A geographical database of Iberian peatland and swob records

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Keywords

Field survey; Literature review; Peatlands; Portugal; Spain

Abstract

Recent efforts have compiled distribution data on Iberian Peninsula peatlands, however, the criteria used to characterise these ecosystems have often been derived from regions where peatlands are more extensive and typically occur under wetter climatic conditions. As a result, many peat-accumulating wetlands in this region were overlooked. Identifying and improving the distribution mapping of peatlands is crucial for their conservation and management. Here, we present an updated geographical dataset of peatlands and swobs —i.e. wetlands with a potential to form peat— of the Iberian Peninsula. Peatland and swob records in Portugal and Spain were compiled through an extensive literature review, also incorporating data from

recently published Iberian peatland maps. Additionally, field surveys conducted between 2011–2015, 2018–2021, and 2023–2024 provided additional records. A total of 445 records were included in the database, representing the current knowledge on the distribution of Iberian peatlands and swobs. This dataset allows the identification of occurrence hotspots, highlights underrepresented regions, and provides a foundation for future research and conservation planning.

SPECIFICATIONS

Subject	Earth & Environmental Sciences
Specific subject area	Soil Science; Ecology.
Type of data	Type of data: Table Data format: Filtered, Processed
Data collection	Peatland and swob records in Portugal and Spain (n=445) were compiled through an online literature review and field surveys. The literature review (n=398) was based on Google Scholar and Google Search, covering multiple sources from various knowledge fields (e.g., paleoenvironment, palynology). Field data (n=47) from surveys performed by the authors (2011–2015, 2018–2021 and 2023–2024) were also included. All records were harmonised and integrated into a unified dataset, enriched with additional information on the geographical, environmental, and socio-economic features of each site.
Data source location	Portugal and Spain peatlands and swobs records, Iberian Peninsula. Geographical extent ranges from 36º 00’ N and 43º 47’ N latitude and 9º 29’ W and 3º 19’ E longitude. Online data collection took place at the Centre of

	Geographical Studies, Institute of Geography and Spatial Planning, University of Lisbon, Rua Branca Edmée Marques, 1600-276 Lisboa, Portugal.
Data accessibility	Repository name: Geographical database of Iberian peatland and swob records Data identification number: https://doi.org/10.5281/zenodo.15412159 Direct URL to data: https://zenodo.org/records/15412160
Related research article	'none'

1. Value of the Data

- Peatlands have gained global attention due to their essential ecosystem services, particularly their role in carbon storage and sequestration. However, comprehensive and harmonized distribution data for these ecosystems remain incomplete in many countries, including Portugal and Spain.
- Preventing the loss of peatland areas requires knowing their distribution. This dataset, which includes 445 records of peatlands and swobs, considerably enhances our understanding of their distribution across the Iberian Peninsula and demonstrate that these ecosystems are more widespread than previously recognised.
- The dataset generated in this study provides a valuable resource for peatland research, offering ground-truth records that can contribute to global initiatives such as the Global Peatland Assessment [1]. Moreover, it is a practical tool for ecosystem managers, conservationists, and environmental authorities.

2. Background

In the Iberian Peninsula, peatlands are mainly found in the northern and northwestern mountain ranges, where high precipitation and lower temperature variability support peat formation [2]. In contrast, southern regions remain understudied, with peatlands typically small, fragmented, and formed under limited water availability [3]. Despite these constraints, peat deposits also occur in coastal and sublittoral wetlands of the west and south, including interdune slacks, endorheic basins, and back-swamp mires [3, 4]. Though less extensive, these southern peatlands often support high floral diversity [5].

Previous mapping efforts have mostly relied on criteria suited to northern peatlands, such as minimum thickness thresholds, often overlooking the characteristics of Iberian peat-forming systems [4, 6]. To address this, we developed a more extensive dataset to improve the completeness of peatland distribution mapping in the region. Peatlands were identified based on the confirmed presence of peat in the top 30 cm of soil, regardless of horizon thickness, and swobs (i.e., vegetated areas with peat-forming potential; [5]) were also included.

This approach helps capture overlooked peat-forming ecosystems and improves their spatial representation, particularly in arid, Mediterranean regions where they are often underreported [4, 6, 7].

3. Data Description

The dataset consists of a datasheet [8] with 445 entries, each representing a record of a peatland or a swob. Of these, 390 records are located in Spain and 55 in Portugal (Fig. 1). The records were compiled through an extensive literature review and complemented by field surveys performed by the authors.

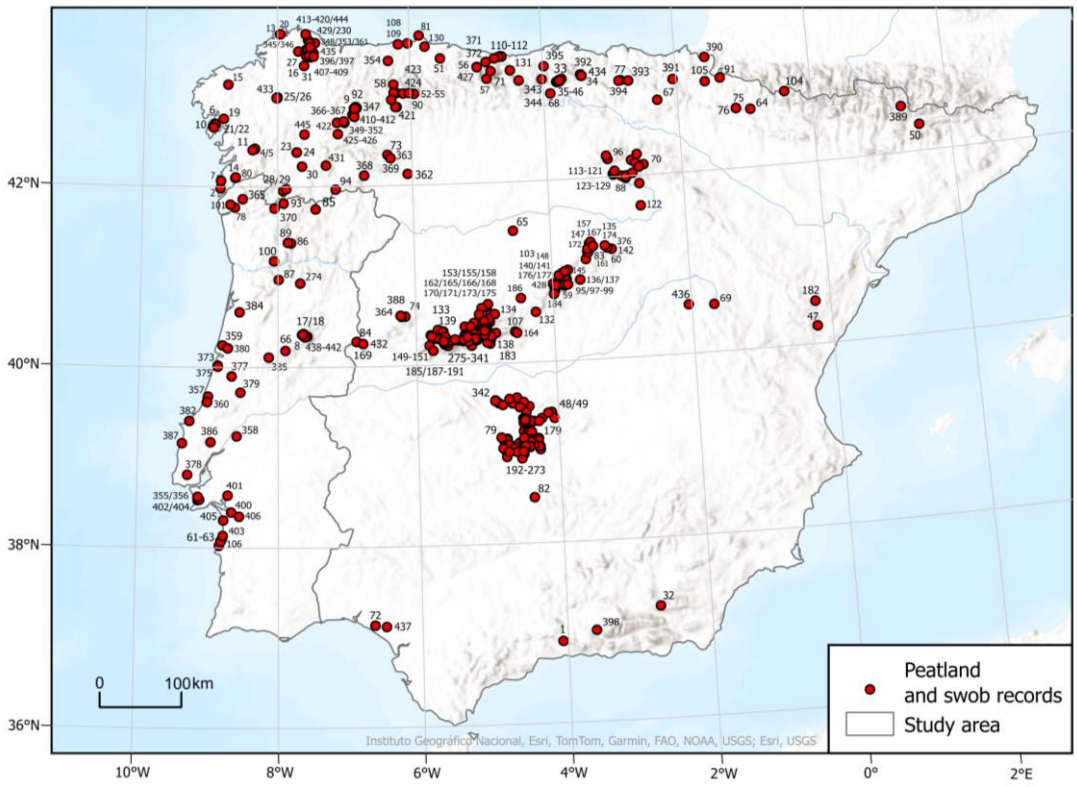

Figure 1 – Spatial distribution of peatland and swob point records collected for Spain and Portugal, based on a literature review and field surveys.

The presented geographical database is stored in an Excel file table format, called "Fernandes_et_al_Peatmap_database_v1.0.xlsx". It contains three sheets. In the first ("Description"), we present a summary of the content that can be accessed in the database. The second ("Dataset") contains 19 columns that aim to identify ("ID"; "Original name"), locate ("Country"; "Municipality"; "Latitude"; "Longitude"), and characterize ("Elevation (m a.s.l.)"; "Extent (ha)"; "Characteristics from literature/fieldwork"; "Mire types based on Natura 2000 habitat"; "Maximum peat depth registered (cm)"; "Classified area/Protection Status"; "Biogeographical region"; "Mire region of Europe"; "Artificial areas (%)"; "Agricultural areas (%)"; "Forest and semi-natural areas (%)"; "Wetlands and Water Bodies (%)") the records. The last column, "Source", indicates the origin of each record, specifying either the literature reference from which the information was obtained or identifying it as a result of own

fieldwork. The third sheet ("References") is the list of references to the records collected in the literature review.

Latitude and longitude coordinates have been standardised in decimal degrees using the standard WGS84 geographic coordinate system, facilitating the integration of location data into Geographic Information Systems (GIS) and supporting visual analysis of the spatial distribution of parameters associated with each record (e.g., Fig. 2). A "NA" code was assigned whenever it was not possible to obtain information for any of the represented variables.

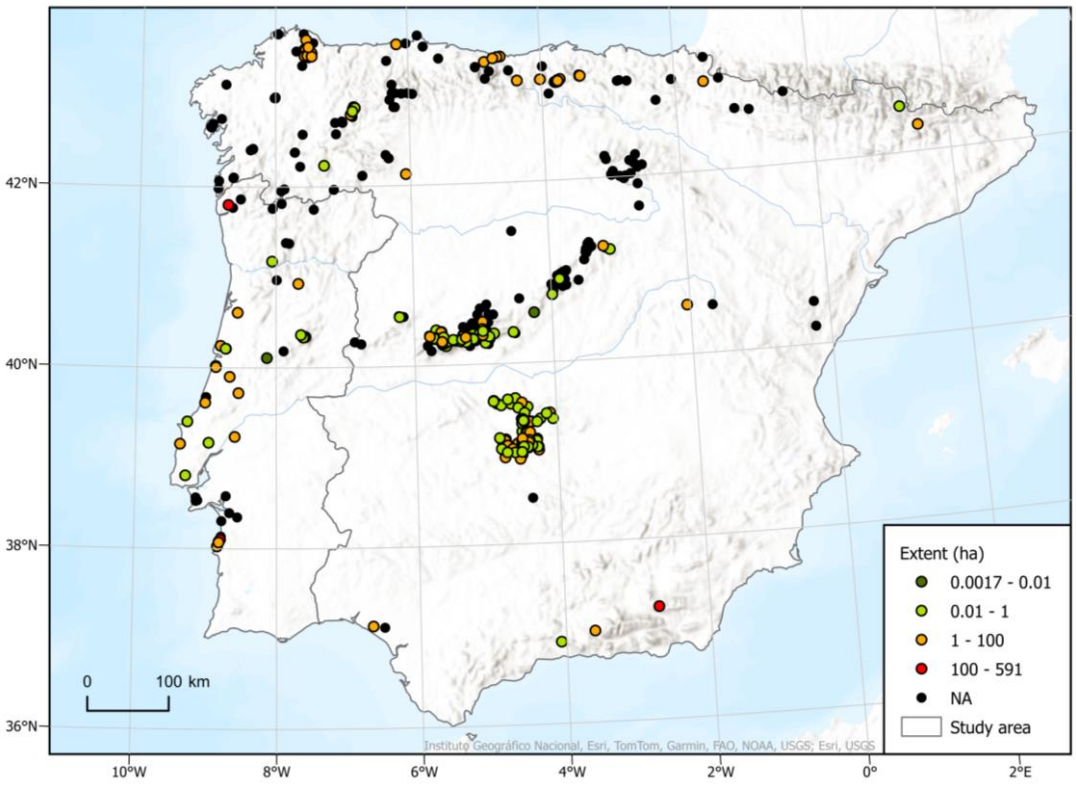

Figure 2 – Example of a visual analysis allowed by the dataset showing the of extent (ha) for each record. Black dots (NA) indicate records where extent information was unavailable.

4. Materials and Methods

4.1. Criteria

To consider a peatland and swob record in the presented dataset, criteria from [5] was adopted, which describe a peatland as an area with a naturally accumulated peat layer at the surface, even if the peat horizon does not reach the minimum 30-cm thickness threshold, and a swob as a wetland with vegetation that may form peat. By using this criterion, records of buried peat and peat at the surface after erosion (i.e., former active peatland ecosystems) are excluded.

4.2. Literature review

Dataset was assembled starting with a systematic review, using Google Scholar and Google Search. Multiple search terms were utilised ("turba", "turbera", "turfa", "turfeira", "peat", "peatland", "mire" and "swob"), combined with the terms "Portugal" and "Spain", and searched published and unpublished scientific articles, doctoral theses, books, and technical reports, from different research areas (e.g., paleoenvironment, palynology, paleoecology). To ensure the comprehensive inclusion of currently existing peatlands, information from the most recent maps of Iberian peatland was also included [3, 4, 6], as well as records cited in at least one document published from 2000 onwards. French, English, Portuguese, and Spanish literature was included.

4.3. Field surveys

Field surveys were conducted during three main periods: 2011–2015, 2018–2021, and 2023–2024. Survey locations were selected based on the presence of mire-typical indicator taxa, known to be associated with peatlands and other organic soil-forming environments across the Iberian Peninsula [9]. The presence or absence of peat was confirmed through in situ macroscopic soil analysis, by using a Royal Eijkelkamp two-piece gauge auger set with conical

screw thread. This equipment facilitated accurate macroscopic assessment across a wide range of soil types, from soft peaty soils to more resistant sandy, loamy, or clayey substrates, and the determination of the peat depth. Geographic coordinates for each sampling site were recorded using a handheld GPS device, allowing a spatial precision of 10m or higher.

4.4. Variable structure

Information about each group of variables - identification, location, and characterisation - was collected for each record, according to the proceedings described in Table 1.

Table 1 – Name of each variable considered in the dataset and description of the procedures adopted to collect the corresponding data.

Group	Variable name	Description
Identification	ID	Identification number for each record, attributed by the authors.
	Original name	Retrieved from literature OR during the field surveys, based on the stream, lagoon, or locality where the record was collected.
	Country	ES = Spain; PT = Portugal
Location	Municipality	Records were intersected with the municipality shapefile provided in the *Base de datos de divisiones administrativas de España* (2019) (Centro Nacional de Información Geográfica, 2025), for Spain, and the shapefile *Carta Administrativa Oficial de Portugal (CAOP)* [10].
	Latitude	Retrieved from literature OR field survey measurements. UTM coordinates and degrees, minutes, and seconds were standardised into decimal degrees using the WGS84 geographic coordinate system.
	Longitude	
Characterization	Elevation (m a.s.l.)	Retrieved from literature OR field survey measurements, when available. If not, elevation data was extracted from the Digital Elevation Model derived from the SRTM 1 Arc-Second Global elevation data, from the EROS Center [11].
	Extent (ha)	Retrieved from literature OR field survey measurements.

Characteristics from literature/fieldwork	Retrieved from literature review OR field survey observation.
Mire types based on Natura 2000 habitat	When available, Natura 2000 habitat information was retrieved from literature. If not, the records were intersected with the Natura 2000 spatial data from the European Environment Agency [12]. The habitats were classified according to Heras Pérez et al. (2017): Raised bog - 7110; Blanket bog - 7130; Fen - 7140, 7150, 7210, 7230; Para-peaty habitats (swobs) - 7140/7230.
Maximum peat depth registered (cm)	Retrieved from literature review OR field survey measurements.
Classified area/Protection Status	Records were intersected with the World Database on Protected Areas (WDPA) [13].
Biogeographical region	Retrieved from Biogeographical regions in Europe [14].
Mire region of Europe	Retrieved from Moen et al., 2017) [15]
Artificial areas (%)	In GIS, a 2000 m radius buffer was generated around the central coordinate of each peatland or swob record. The percentage of area covered by the CORINE Land Cover land use classes from 2018 [16], was then calculated in each buffer.
Agricultural areas (%)	
Forest and semi-natural areas (%)	
Wetlands and Water Bodies (%)	
Source	Original source of the record.

Limitations

Not applicable.

Ethics statement

Our work does not involve studies with animals and humans.

CRediT Author Statement

Raquel Fernandes: Conceptualization, Data collection, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. **Miguel Geraldes:** Conceptualization, Data collection, Methodology. **Guaduneth Chico:** Conceptualization, Methodology, Writing – review & editing. **César Capinha:** Conceptualization, Supervision, Writing – review & editing.

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Declaration of Competing Interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

[1] United Nations Environment Programme. (2022). Global Peatlands Assessment – The State of the World's Peatlands: Evidence for action toward the conservation, restoration, and sustainable management of peatlands. Main Report. https://www.unep.org/resources/global-peatlands-

[2] Martínez Cortizas, A., Pontevedra Pombal, X., Novóa Muñoz, J. C., & García.Rodeja, E. (2000). Turberas de montaña del Noroeste de la Península Ibérica. Edafolofia , 7, 1–29.

[3] Pontevedra-Pombal, X., Castro, D., Carballeira, R., Souto, M., López-Sáez, J. A., Pérez-Díaz, S., Fraga, M. I., Valcárcel, M., & García-Rodeja, E. (2017). Iberian acid peatlands: Types, origin and general trends of development. Mires and Peat, 19. https://doi.org/10.19189/MaP.2016.OMB.260

[4] Mateus, J., Queiroz, P., & Joosten, H. (2017). Portugal. In H. Joosten, F. Tanneberger, & A. Moen (Eds.), Mires and peatlands of Europe (pp. 572–579).

[5] Joosten, H., Tanneberger, F., & Moen, A. (2017). Mires and peatlands of Europe. E. Schweizerbart'sche Verlagsbuchhandlung .

[6] Heras Pérez, P., Sánchez, M., Pontevedra-Pombal, X., & Nóvoa-Muñoz, J. (2017). Spain. In Mires and peatlands of Europe (pp. 639–656).

[7] Kottek, M., Grieser, J., Beck, C., Rudolf, B., & Rubel, F. (2006). World map of the Köppen-Geiger climate classification updated. Meteorologische Zeitschrift, 15(3), 259–263. https://doi.org/10.1127/0941-2948/2006/0130

[8] Fernandes, R., Geraldes, M., Chico, G., & Capinha, C. (2025). Geographical database of Iberian peatland and swob records [Data set]. Zenodo. https://doi.org/10.5281/zenodo.15412160

[9] Geraldes, M., Fernandes, R., Santos, M., & Capinha, C. (2025). Bioindicator-based mapping of peatland potential in the Western Mediterranean-Atlantic Realm. BioRxiv, 2025.03.21.644445. https://doi.org/10.1101/2025.03.21.644445

[10] Direção-Geral do Território. (2024). Carta Administrativa Oficial de Portugal.

[11] Earth Resources Observation and Science (EROS) Center. (2018). USGS EROS Archive - Digital Elevation - Shuttle Radar Topography Mission (SRTM) 1 Arc-Second Global.

[12] European Environment Agency. (2021). Natura 2000 - Spatial data. https://www.eea.europa.eu/data-and-maps/data/natura-14/natura-2000-spatial-data

[13] UNEP-WCMC, & IUCN. (2025). The World Database on Protected Areas (WDPA). https://www.protectedplanet.net

[14] European Environmental Agency. (2024). Biogeographical regions in Europe. https://www.eea.europa.eu/en/analysis/maps-and-charts/biogeographical-regions-in-europe-2?activeTab=265e2bee-7de3-46e8-b6ee-76005f3f434f

[15] Moen, A., Joosten, H., & Tanneberger, F. (2017). Mire diversity in Europe: Mire regionality. In H. Joosten, F. Tanneberger, & A. Moen (Eds.), Mires and Peatlands of Europe. Status, Distribution and Conservation (pp. 97–150). Schweizerbart.

[16] European Union, & Copernicus Land Monitoring Service. (2018). European Union, Copernicus Land Monitoring Service 2018, European Environment Agency. https://land.copernicus.eu/pan-european/corine-land-cover