed in August and December 2005 at the Mata dos Godoy State Park (least disturbed, primary forest), Arthur Thomas Municipal Park (intermediate disturbance; intermediate regeneration stage) and the Horto Florestal of the Universidade Estadual de Londrina (most disturbed; initial regeneration stage). In each forest fragment, 25 samples were taken in a square grid of 5x5 samples, with 10

m between sampling points. Of the total, five samples (along the diagonal) were taken down to 30 cm depth, and the remaining only to 0-10 cm depth. Samples were taken using the standard methodology of the Tropical Soil Biology and Fertility Programme (TSBF), where soil and litter fauna were hand-sorted from monoliths of 25x25 cm, and the abundance of a total of 42 taxa was assessed.

Column label	Column description
idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"	idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"

Data set name: Soil macrofauna communities in various land use systems in Ponta Grossa, Paraná, Brazil

Download URL: <https://doi.org/10.15468/p86sf9>

Data format: Darwin Core Archive

Data format version: 1.5

Description: Soil macrofauna communities were evaluated in in October 2012 and April of 2013 in a number of land use systems in Ponta Grossa county, Paraná state, Brazil. At the Fazenda Modelo managed by the Instituto Agronômico do Paraná (IAPAR), samples were taken in three land use systems as part of a long-term integrated production systems experiment initiated in 2006: 1) an agrosilvopastoral system with rows of *Eucalyptus dunnii* and annual grain cropping (maize, soybean) in the summer and *Lolium multiflorum* (Italian ryegrass) grazed pasture in the winter performed in the interrow; 2) an agropastoral system with grain cropping (maize, soybean) in the summer and grazed Italian ryegrass in the winter; 3) a permanent pasture of native grasses. Each of these systems was replicated 3 times, and eight samples were taken in each plot. At the Embrapa research station, two land uses were evaluated, with 24 samples taken in each area: 1) a minimum-tillage grain crop production system; and 2) a 20-year old *Eucalyptus dunnii* tree plantation. Samples were taken using the standard methodology of the Tropical Soil Biology and Fertility Programme (TSBF), where soil (down to 20 cm depth) and litter fauna were hand-sorted from monoliths of 25x25 cm, and the abundance of a total of 42 taxa was assessed.

Column label	Column description
idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"	idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"

Data set name: Soil macrofauna communities in a pasture and annual cropping systems in Cafeara, Paraná, Brazil

Download URL: <https://doi.org/10.15468/wtfx6j>

Data format: Darwin Core Archive

Data format version: 1.1

Description: Soil macrofauna communities were evaluated on six occasions from March 2004 to January 2005 in a pasture and in annual crops following the standard methodology of the Tropical Soil Biology and Fertility Programme (TSBF), in monoliths of 25x25 cm, hand-sorted for all litter and soil-dwelling taxa. The abundance of a total of 42 taxa is presented per land use (one pasture and two cropping fields) on each sampling date, performed at a private farm in Cafeara county, Paraná State, Brazil.

Column label	Column description
idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"	idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"

Data set name: Soil macrofauna communities in various land use systems in Itatinga, São Paulo, Brazil

Download URL: <https://doi.org/10.15468/hm49kv>

Data format: Darwin Core Archive

Data format version: 1.4

Description: Soil macrofauna communities were evaluated in February 2014 in a number of land use systems in Itatinga, São Paulo state, Brazil. At the University of São Paulo Forestry Department Experimental Station, the following land uses were studied: 1) a mixed *Eucalyptus grandis* and *Acacia mangium* tree plantation; 2) an *Acacia mangium* tree plantation; 3) a *Eucalyptus grandis* tree plantation; and 4) a Atlantic Forest/Cerrado ecotone semi-deciduous native forest fragment. At a private farm in the Distrito de Lobo, the following land uses were sampled: 1) a mixed *Eucalyptus grandis* and *Acacia mangium* tree plantation; 2) an *Acacia mangium* tree plantation; 3) a *Eucalyptus grandis* tree plantation; 4) a sugarcane plantation; and 5) a permanent pasture. At the Fazenda Americana of the Duratex Company, a *Eucalyptus* sp. plantation was sampled on two soil textural types: a sandy clay loam and a clay loam. Samples were taken using the standard methodology of the Tropical Soil Biology and Fertility Programme (TSBF), where soil (down to 20 cm depth) and litter fauna were hand-sorted from monoliths of 25x25 cm, and the abundance of a total of 42 taxa was assessed.

Column label	Column description
idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"	idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"

Data set name: Soil macrofauna communities in urban public parks of Curitiba, Paraná state, Brazil

Download URL: <https://doi.org/10.15468/ek2wuh>

Data format: Darwin Core Archive

Data format version: 1.3

Description: Soil macrofauna communities were evaluated in five urban parks of the city of Curitiba, Paraná state, Brazil: Barigui, Tingui, Barreirinha and Passaúna Municipal parks and the Botanic Garden. Samples were taken in November 2013 and July 2014 in two areas of each park: one with native Atlantic Forest, and the other with a grass lawn. Five samples were taken in each land use on each date, using the standard methodology of the Tropical Soil Biology and Fertility Programme (TSBF), where soil (down to 20 cm depth) and litter fauna were hand-sorted from monoliths of 25x25 cm, and the abundance of a total of 42 taxa was assessed.

Column label	Column description
idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"	idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"

Data set name: Soil macrofauna communities in a long-term soil and crop management experiment at Embrapa Soybean, Londrina, Paraná, Brazil

Download URL: <https://doi.org/10.15468/3gbqk9>

Data format: Darwin Core Archive

Data format version: 1.1

Description: The soil macrofauna community was assessed in a long-term soil and crop management experiment established in 1988 at the Embrapa Soybean research station in Londrina, Paraná, Brazil. The experiment includes two rotation systems (soybean-wheat double cropping and a rotation with lupine/maize-oats/soybean-wheat/soybean-wheat/soybean) and three soil tillage types (no-tillage, conventional tillage and minimum tillage with chisel plow every 3 years). The experiment was replicated four times, and one sample was taken in each plot. Sampling was performed in April 2001 and April 2005, using the standard methodology of the Tropical Soil Biology and Fertility Programme (TSBF). Monoliths were hand-sorted for all litter and soil-dwelling taxa (down to 30 cm depth), and the abundance of a total of 42 taxa assessed.

Column label	Column description
idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"	idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"

Data set name: Soil macrofauna communities in an organic agroforestry system and under initial native vegetation regeneration at the Assentamento Contestado in Lapa, Paraná, Brazil

Download URL: <https://doi.org/10.15468/rmfcj7>

Data format: Darwin Core Archive

Data format version: 1.1

Description: Soil macrofauna communities were evaluated in an organic agroforestry production system and in initial native vegetation regeneration at an area managed and owned by the Assentamento Contestado, in Lapa, Paraná, Brazil. Sampling was performed in April 2016 in three areas with agroforestry systems including various vegetables, pasture grasses and orchard trees like figs, peaches, pears, apples, pecans, and persimmons. Samples were taken using the standard methodology of the Tropical Soil Biology and Fertility Programme (TSBF), where soil (down to 20 cm depth) and litter fauna were hand-sorted from monoliths of 25x25 cm, and the abundance of a total of 42 taxa was assessed.

Column label	Column description
idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"	idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"

Data set name: Soil macrofauna communities in native Atlantic Forest fragments and agroforestry systems of different ages the Ribeira River Valley, Brazil

Download URL: <https://doi.org/10.15468/h6m947>

Data format: Darwin Core Archive

Data format version: 1.3

Description: Soil macrofauna communities were evaluated in three Atlantic Forest fragments at different stages of regeneration, and in three organic agroforestry systems of different ages in the Ribeira River Valley, Brazil. Sampling was performed in March and August of 2008 in six sites, five of which were located in Barra do Turvo county in São Paulo state, and one in Adrianópolis county in Paraná state. The sites in Barra do Turvo were: a 5, 20 and >30-year-old Atlantic Forest regeneration fragment, and a 4- and 16-year-old organic agroforestry system. In Adrianópolis, only an 8-year-old organic agroforestry system was sampled. Each land use was replicated three times and two samples were taken per plot. Samples were taken using the standard methodology of the Tropical Soil Biology and Fertility Programme (TSBF), where soil (down to 20 cm depth) and litter fauna were hand-sorted from monoliths of 25x25 cm, and the abundance of a total of 42 taxa was assessed.

Column label	Column description
idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"	idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"

Data set name: Soil macrofauna communities in various land uses in and neighboring the Mata do Uru Private Reserve, Lapa, Paraná state, Brazil

Download URL: <https://doi.org/10.15468/h8y7f5>

Data format: Darwin Core Archive

Data format version: 1.3

Description: Soil macrofauna communities were evaluated in four land uses in the Mata do Uru Private Reserve, and in a conventionally managed annual grain crop production system neighboring the reserve, in February 2015 and July 2016. In the Uru Reserve, samples were taken in: 1) a native Atlantic Forest (*Araucaria* forest) fragment; 2) a 10-year-old regeneration plot, planted with native trees; 3) a native grassland; and 4) a grass lawn. Six samples were taken in each land use on each date, using the standard methodology of the Tropical Soil Biology and Fertility Programme (TSBF), where soil (down to 20 cm depth) and litter fauna were hand-sorted from monoliths of 25x25 cm, and the abundance of a total of 42 taxa was assessed.

Column label	Column description
idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"	idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"

Data set name: Soil macrofauna communities in native Atlantic Forest and native grassland vegetation at the Vila Velha State Park, Ponta Grossa, Paraná, Brazil

Download URL: <https://doi.org/10.15468/9ja9ce>

Data format: Darwin Core Archive

Data format version: 1.3

Description: Soil macrofauna communities were evaluated in a native Atlantic Forest (*Araucaria* forest) and a native grassland area at the Vila Velha State Park, in Ponta Grossa county, Paraná state, Brazil, in September 2013, and in January of 2014. The fauna was sampled following the standard methodology of the Tropical Soil Biology and Fertility Programme (TSBF), where the soil (down to 20 cm depth) and surface litter were hand-sorted from monoliths of 25x25 cm, and the abundance of a total of 42 taxa assessed.

Column label	Column description
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idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"	idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"
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Data set name: Soil macrofauna communities in a sandy soil with conventional and no-tillage soybean production systems in Taciba, São Paulo state, Brazil

Download URL: <https://doi.org/10.15468/hfpvrg>

Data format: Darwin Core Archive

Data format version: 1.1

Description: Soil macrofauna communities were evaluated a private farm with soybean production system using conventional tillage and no-tillage after long-term permanent pastures in Taciba, São Paulo state, Brazil. Samples were taken in December of 2004 in two areas with no-tillage (second and third year of no-till soybean production) and in a recently tilled (conventional) soybean production area converted from pasture. Four samples were taken in each area, using the standard methodology of the Tropical Soil Biology and Fertility Programme (TSBF), where soil (down to 30 cm depth) and litter fauna were hand-sorted from monoliths of 25x25 cm, and the abundance of a total of 42 taxa was assessed.

Column label	Column description
idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"	idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"

Data set name: Soil macrofauna communities in various land use systems in Canoinhas and Três Barras, Santa Catarina state, Brazil

Download URL: <https://doi.org/10.15468/2r7dpw>

Data format: Darwin Core Archive

Data format version: 1.3

Description: Soil macrofauna communities were evaluated in May 2011 in five land use systems in the region of Canoinhas and Três Barras, Santa Catarina state, Brazil. In Três Barras, samples were taken in a native Atlantic Forest fragment and an *Araucaria angustifolia* tree plantation in the Três Barras National Forest, as well as in an annual grain crop production system under no-tillage on a private farm. In Canoinhas, samples were taken in an agropastoral system with Italian ryegrass (*Lolium multiflorum*), and in a permanent pasture of native grasses. Nine samples were taken in each land use system in a 3x3 square grid with 30 m distance between samples. Samples were taken using the standard methodology of the Tropical Soil Biology and Fertility Programme (TSBF), where soil (down to 20 cm depth) and litter fauna were

hand-sorted from monoliths of 25x25 cm, and the abundance of a total of 42 taxa was assessed.

Column label	Column description
idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"	idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"

Data set name: Soil macrofauna communities in an integrated production system experiment at the Canguiri Farm in Pinhais, Paraná, Brazil

Download URL: <https://doi.org/10.15468/5x7dww>

Data format: Darwin Core Archive

Data format version: 1.3

Description: Soil macrofauna communities were evaluated in September 2016 in an experiment evaluating integrated agricultural production systems located at the Canguiri Farm of the Federal University of Paraná in Pinhais, Paraná, Brazil. Samples were taken in four land use systems: 1) an agrosilvopastoral system with rows of *Eucalyptus benthamii* and maize cropping in the summer and black oats in the winter, followed by three years of *Panicum maximum* pasture grasses in the interrow; 2) an agropastoral system with maize cropping in the summer and black oats in the winter, followed by three years of *Panicum maximum* pasture grasses in the interrow; 3) a permanent pasture of *Panicum maximum*; and 4) annual cropping of maize in the summer and black oats in the winter. Each of these systems was replicated 3 times, and three samples were taken in each plot. Samples were taken using the standard methodology of the Tropical Soil Biology and Fertility Programme (TSBF), where soil (down to 20 cm depth) and litter fauna were hand-sorted from monoliths of 25x25 cm, and the abundance of a total of 42 taxa was assessed.

Column label	Column description
idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"	idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"

Data set name: Soil macrofauna communities in native tree plantations along the coastal plain of the state of Paraná, Antonina, Brazil

Download URL: <https://doi.org/10.15468/xagmsg>

Data format: Darwin Core Archive

Data format version: 1.3

Description: Soil macrofauna communities were evaluated in two native tree plantations used to recover native vegetation in abandoned pastures on the coastal

plain of the state of Paraná, Brazil. Samples were taken in November 2007 in the Cachoeira River Natural Reserve managed by the “Sociedade de Proteção da Vida Silvestre” (SPVS) in Antonina County. Samples were taken in *Inga edulis* and *Myrsine coreacea* plantations, replicated four times. Two samples were taken in each plot using the standard methodology of the Tropical Soil Biology and Fertility Programme (TSBF), where soil (taken only to 10 cm depth due to high water table) and litter fauna were hand-sorted from monoliths of 25x25 cm, and the abundance of a total of 42 taxa was assessed.

Column label	Column description
idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"	idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"

Data set name: Soil macrofauna communities in a long-term soil tillage experiment at Embrapa Soybean, Londrina, Paraná, Brazil

Download URL: <https://doi.org/10.15468/pucqj2>

Data format: Darwin Core Archive

Data format version: 1.1

Description: The soil macrofauna community was assessed in a long-term soil tillage experiment established in 1981 at the Embrapa Soybean research station in Londrina, Paraná, Brazil. The experiment is conducted under soybean-wheat double cropping and using three soil tillage types: no-tillage, conventional tillage (disk plow), and minimum tillage (chisel plow every 3 years). The experiment was replicated four times, and one sample was taken in each plot. Sampling was performed in September 2001 and October 2005, using the standard methodology of the Tropical Soil Biology and Fertility Programme (TSBF). Monoliths were hand-sorted for all litter and soil-dwelling taxa (down to 30 cm depth), and the abundance of a total of 42 taxa was assessed.

Column label	Column description
idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"	idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"

Data set name: Soil macrofauna communities in a long-term crop rotation experiment at Coamo in Campo Mourão, Paraná, Brazil

Download URL: <https://doi.org/10.15468/gxz6g2>

Data format: Darwin Core Archive

Data format version: 1.1

Description: The soil macrofauna community was assessed in a long-term crop rotation experiment established in 1985 at the Coamo Agroindustrial Cooperativa experimental farm in Campo Mourão, Paraná state, Brazil. The experiment includes several rotations all of which are planted using the no-tillage system, though only four rotation systems were evaluated: maize-oats/ soybean-maize-millet/soybean-maize/soybean-wheat (Tr3), maize-lupine/soybean-oats/soybean-wheat/soybean-wheat (Tr4), maize-hairy vetch/maize-maize-millet/soybean-maize/soybean-wheat (Tr8) and soybean-wheat continuous double cropping (Tr11). The experiment was replicated four times, and one sample was taken in each plot. Sampling was performed in April 2004, using the standard methodology of the Tropical Soil Biology and Fertility Programme (TSBF). Monoliths were hand-sorted for all litter and soil-dwelling taxa (down to 30 cm depth), and the abundance of a total of 42 taxa was assessed.

Column label	Column description
idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"	idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"

Data set name: Soil macrofauna communities in an organic grain production system under conventional and no-tillage system in São Jerônimo da Serra, Paraná, Brazil

Download URL: <https://doi.org/10.15468/fxgq4p>

Data format: Darwin Core Archive

Data format version: 1.1

Description: Soil macrofauna communities were evaluated in an organic grain (soybean) crop production system at the farm run by the Associação Filantrópica Humanitas in São Jerônimo da Serra, Paraná, Brazil. Sampling was performed in April 2003 in an area planted with soybean under conventional tillage and another area planted with no-tillage system for two years. Samples were taken using the standard methodology of the Tropical Soil Biology and Fertility Programme (TSBF), where soil (down to 30 cm depth) and litter fauna were hand-sorted from monoliths of 25x25 cm, and the abundance of a total of 42 taxa was assessed.

Column label	Column description
idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"	idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"

Data set name: Soil macrofauna communities in organic grain production systems in Jataizinho, Paraná, Brazil

Download URL: <https://doi.org/10.15468/dfd2j>

Data format: Darwin Core Archive

Data format version: 1.2

Description: Soil macrofauna communities were evaluated in two annual grain crop (soybean and maize) organic production systems in the municipality of Jataizinho, Paraná, Brazil, in April 2003. Sampling followed the standard methodology of the Tropical Soil Biology and Fertility Programme (TSBF), where soil (down to 40 cm depth) and litter fauna were hand-sorted from monoliths of 25x25 cm, and the abundance of a total of 42 taxa was assessed.

Column label	Column description
idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"	idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"

Data set name: Soil macrofauna communities in a long-term soil tillage experiment at Coamo in Campo Mourão, Paraná, Brazil

Download URL: <https://doi.org/10.15468/595jyb>

Data format: Darwin Core Archive

Data format version: 1.2

Description: The soil macrofauna community was assessed in a long-term soil tillage systems experiment established in 1991 at the Coamo Agroindustrial Cooperativa experimental farm in Campo Mourão, Paraná state, Brazil. The experiment includes three soil tillage systems (no-tillage, conventional tillage and minimum tillage) planted with two crop rotation systems: soybean-wheat continuous double cropping and a more complex rotation (including maize, wheat, oats, soybean and lupine). However, only four treatments were evaluated: no-tillage with complex rotation; no-tillage with double cropping; conventional (disk) tillage with double cropping, minimum tillage (chisel plowing every 3 years) with double cropping. Four samples were taken per treatment in April 2004, using the standard methodology of the Tropical Soil Biology and Fertility Programme (TSBF). Monoliths were hand-sorted for all litter and soil-dwelling taxa (down to 30 cm depth), and the abundance of a total of 42 taxa assessed.

Column label	Column description
idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"	idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"

Data set name: Soil macrofauna communities along a transect from native Atlantic Forest at the Mata dos Godoy State Park (Londrina, Paraná, Brazil) into a soybean cultivation field

Download URL: <https://doi.org/10.15468/9ze9v2>

Data format: Darwin Core Archive

Data format version: 1.4

Description: The soil macrofauna community was assessed along a transect including 16 sampling points from the inside of the forest (80 m from the edge) out toward the neighboring recently harvested soybean plantation (up to 70 m from the edge). Sampling was performed in May 2003 at the Mata dos Godoy State Park and the neighboring Fazenda Santa Helena, using the standard methodology of the Tropical Soil Biology and Fertility Programme (TSBF). Monoliths were hand-sorted for all litter and soil-dwelling taxa (down to a 40 cm depth), and the abundance of a total of 42 taxa was assessed.

Column label	Column description
idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"	idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"

Data set name: Soil macrofauna communities in native Atlantic Forest fragments in Sertanópolis, Paraná, Brazil

Download URL: <https://doi.org/10.15468/6r73ze>

Data format: Darwin Core Archive

Data format version: 1.3

Description: Soil macrofauna communities were evaluated in two native Atlantic Forest fragments in private properties in the municipality of Sertanópolis, in northern Paraná state, Brazil, in October 2001, and in April of 2003. Sampling following the standard methodology of the Tropical Soil Biology and Fertility Programme (TSBF), where soil (down to 40 cm depth) and litter fauna were hand-sorted from monoliths of 25x25 cm, and the abundance of a total of 42 taxa was assessed.

Column label	Column description
idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"	idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"

Data set name: Soil macrofauna communities along a transect from native Atlantic Forest into a soybean cultivation field at the Fazenda São Paulo in Cornélio Procópio, Paraná, Brazil

Download URL: <https://doi.org/10.15468/qfzdtc>

Data format: Darwin Core Archive

Data format version: 1.1

Description: The soil macrofauna community was assessed along a transect including 13 sampling points from the inside of the forest (60 m from the edge) out toward the

neighboring recently harvested soybean plantation (up to 60 m from the edge). Sampling was performed in April 2004 at the Fazenda São Paulo, near Cornélio Procópio, Paraná state, Brazil, using the standard methodology of the Tropical Soil Biology and Fertility Programme (TSBF). Monoliths were hand-sorted for all litter and soil-dwelling taxa (down to 30 cm depth), and the abundance of a total of 42 taxa was assessed.

Column label	Column description
idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"	idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"

Data set name: Soil macrofauna community in areas with high and low population of Scarab beetle larvae in Lerroville, Paraná, Brazil

Download URL: <https://doi.org/10.15468/hcj7af>

Data format: Darwin Core Archive

Data format version: 1.4

Description: The soil macrofauna community was assessed in a long-term (28 years) no-tillage annual grain production farm with areas having a high and a low population of Scarab beetle larvae in Lerroville, Londrina municipality, Paraná state, Brazil. Sampling occurred after the soybean harvest in April 2003, using the standard methodology of the Tropical Soil Biology and Fertility Programme (TSBF). Monoliths were hand-sorted for all litter and soil-dwelling taxa (down to 30 cm depth), and the abundance of a total of 42 taxa was assessed.

Column label	Column description
idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"	idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"

Data set name: Soil macrofauna communities in an early conversion phase of conventional to organic grain production systems at the Embrapa Soybean experiment station in Londrina, Paraná, Brazil

Download URL: <https://doi.org/10.15468/hya4u8>

Data format: Darwin Core Archive

Data format version: 1.1

Description: Soil macrofauna communities were evaluated in two areas recently being converted from conventional to organic grain (soybean) crop production systems at the Embrapa Soybean experiment station in Londrina, Paraná, Brazil. Sampling was performed in October 2003 in an area planted with soybean under conventional tillage

and an area planted with pigeon-pea (*Cajanus cajan*) under no-tillage system. Samples were taken using the standard methodology of the Tropical Soil Biology and Fertility Programme (TSBF), where soil (down to 30 cm depth) and litter fauna were hand-sorted from monoliths of 25x25 cm, and the abundance of a total of 42 taxa was assessed.

Column label	Column description
idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"	idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"

Data set name: Soil macrofauna communities in native Atlantic Forest fragments and Pinus plantations at the Embrapa Forestry research station in Colombo, Paraná, Brazil

Download URL: <https://doi.org/10.15468/w6v87y>

Data format: Darwin Core Archive

Data format version: 1.2

Description: Soil macrofauna communities were evaluated in four native Atlantic Forest (*Araucaria* forests) fragments and three *Pinus elliottii* plantations at the Embrapa Forestry research station in Colombo municipality, Paraná, Brazil. Three forest fragments in an advanced state of regeneration (>70 years without disturbance) and three pine plantations (25 to 32 years old) were sampled in May 2007, and another forest fragment was sampled in September 2011, following the standard methodology of the Tropical Soil Biology and Fertility Programme (TSBF). Soil and litter fauna were hand-sorted from monoliths of 25x25 cm (to 10 cm depth in 2007 and 20 cm depth in 2011), and the abundance of a total of 42 taxa was assessed.

Column label	Column description
idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"	idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"

Data set name: Soil macrofauna communities in native Atlantic Forest at the Mata dos Godoy State Park in Londrina, Paraná, Brazil

Download URL: <https://doi.org/10.15468/43j5fq>

Data format: Darwin Core Archive

Data format version: 1.2

Description: Soil macrofauna communities were evaluated in February 2001 in a native fragment forest at the Mata dos Godoy State Park using the standard methodology of the Tropical Soil Biology and Fertility Programme (TSBF). Monoliths

were hand-sorted for all litter and soil-dwelling taxa (down to a 40 cm depth), and the abundance of a total of 42 taxa was assessed.

Column label	Column description
idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"	idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"

Data set name: Soil macrofauna community in a site with high and low population of Scarab beetle larvae in Florínea, São Paulo, Brazil

Download URL: <https://doi.org/10.15468/6byztf>

Data format: Darwin Core Archive

Data format version: 1.4

Description: The soil macrofauna community was assessed in a no-tillage annual grain production farm with areas having a high and low population of Scarab beetle larvae in Florínea, São Paulo state, Brazil. The site had been in maize production, and the sampling occurred after the maize harvest in March 2005, using the standard methodology of the Tropical Soil Biology and Fertility Programme (TSBF). Monoliths were hand-sorted for all litter and soil-dwelling taxa (down to 40 cm depth), and the abundance of a total of 42 taxa was assessed.

Column label	Column description
idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"	idem as Dataset "Soil macrofauna communities in various land use systems in Jaguapitã, Paraná, Brazil"

Additional information

The 29 datasets are described individually below including a title and a brief summary (as provided in the IPT website of Embrapa Forestry; see <https://www.gbif.org/publisher/bcbe7ef4-5cc8-4197-bccc-1e279fb498a7>) of each study, while the overall information on number of sites, plots or land use systems sampled, as well as the number of records (monoliths), and occurrences and soil metadata measures are listed in Table 2. All datasets include the abundance and (frequently) biomass of the 42 soil macroinvertebrate taxa listed in Table 1. Köppen Climate types provided followed Alvares et al. (2013) (Furthermore, information on variables included in the "Extended measurement or fact" datasheets (soil chemical and physical analyses) is shown in Table 3. The number of soil variables in each dataset depended on the intensity of measurements performed at each particular site, but generally included the standard chemical attributes analysed in Brazilian soil analysis laboratories, i.e., pH, Exchangeable Potassium, Calcium, Magnesium and Aluminium, Potential acidity, Available Phosphorous, Soil Organic Carbon, Sum of bases, Cation Exchange Capacity and Base saturation. Infrequently, soil organic nitrogen was

measured. The vast majority of the sites also had particle size distribution results (i.e., sand, silt and clay contents), while only a few had data on bulk density and soil moisture.

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Author contributions

The conceptual design was by GGB, with the assistance of the FaunaServices project members: MC, JM, WD, MLCB, CPV, LPV, CP, BP, and TD. GGB wrote the first draft, and WCD and JM revised the manuscript. Original soil and macrofauna data were prepared by VK, AP, MLCB, NPB, AS, MRGZ, TF, HSN, WM, RTD, LAC, KDS, EO, MC, TAC, and GFB,

and the datasets were transformed and submitted to SiBBR/GBIF by WCD, QG and GGB. Field and laboratory assistance to collect and/or to identify the samples was provided by GGB, WCD, AP, VK, LJO, TF, WM, MLCB, CCN, LAC, DHN, SWJ, AM, AS, MRGZ, ET, JCFS, PRG, DLPG, NPB, RTD, HSN, KDS, LCMF, CESS, OA, OBJ, OS, AG, EO, RMC, BSCF, LSMB, ES, GBXC, PL, EV, MC, AAC, LPV, VPS, AJB, EN, MH, TAC, VLS, CBR, JPDB, JLMG, CBB, RAGV, RRP, and ACC.

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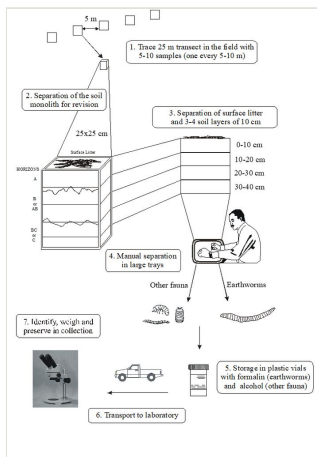


Figure 1.

Step-by-step diagram illustrating the handsorting method of the TSBF (Tropical Soil Biology and Fertility) Program, standardized by ISO (2011, and used to quantitatively sample soil macroinvertebrate communities. Samples are located on a transect or grid, at distances of at least 10 m and preferably 20+ m from each other, and a soil monolith of variable depth (but usually up to 30 cm) is removed in depth increments (usually 10 cm thick) and placed into a plastic bag or bucket and subsequently sorted by hand, to remove all the soil macrofauna visible to the naked eye. The animals are fixed and stored in ethanol at approx. 80%, and taken to be identified in the laboratory. All of the main taxa (Table 1) are quantified and their fresh biomass is estimated using a 0.0001 g balance. Figure from Brown et al. (2001).



Figure 2.

An example of a modification of the TSBF soil monolith sample from a semideciduous tropical forest, where an "L"-shaped hole is dug in front of the monolith to facilitate the removal of the soil layers of different depth increments. The quadrat on top has an internal area of 25 x 25 cm, which is used to mark the area from which the surface litter (when present) is removed for handsorting of the surface-dwelling macroinvertebrates. Photograph by George Brown



Figure 3.

Image of a TSBF monolith sample from a pasture, where only one side of the monolith remains connected, and where a flat straight spade is used to cut 10-cm layers of soil for handsorting. Photograph by George Brown



Figure 4.

Isolation of a TSBF monolith, in which the sample is removed without digging around the hole. This is more effective when only the top 0-10 or at most the 0-20 cm layer is going to be sampled and handsorted. Photograph by George Brown



Figure 5.

Handsorting of soil macrofauna samples taken in a regenerating forest near Pacajá, Pará, Brazil (May 2008). A small amount (at most 2 handfulls) of soil is placed into the large white plastic trays, and is systematically handsorted removing the soil macroinvertebrates by hand or with the aid of small tweezers or even paint-brushes. The fauna are placed into small plastic vials containing ethanol at around 80%. Photograph by George Brown

Table 1.

List of the 42 taxa of soil macroinvertebrates considered in the current datasets (including common names, when present), and an indication of their main food preferences and functional groups. Updated from Brown et al. (2018) and complemented with information from Potapov et al. (2022b).

Taxonomic classification	Common name	Feeding preferences & Functional groups/				
		Geophage, Bioturbator	Detritivore, Coprophage Decomposer	Phytophage, Xylophage, Pest	Carnivore, Predator, Parasite	Fungivore, Microbivore
Phylum Annelida						
Class Clitellata						
Subclass Hirudinea	Leeches				X	
Subclass Oligochaeta						
Order Crassiclitellata	Earthworms	X	X			X
Order Enchytraeida	Enchytraeids, potworms	X	X			X
Phylum Mollusca						
Class Gastropoda	Slugs and snails	X	X	X		X
Phylum Nematoda						
Class Enoplea						
Order Mermithida	Mermithid				X	
Class Gordioidea						
Order Gordioida	Horsehair worms				X	
Phylum Platyhelminthes						
Class Rhabditophora						
Order Tricladida	Flatworms, land planarians				X	
Phylum Arthropoda						
Subphylum Chelicerata						
Class Arachnida						
Order Acari	Mites				X	
Order Amblypigi	Whip-spiders					
Order Araneae	Spiders	X			X	
Order Ixodida	Ticks					

Order Opiliones	Harvestmen	X			X	
Order Pseudoscorpiones	Pseudoscorpions		X		X	X
Order Scorpiones	Scorpions	X			X	
Order Solifugae	Camel spiders	X			X	
Order Uropygi	Vinagroom scorpions				X	
Subphylum Crustacea						
Class Malacostraca						
Order Amphipoda		X	X			
Family Talitridae	Sandfleas					
Order Isopoda						
Suborder Oniscidea	Woodlice, pillbugs, sowbugs	X	X		X	X
Subphylum Hexapoda						
Class Diplura	ND		X		X	
Class Insecta						
Order Achaeognatha	Bristletails		X	X		
Order Blattodea: Blattaria	Cockroaches	X	X	X		X
Order Isoptera	Termites	X	X	X		X
Order Coleoptera	Beetles	X	X	X	X	X
Order Dermaptera	Earwigs	X	X	X	X	
Order Diptera	Fly larvae	X	X	X	X	X
Order Embioptera	Webspinners		X			X
Order Hemiptera		X	X	X	X	
Suborder Auchenorrhyncha	Cicadas	X		X		
SubOrder Heteroptera	True bugs	X		X	X	
Order Hymenoptera						
Family Formicidae	Ants	X	X	X	X	X
Family Vespidae	Wasps, hornets	X			X	
Order Lepidoptera	Butterflies, moths (larvae, pupae)			X	X	
Order Mantodea	Praying mantis				X	

Order Neuroptera						
Family Myrmeleontidae	Antlions	X			X	
Family Chrisopidae	Lacewings				X	
Order Orthoptera	Crickets	X		X		
Order Psocodea	Booklice		X	X		
Order Thysanoptera	Thrips		X	X	X	
Order Trichoptera	Caddisflies		X		X	X
Order Zygentoma	Silverfish		X			X
Subphylum Myriapoda						
Class Chilopoda	Centipedes	X			X	
Class Diplopoda	Millipedes	X	X	X		X
Class Symphyla	Garden centipedes		X	X	X	X

Table 2.

Sites (counties and states following the Brazilian abbreviation, where PR=Paraná, SC=Santa Catarina and SP=São Paulo), approximate geographic location land use systems and number of plots or treatments evaluated, and the number of records, occurrences and metadata including various soil attributes of the 29 datasets on soil macrofauna communities in Brazil made available online (published) in the GBIF system via the Embrapa Forestry IPT (see https://www.gbif.org/dataset/search?offset=0&publishing_org=bcbe7ef4-5cc8-4197-bccc-1e279fb498a7), as part of the project “Soil macrofauna communities in Brazilian land use systems“, through a SoilBON/CSU-GBIF data mobilization call (Guerra and Wall 2023).

Counties (State)	Latitude	Longitude	Land use systems	No. sites, plots treatments	Link to published dataset in GBIF	Records	Occurrence	Soil
Jaguapitã (PR)	-23.04722	-51.54555	native vegetation / pasture / annual crop	9	https://doi.org/10.15468/xjqhra	450	20,250	7,649
Itatinga (SP)	-23.04251	-48.63158	native vegetation / annual crop / pasture / forestry plantation	11	https://ipt.sibbr.gov.br/sibbr/manage/resource?r=soil_macrofauna_itatinga	144	6,192	2,160
Santo Inácio (PR)	-22.76638	-51.85083	perennial crop / pasture / agropastoral and agrosilvopastoral systems / forestry plantation / native vegetation	7	https://doi.org/10.15468/dgjps	156	7,020	1,716
Ponta Grossa (PR)	-25.08638	-50.16055	Agrosilvopastoral and agropastoral system / forestry plantation / perennial crop / pasture	5	https://doi.org/10.15468/p86sf9	150	6,450	2,550
Curitiba (PR)	-25.4257	-49.31163	native vegetation / urban lawn	10	https://doi.org/10.15468/ek2wuh	100	4,500	1,700
Londrina (PR)	-23.44527	-51.24944	native vegetation	3	https://doi.org/10.15468/6rxpw9	150	6,750	2,550
Cafeara (PR)	-22.83575	-51.70034	annual crop / pasture	3	https://doi.org/10.15468/wtfx6j	86	3,870	492
Adrianópolis (PR), Barra do Turvo (SP)	-24.88666	-48.48194	agroforestry systems / native vegetation	6	https://doi.org/10.15468/h6m947	72	3,240	1,224
Ponta Grossa (PR)	-25.23952	-49.9985	native vegetation	2	https://doi.org/10.15468/9ja9ce	60	2,700	480

Lapa (PR)	-25.80932	-49.68626	annual crop / native vegetation	5	https://doi.org/10.15468/h8y7f5	60	2,700	1,020
Londrina (PR)	-23.18527	-51.17833	annual crop	8	https://doi.org/10.15468/3gbqk9	56	2,520	336
Lapa (PR)	-25.65192	-49.70067	agroforestry / native vegetation	5	https://doi.org/10.15468/rmfqj7	41	1,800	336
Três Barras, Canoinhas (SC)	-26.18804	-50.22586	annual crop / forestry plantation / agropastoral system / native vegetation / pasture	5	https://doi.org/10.15468/2r7dpw	45	2,025	765
Pinhais (PR)	-25.40172	-49.1225	annual crop / pasture / agropastoral and agrosilvopastoral system	4	https://doi.org/10.15468/5x7dwu	36	1,620	612
Antonina (PR)	-25.41666	-48.66666	Native tree plantation	2	https://doi.org/10.15468/xagmsg	32	1,440	544
Taciba (SP)	-22.39000	-51.29000	annual crop	3	https://doi.org/10.15468/hfpvrg	28	1,260	165
Londrina (PR)	-23.18527	-51.17833	annual crop	3	https://doi.org/10.15468/pucqj2	32	1,440	154
Campo Mourão (PR)	-24.09000	-52.36000	annual crop	4	https://doi.org/10.15468/gxz6q2	16	720	0
São Jerônimo da Serra (PR)	-23.730034	-50.731778	Organic annual crop	2	https://doi.org/10.15468/fxqq4p	16	720	240
Jataizinho (PR)	-23.31472	-50.87028	Organic annual crop	2	https://doi.org/10.15468/dfdh2j	14	630	155
Campo Mourão (PR)	-24.09000	-52.36000	annual crop	4	https://doi.org/10.15468/595jyb	16	720	0
Londrina (PR)	-23.44333	-51.25805	annual crop / native vegetation	2	https://doi.org/10.15468/9ze9v2	16	720	180
Sertanópolis (PR)	-23.16611	-51.16388	native vegetation	1	https://doi.org/10.15468/6r73ze	17	765	204
Cornélio Procopio (PR)	-23.20000	-50.63000	Native vegetation / annual crop	2	https://doi.org/10.15468/qfzdtc	13	540	144
Londrina (PR)	-23.17166	-51.16583	annual crop	2	https://doi.org/10.15468/hcj7af	14	629	168
Florínia (SP)	-22.88000	-50.73000	annual crop	2	https://doi.org/10.15468/6byztf	10	450	150
Londrina (PR)	-23.20327	-51.17594	Organic crops	2	https://doi.org/10.15468/hya4u8	10	450	110

Colombo (PR)	-25.31554	-49.15531	native vegetation / forestry plantation	7	https://doi.org/10.15468/w6v87y	8	360	40
Londrina (PR)	-23.44277	-51.25222	native vegetation	1	https://doi.org/10.15468/43j5fq	7	315	77
23				122		1,855	82,797	25,92

Table 3.

List of soils-related variables included in the "Extended measurement or fact" datasheets (results of soil chemical and physical analyses and measurements) for each of the 29 datasets available for download from GBIF (see links in Table 2).

Variables	Unit	Description
soil pH	-	soil potential hydrogen content
exchangeable aluminum	cmol _c dm ⁻³	soil exchangeable aluminum content
potential acidity	cmol _c dm ⁻³	soil potential acidity at pH 7
exchangeable potassium	cmol _c dm ⁻³	soil exchangeable potassium content
exchangeable calcium	cmol _c dm ⁻³	soil exchangeable calcium content
exchangeable magnesium	cmol _c dm ⁻³	soil exchangeable magnesium content
available phosphorous	g kg ⁻¹	soil available phosphorous content
soil organic carbon	mg kg ⁻¹	soil organic carbon content
sum of bases	cmol _c dm ⁻³	sum of calcium, magnesium and potassium contents
cation exchange capacity	cmol _c dm ⁻³	soil cation exchange capacity at pH 7
base saturation	%	base saturation
soil organic nitrogen	g kg ⁻¹	soil organic nitrogen content
clay content	g kg ⁻¹	soil mineral particles content with size <0.002 mm
silt content	g kg ⁻¹	soil mineral particles content ranging from 0.002-0.05 mm
sand content	g kg ⁻¹	soil mineral particles content ranging from 0.05-2.0 mm
bulk density	g cm ⁻³	soil bulk density
moisture	%	gravimetric soil water content

Supplementary material

Suppl. material 1: Additional sites (counties and Brazilian states identified with standard abbreviations) and land use systems in various Brazilian biomes (IBGE, 2019) where soil macroinvertebrate communities were sampled using the standard TSBF method in Brazil, and for which data is available at the monolith and/or layer level for up to 42 taxa. The number of sites, plots, or treatments sampled, and the number of records, occurrences, and soils-related data in each dataset are also provided.

Authors: Wiliam C. Demetrio, Quentin Gabriac, George G. Brown

Data type: PDF

Brief description: Table showing additional sites for which soil macrofauna data are available in Brazil. The data from these sites was prepared for the FaunaServices project using the standard template of Mathieu et al. (2023a) and must still be transformed into the Darwin Core standards of GBIF.

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