

First confirmed records of *Thyris fenestrella* (Scopoli, 1763) (Lepidoptera: Thyrididae) in Portugal: distribution, hostplant associations, and morphological variation

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Abstract: In this paper *Thyris fenestrella* (Scopoli, 1763) (Lepidoptera: Thyrididae) is reliably reported for the first time in Portugal, based on multiple recent records from the southernmost region of the country. These observations represent a significant range extension, as they are geographically isolated from the species' previously known Iberian populations. Given the disjunct nature of these Portuguese occurrences, the species' biology and its distribution in southern Iberia is explored. In addition, the associated history behind this species' recording in the region is commented. This contribution aims to highlight the need for targeted research to better understand this elusive and understudied moth.

Key words: Lepidoptera, Thyrididae, *Thyris fenestrella*, *Clematis*, Portugal.

Resumen: Primeros registros confirmados de *Thyris fenestrella* (Scopoli, 1763) (Lepidoptera: Thyrididae) en Portugal: distribución, asociaciones de plantas huésped y variación morfológica. En este trabajo se cita de manera fidedigna *Thyris fenestrella* (Scopoli, 1763) (Lepidoptera: Thyrididae) por primera vez en Portugal, a partir de múltiples registros recientes en la región más meridional del país. Estas observaciones representan una extensión significativa del área de distribución, ya que están geográficamente aisladas de las poblaciones ibéricas previamente conocidas de la especie. Dada la disjunta naturaleza de estos hallazgos portugueses, se explora la biología de la especie y su distribución en el sur de Iberia. Además, se comenta la historia asociada detrás del registro de esta especie en la región. Esta contribución tiene como objetivo resaltar la necesidad de una investigación específica para comprender mejor a esta polilla esquiva y poco estudiada.

Palabras clave: Lepidoptera, Thyrididae, *Thyris fenestrella*, *Clematis*, Portugal.

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Introduction

Thyris fenestrella (Scopoli, 1763) is a small, day-flying moth native to the warm-temperate zones of the Palaearctic region. It ranges from western Europe (e.g., Spain and France) to the Russian Far East and Japan (Thiele, 1986; Karsholt & Razowski, 1996; Tschistjakov, 1998). Its distribution is almost continuous in central Europe, but it becomes increasingly scattered both in the north (e.g. Dawidowicz, 2015; Aarvik *et al.*, 2017) and to the south, in southern Spain, Sicily and Syria (Thiele, 1986; GBIF, 2023). The species belongs to the family Thyrididae, a primarily tropical clade, and is the only confirmed West Palaearctic representative of this group. Its congeneric relatives include *Thyris usitata* Butler, 1879, found in Japan and the Kuril Islands, and *T. maculata* Harris, 1836, distributed across eastern North America (Thiele, 1986).

Thyris fenestrella is notable for its heliophilic and diurnal behaviour, often seen nectaring on flowers such as *Sambucus* spp., or aggregating at puddles and dung in full sunlight, but does not come to light-traps (Buchbaum & Thiele, 2007). These behaviours, combined with its small size and possible resemblance to a dipteran or small hymenopteran, may contribute to detection bias and historical under-recording.

Ecologically, the species is closely associated with calcareous scrubland, hedgerows, and sunny woodland glades where its primary larval host plant, *Clematis vitalba* (Ranunculaceae), thrives (Hasenfuss, 1980; Dawidowicz, 2015). The larvae begin as leaf miners, but later feed externally, spinning leaves into silken shelters. Pupation occurs within a tough cocoon in the leaf litter or topsoil. Typically univoltine in Europe, adults are active during late spring to mid-summer, aligning with the flowering period of co-occurring nectar sources (Thiele, 1983, 1986; Buchbaum & Thiele, 2007).

Despite being relatively widespread in central and eastern Europe, *T. fenestrella* has historically remained elusive in the Iberian Peninsula. Its Iberian distribution has long been characterized by both under-detection and true scarcity. Early lepidopterological literature noted its rarity on the Peninsula (Gómez Bustillo & Fernández Rubio, 1976), and modern records corroborate that it is indeed seldom encountered outside a few regional clusters.

Notably, *T. fenestrella* is relatively well documented in northeastern Spain, particularly in Catalonia, where a plethora of confirmed occurrences have been reported in recent years (GBIF, 2023), and in Huesca (Abós Castel, 2013). Outside this northeastern nucleus, however, its presence is fragmentary. Scattered records exist for the northernmost third of the Iberian Peninsula, including three nearby localities in Galicia (Fernández Vidal, 2011), and singletons in Zamora (Magro & Jambrina Pérez, 2013), and Cáceres (Blázquez-Caselles *et al.*, 2021).

In southern Spain, the species' occurrence is historically notable yet taxonomically complex. The reference to Andalusian specimens goes back at least to Möschler (1866), when dealing with samples collected by the Count of Hoffmannsegg, but it was not until Oberthür (1884) that it was dealt in more detail, when the author described a reduced-spotted form, with slightly different antennal structure from Sierra Nevada (Güéjar Sierra, originally written as 'Huejar'), as *Thyris nevadae* Oberthür, 1884. Thiele (1986), upon examination of two syntypes in the BMNH, placed the taxon under *T. usitata*, corroborating their morphological fit to the Eastern Palaearctic species. The reason for retaining taxon *nevadae* may have been only the remarkably disjunct distribution. However, before considering the occurrence of both species in Iberia, a more likely explanation may lie in the original mislabeling of the material that was used by C. Oberthür in the description of *T. nevadae*, regardless of the true occurrence of the species in the region, as currently advanced by E. Rennwald (Lepiforum, 2025).

Whilst the species has remained largely undocumented in modern Andalusian surveys, it was again observed near Jaén as recently as of 2014 (GBIF, 2023), suggesting persistence in parts of southern Iberia, albeit without comprehensive confirmation across the wider region (Fuentes García, 2003).

If the extent of the distribution of the species and its potential genetic distinction from northern populations still remains unresolved in southern and western Spain, there is at least photographic evidence confirming the species' presence in these areas. This is not the case of Portugal, from where the species had been reported only once, in Vizela (Braga) in July (Cruz & Wattison, 1931), and never again. Corley (2015a, 2015b) cast doubt on this record, treating it as a probable misidentification, after having found no specimens in the collections of M.A. Silva-Cruz or J.T. Wattison, currently housed respectively in the Natural History Museum of Porto (MHNC-UP) and the Natural History Museum, London (BMNH).

Thus, between 1931 and recent years, the presence of *T. fenestrella* in Portugal remained unconfirmed in the absence of precise specimen-associated records or other corroborated evidence.

In 2015, however, *T. fenestrella* was found in Portugal. A number of observations followed, representing a significant expansion of knowledge in the westernmost part of the species' range,

extending into previously unsampled territory. These new Portuguese records lie far from the nearest stable populations in northeastern or central Spain, underscoring the importance of presenting the novel data associated with them in the understanding of the species' biology, ecology and distribution, and raising renewed biogeographical and ecological attention to Iberia's southwestern edge, where the life-histories of many species remain underexplored.



Fig. 1.- Male specimen of *Thyris fenestrella* spotted in Pardieiro, Monchique, 04.04.2015. Photo: Néilson Fonseca.

Material examined and observational results

The first recent, confirmed observation of *T. fenestrella* in Portugal was made in early April 2015 by the senior author, who encountered a single male specimen resting on moist rocky substrate near a stream in the Monchique area of western Algarve (Fig. 1). The local habitat is characterised by a schist outcrop flanked by riparian vegetation dominated by *Alnus lusitanica* and *Salix salviifolia* subsp. *australis*. This observation was biogeographically unexpected at the time, as the nearest known localities were in Galicia (Fernández Vidal, 2011) and the historical record from Sierra Nevada (Oberthür, 1884).

In April 2025, the junior author was able to locate the species in two nearby areas of central Algarve): Fonte Filipe (Fig. 2) and Fonte da Benémola. This represents a considerable eastward range extension and a confirmation of the presence of the species in the wider region. In Fonte Filipe, a female moth (Figs. 3-4) was spotted flying between a *Cistus monspeliensis* bush and a nearby thicket of *Clematis flammula*, and was initiating oviposition on a leaf underside when netted. In Fonte da Benémola, a male was observed whilst feeding on *Cistus albidus* in the ridge over the dirt-track that traverses the area. This male however, flew away to an inaccessible place.



Fig. 2.- Habitat of *Thyris fenestrella* in Fonte Filipe with *Clematis flammula* in the foreground. Photo: Eduardo Marabuto.



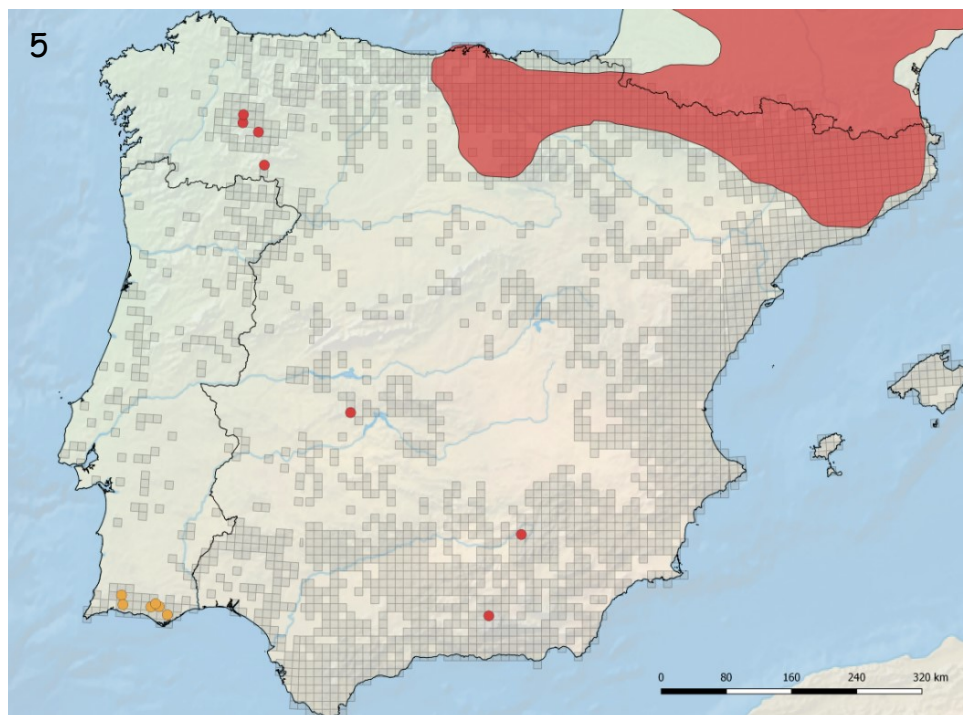
Figs. 3-4.- Female specimen of *Thyris fenestrella* collected in Fonte Filipe, Loulé, 16.04.2025. Eduardo Marabuto leg. & photos.

Additionally, three intermediate records were sourced from the iNaturalist platform which makes them publically available (iNaturalist community, 2025). These were based on photo-confirmed observations submitted between 2022 and 2024. Each was reviewed and validated by the authors. The inclusion of these records enhances the spatial and temporal resolution of *T. fenestrella*'s occurrence in southern Portugal and supports preliminary interpretations of its ecological preferences and range limits. A full list of all records is presented in Table 1.

Table 1. - Known records of *Thyris fenestrella* in Portugal.

Record	Locality data	Coordinates (MGRS)	Date	Observer, Source	Notes
0	Vizela, Braga	-	July < 1931	Silva Cruz & Wattison (1931)	Unconfirmed
1	Pardieiro, Monchique	29SNB4526	04.04.2015	Nélson Fonseca, this paper	Male puddling, light color
2	Alcaria Cova, Estoi	29SPB0205	24.04.2022	João Santos, iNaturalist (112700124)	Male nectaring on <i>Cistus monspeliensis</i> , dark color
3	Barrocal de Tôr, Loulé	29SNB8214	09.04.2023	Luis da Costa, iNaturalist (154175277)	Male nectaring on <i>Cistus albidus</i> , dark color
4	Arrochela, Silves	29SNB4715	02.04.2024	Thijs Valkenberg, iNaturalist (205926388)	Male nectaring on <i>Cistus albidus</i> , light color
5	Fonte Filipe, Loulé	29SNB9215	16.04.2025	Eduardo Marabuto, this paper	Female on <i>Clematis flammula</i> , light color
6	Fonte da Benémola	29SNB8718	17.04.2025	Eduardo Marabuto, this paper	Male on <i>Cistus albidus</i> , light color

Fig. 5.- Known Iberian distribution of *T. fenestrella* superimposed to the distribution of *Clematis* spp. in Ramos-Gutiérrez *et al.* (2021), Araújo *et al.* (2025a, 2025b), Gomes *et al.* (2025), and Carapeto *et al.* (2025). In red, the distribution in Spain according to published information and GBIF (2023); in orange, new records.



Discussion

The newly documented records of *T. fenestrella* from southern Portugal significantly enhance our understanding of the species' distribution in the Iberian Peninsula (Fig. 5, including Spanish records from Fernández Vidal, 2011; Blázquez-Caselles *et al.*, 2021; GBIF, 2023). Until recently, the species had not been reliably recorded from Portugal since the disputed 1931 record (Cruz & Wattison, 1931; Corley, 2015a, 2015b). With six independent records between 2015 and 2025, all supported by photographic or specimen-based evidence, *T. fenestrella* can now be confidently added to the Portuguese fauna. Moreover, the spatial consistency of these records across the Algarve region suggests not isolated vagrants but the presence of small, possibly overlooked, local populations.

The strong association between *T. fenestrella* larvae and species of *Clematis*, particularly *C. vitalba* but also *C. recta* in Poland (Dawidowicz, 2015), is well-documented (Hasenfuss, 1980; Lepiforum 2025). In Portugal, *C. vitalba* is widespread but largely absent from the southernmost regions, including the Algarve (Araújo *et al.*, 2025a). Instead, two other *Clematis* species, *C. flammula* and *C. cirrhosa*, are prevalent in the south (Carapeto *et al.*, 2025; Gomes *et al.*, 2025), particularly in limestone habitats and Mediterranean scrub, with *C. flammula* showing a broader distribution. *C. campaniflora* has a more northern prevalence, although it is widespread countrywide (Araújo *et al.*, 2025b) (Fig. 6).

All verified Portuguese records of *T. fenestrella* fall within or adjacent to grid squares where *C. flammula* is known to occur, and the most recent field observations not only explicitly document the species flying near or between thickets with *C. flammula* but its use for oviposition was observed at Fonte Filipe. While the possibility of larval feeding on *C. cirrhosa* cannot be excluded, this species appears less widespread and more restricted. The circumstantial evidence therefore supports *C. flammula* as the likely local hostplant in Algarve populations of *T. fenestrella*.

This geographic host-shift, or at least host-flexibility, mirrors the biogeographic pattern observed in southern Spain, where the species seems to occur in areas largely devoid of *C. vitalba*, such as Cáceres (only *C. campaniflora*) and Jaén (*C. vitalba* and *C. flammula* possible, but the latter is more abundant) (Ramos-Gutiérrez *et al.*, 2021). As such, Portuguese populations may represent part of a relict southern Iberian lineage capable of exploiting other Mediterranean-adapted *Clematis* species.

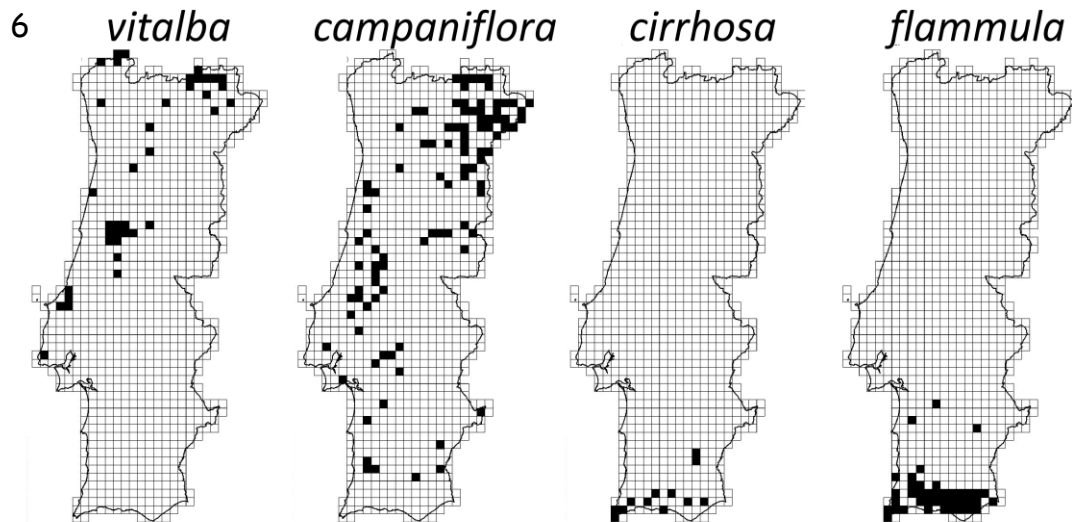


Fig. 6. - The Portuguese distribution of species within the genus *Clematis*, hostplants of *Thyris fenestrella*, according to Araújo et al. (2025a) (*C. vitalba*), Araújo et al. (2025b) (*C. campaniflora*), Gomes et al. (2025) (*C. cirrhosa*), and Carapeto et al. (2025) (*C. flammula*).

Potential distribution and undetected populations

The records presented here are limited to the Algarve and, therefore, hard to translate to national level. This geographic clustering could reflect true ecological restriction or be an artefact of sampling bias. The combined hostplant map (Fig. 3) shows that *C. flammula* is restricted to the extreme south, while *C. vitalba* and *C. campaniflora* dominate in the north and central regions. This opens the possibility that *T. fenestrella* may occur in central and northern Portugal whenever *Clematis* spp. co-occur yet has gone undetected.

Moreover, the extremely narrow flight period of the species in Portugal (all confirmed records occur between early and late April) likely contributes to its under-recording. *T. fenestrella*'s diurnal activity, low flight near the ground, and superficial resemblance to other flying insects may further reduce detection likelihood, especially in areas not targeted by daytime visual surveys. The lack of attraction to light traps (a primary tool in most Lepidoptera monitoring) further limits detection. Targeted springtime surveys focusing on *C. vitalba* and *C. flammula*-rich habitats would be the most effective approach to further assess the moth's range.

Given this, it is reasonable to expect that small, undetected populations may exist elsewhere in Portugal. More importantly, targeted research in the extreme north of the country, near *C. vitalba* thickets may yield modern records and potentially validate the record by Silva Cruz & Wattison (1931).

Morphological observations and taxonomic implications

In addition to the ecological data, a preliminary morphological assessment of the Portuguese specimens was conducted from photos and a collection-based female (Fig. 1B & 1D). The moths examined show moderate intraspecific variation, particularly in overall wing coloration, ranging from pale golden-brown to a much darker brown, with no clear geographical pattern. Most specimens observed in the Algarve tend to be lighter-coloured, though both extremes of this range are present. The pattern of vitreous (transparent) wing spots also shows individual variability, but does not support a consistent trend toward reduction in size or number. This is notable, as reduced fenestrae have historically been used as diagnostic features in distinguishing *T. usitata* from *T. fenestrella* (Thiele, 1986). However, none of the observed individuals displayed the markedly reduced or absent fenestrae, nor the strongly altered wing proportions or antennal structure described by Oberthür (1884) for his taxon *T. nevadae*. These observations, while preliminary, lend further support to the identification of the Portuguese populations as *T. fenestrella*, and suggest that observed variation may reflect either natural polymorphism or local environmental adaptation. Formal morphometric analyses and dissection of genitalia, as well as

comparison with populations from eastern Spain and France, would be valuable in verifying the degree of morphological continuity.

Ecological significance and future research

These findings raise intriguing questions about the species' hostplant specificity, population structure, and biogeographical origin in southwestern Iberia. The apparent absence of *T. fenestrella* from areas where *C. campaniflora* and *C. cirrhosa* are dominant may reflect either unadapted larval physiology, a lag in colonization history or simply a lack of observations, even despite the Algarve being amongst the best studied regions of the country for butterflies and moths (Corley, 2015b). Additionally, the flight period in Portugal appears to precede most populations throughout Europe (Buchbaum & Thiele, 2007; GBIF, 2023), perhaps as an adaptation to early-blooming host associations in an extremely mild Mediterranean climate.

In conclusion, this study presents relevant data about the distribution and ecology of this hitherto unknown species in Portugal, but considerable research opportunities remain, particularly concerning early stage documentation, confirmation of host-plant range, and molecular comparisons. Sequencing mitochondrial DNA to compare southern Iberian populations with those in northeastern Spain and central Europe, followed by ecological niche modelling, may help to identify potentially suitable yet unrecorded areas of occurrence or of genetic uniqueness.

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