Title page

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Catalogue of Papilionoidea from Noguera de Albarracín (Teruel, Spain), including new distributional data for the Sierra de Albarracín (Insecta: Lepidoptera)

Título

Catálogo de Papilionoidea de Noguera de Albarracín (Teruel, España), con nuevos datos de distribución para la Sierra de Albarracín (Insecta: Lepidoptera)

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Statements and Declarations

Competing Interests

The authors have no relevant financial or non-financial interests to disclose

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None conflicts to our knowledge, no special approval required

Permission to reproduce material from other sources

No materials from other sources are included

Contribution of authors

All authors contributed to the study conception and design. Material preparation, data collection were performed by Mario Alamo and Javier Sánchez. The first draft of the manuscript was written by Mario Alamo and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Abstract

We present a catalogue of butterflies from Noguera de Albarracín (Teruel, Spain), based on field surveys conducted in 2024 and 2025 within the framework of the Iberozoa Entomology Course. A total of 52 species were recorded, representing 20.15% of the Iberian butterfly fauna. The material belongs to 5 families, 13 subfamilies, 33 genera and 52 species. Lycaenidae was the richest family with 16 species, followed by Nymphalidae (15), Pieridae (12), Hesperiidae (8) and Papilionidae (1). Several taxa of conservation interest were detected, including the Iberian endemics *Iolana debilitata*, *Lycaena bleusei* and *Polyommatus nivescens*. Threatened species such as *Scolitantides orion* and *Euphydryas aurinia* were also recorded, the latter listed in Annex II of the EU Habitats Directive. Additionally, the occurrence of *Boloria dia* represents the southwesternmost distributional record of the species in the Iberian Peninsula. This study highlights the importance of the Sierra de Albarracín as a refuge for Iberian butterfly diversity, including rare and endemic taxa, and provides baseline data for future conservation and monitoring programmes.

Keywords: Lepidoptera, butterfly checklist, Iberian Peninsula, endemic species, conservation, Sierra de Albarracín

Resumen

Se presenta un catálogo de mariposas diurnas de Noguera de Albarracín (Teruel, España), obtenido a partir de muestreos de campo realizados en 2024 y 2025 en el marco del Curso de Entomología de Iberozoa. Se registraron un total de 52 especies, lo que representa el 20,15% de la fauna ibérica de ropalóceros. El material corresponde a 5 familias, 13 subfamilias, 33 géneros y 52 especies. La familia más diversa fue Lycaenidae con 16 especies, seguida de Nymphalidae (15), Pieridae (12), Hesperiidae (8) y Papilionidae (1). Se detectaron varios taxones de interés para la conservación, entre ellos los endemismos ibéricos *Iolana debilitata*, *Lycaena bleusei* y *Polyommatus nivescens*. Asimismo, se registraron especies amenazadas como *Scolitantides orion* y *Euphydryas aurinia*, esta última incluida en el Anexo II de la Directiva Hábitats de la UE. De forma destacable, la presencia de *Boloria dia* supone la cita más suroccidental conocida hasta la fecha en la península ibérica. Este estudio subraya la importancia de la Sierra de Albarracín como refugio de diversidad de mariposas, incluyendo especies raras y endémicas, y aporta datos de referencia para futuros programas de conservación y seguimiento.

Palabras clave: Lepidoptera, catálogo de mariposas, Península Ibérica, especies endémicas, conservación, Sierra de Albarracín

Introduction

Butterflies (Lepidoptera: Papilionoidea) are among the best-studied insect groups in terms of taxonomy, distribution, and ecology, and serve as effective bioindicators of environmental change due to their sensitivity to habitat alterations and climatic shifts (Pollard & Yates, 1993; Thomas, 2005). Faunistic surveys are essential to document biodiversity at local and regional scales, particularly in heterogeneous mountain landscapes where species richness is high and distribution limits are often poorly defined (Kudrna et al., 2011; García-Barros et al., 2013).

The Iberian Peninsula hosts a particularly rich butterfly fauna, characterized by the interplay between Mediterranean and Eurosiberian elements (García-Barros et al., 2004). The Sierra de Albarracín, in the eastern Iberian System (Teruel, Spain), is a biogeographically significant area whose complex geology, altitudinal gradients, and mosaic habitats—including calcareous grasslands, pine forests, and riparian zones—favor a rich lepidopteran assemblage (García-Barros et al., 2004).

Several conservation-relevant taxa inhabit this region, such as *Erebia zapateri* (Oberthür, 1875), an Iberian endemic restricted to Montes Universales and surrounding ranges (Tennent, 2008), and *Chazara prieuri* (Pierret, 1837), whose distribution includes parts of eastern Spain and northern Africa (Wiemers et al., 2018; Alamo, 2025). Their presence underscores the biogeographical and ecological importance of the Sierra de Albarracín.

Despite its demonstrated value, the butterfly fauna of the Sierra remains underdocumented, with most information stemming from broad atlases or isolated records (García-Barros et al., 2004; García-Barros et al., 2013). In the context of global environmental change, updated faunistic inventories are vital for detecting shifts in species distributions and supporting conservation efforts (Settele et al., 2008).

In this contribution, we present a catalogue of butterflies recorded in Noguera de Albarracín during fieldwork carried out in 2024–2025. Our data provide novel distributional records for the Sierra de Albarracín and enrich our understanding of the regional Lepidoptera fauna.

Methods

Field surveys were conducted in the surroundings of Noguera de Albarracín (Teruel, Spain), within the framework of the *Iberozoa Entomology Course* (2024 and 2025 editions),

coordinated by the first author, with the participation of 20 students. This collaborative setting allowed for extensive coverage of the study sites and efficient detection of local butterfly fauna.

Two main routes were sampled (**Fig. 1**). In 2024, a survey was carried out on 2-VI-2024, from 10:30 to 13:00 h, along the Garganta stream (starting point: 40.4480ºN, 1.6071ºW; 1,250–1,360 m a.s.l.), following its course through riparian and open habitats. In 2025, sampling took place on 31-V-2025 (10:30–13:00 h) along a dirt track from "C. Pedro Miguel Po" to the Barranco de la Tejeda (starting point: 40.4666ºN, 1.5965ºW; 1,320–1,470 m a.s.l.), and on 1-VI-2025 (10:30–14:00 h) the same route along the Garganta stream as in 2024. Temperatures during surveys ranged from 25 °C in 2024 to 28 °C in 2025, with clear skies and light winds.

The area lies within the Macizo del Tremedal (eastern Iberian System), a complex geological structure comprising Paleozoic (Ordovician, Silurian, Permian) formations, Mesozoic (Triassic, Jurassic) strata, and overlying Tertiary and Quaternary deposits. Dominant lithologies include slates, quartzites, sandstones, limestones, and limonites (IGME-CSIC, 2024). Vegetation is largely conditioned by substrate: extensive stands of *Pinus sylvestris* L. over slates and quartzites, and patches of *Juniperus* spp. and *Quercus faginea* Lam., (1785) on calcareous soils, with a mosaic of open rocky slopes, shrublands, and herbaceous clearings.

Along the C. Pedro Miguel Po–Barranco de la Tejeda route, the path ascends from approximately 1,320 to 1,470 m a.s.l., crossing sun-exposed rocky slopes, shaded pine stands, and ephemeral streambeds. The Garganta stream route follows a riparian corridor bordered by *Populus* spp., *Salix* spp. L., and open meadows interspersed with scrub and scattered pines.

Butterflies were captured using an entomological net, identified, and released. Specimens that could not be reliably identified in the field—particularly within the genus *Leptidea*—were collected and identified through examination of genitalia (García-Barros et al., 2013).

Results

A total of 52 butterfly species were recorded during surveys conducted in Noguera de Albarracín (Teruel, Spain) in 2024 and 2025, representing 20.15% of the Iberian fauna (258 species considered). The material belongs to 5 families, 13 subfamilies, 33 genera, and 52 species.

The richest family was Lycaenidae with 16 species in 4 subfamilies and 10 genera, followed by Nymphalidae with 15 species in 5 subfamilies and 11 genera, Pieridae with 12 species in 3 subfamilies and 7 genera, Hesperiidae with 8 species in 2 subfamilies and 6 genera, and Papilionidae with a single representative in 1 subfamily and 1 genus.

These results indicate that the surveyed area harbors nearly half of the butterfly fauna known for the Sierra de Albarracín, where more than 100 species have been documented (Munguira et al., 2019). The observed richness also fits within the broader corological framework described for the Iberian Peninsula (García-Barros et al., 2013), confirming the regional representativeness of the sampled assemblage.

Material examined corresponds to: Noguera de Albarracín (Teruel, Spain), 2-VI-2024, 31-V-2025, 1-VI-2025, leg. Mario et al.

Family Papilionidae Latreille, 1802

Subfamily Papilioninae Latreille, 1802

Iphiclides feisthamelii (Duponchel, 1832)

Family Pieridae Swainson, 1820

Subfamily Pierinae Swainson, 1820

Anthocharis cardamines (Linnaeus, 1758)

Anthocharis euphenoides Staudinger, 1869

Aporia crataegi (Linnaeus, 1758)

Pieris napi (Linnaeus, 1758)

Pieris rapae (Linnaeus, 1758)

Pontia daplidice (Linnaeus, 1758)

Zegris eupheme (Esper, 1804)

A xerothermophilous species of conservation concern, included in the Spanish Red List of Invertebrates due to its rarity and fragmented distribution.

Subfamily Coliadinae Swainson, 1820

Colias crocea (Geoffroy, 1785)

Colias alfacariensis Ribbe, 1905

Gonepteryx rhamni (Linnaeus, 1758)

Gonepteryx cleopatra (Linnaeus, 1767)

Subfamily Dismorphiinae Schatz, 1886

Leptidea reali Reissinger, 1990

Identified through genitalia; previously included within the *L. sinapis* complex.

Family Lycaenidae Leach, 1815

Subfamily Polyommatinae Swainson, 1827

Polyommatus (Lysandra) albicans (Gerhard, 1851)

Iberian endemic with a distribution restricted to the south-eastern mountains, locally abundant in calcareous grasslands.

Polyommatus (Lysandra) bellargus (Rottemburg, 1775)

Polyommatus (Polyommatus) icarus/celina (Rottemburg, 1775 / Austaut, 1879)

Not determined to species level without genitalia.

Polyommatus (Plebicula) nivescens (Keferstein, 1851)

Iberian endemic, typically associated with calcareous grasslands of the eastern and central ranges.

Polyommatus (Plebicula) thersites (Cantener, 1835)

Pseudophilotes (Pseudophilotes) panoptes (Hübner, 1813)

Scolitantides (*Scolitantides*) *orion* (Pallas, 1771)

A threatened species in the Iberian Peninsula, confined to rocky habitats with *Sedum* spp.; populations are small and highly localized.

Cupido (Cupido) minimus (Fuessly, 1775)

Celastrina argiolus (Linnaeus, 1758)

Glaucopsyche melanops (Boisduval, 1828)

Iolana debilitata (Schultz, 1905)

Iberian endemic with a very localized distribution in eastern mountain ranges, associated with *Colutea arborescens L.*

Lampides boeticus (Linnaeus, 1767)

Aricia cramera (Eschscholtz, 1821)

Subfamily Theclinae Butler, 1869

Callophrys rubi (Linnaeus, 1758)

Subfamily Lycaeninae Leach, 1815

Lycaena bleusei (Oberthur, 1884)

Iberian endemic, restricted to the central-eastern ranges, where it is generally scarce and patchily distributed.

Lycaena phlaeas (Linnaeus, 1761)

Family Nymphalidae Rafinesque, 1815

Subfamily Satyrinae Boisduval, 1833

Coenonympha arcania (Linnaeus, 1761)

Coenonympha pamphilus (Linnaeus, 1758)

Lasiommata megera (Linnaeus, 1767)

Lasiommata maera (Linnaeus, 1758)

Pararge aegeria (Linnaeus, 1758)

Maniola jurtina (Linnaeus, 1758)

Erebia triaria (Prunner, 1798)

Subfamily Limenitidinae Behr, 1864

Limenitis reducta Staudinger, 1901

Subfamily Heliconiinae Swainson, 1827

Boloria (Clossiana) dia (Linnaeus, 1767)

Present record represents the southwesternmost distributional limit known to date in the Iberian Peninsula.

Issoria lathonia (Linnaeus, 1758)

Subfamily Nymphalinae Rafinesque, 1815

Melitaea cinxia (Linnaeus, 1758)

Melitaea phoebe (Goeze, 1779)

Vanessa atalanta (Linnaeus, 1758)

Vanessa cardui (Linnaeus, 1758)

Euphydryas aurinia (Rottemburg, 1775)

Species listed in Annex II of the EU Habitats Directive, considered vulnerable due to habitat loss and population decline.

Family Hesperiidae Latreille, 1809

Subfamily Pyrginae Burmeister, 1878

Carcharodus boeticus (Rambur, 1839)

Carcharodus lavatherae (Esper, 1783)

Erynnis tages (Linnaeus, 1758)

Muschampia (Sloperia) *proto* (Ochsenheimer, 1808)

Spialia sp. Swinhoe, [1912]
Not determined to species level.

Pyrgus sp. Hubner, 1819
Identification pending genitalia dissection.

Subfamily Hesperiinae Latreille, 1809

Thymelicus lineola (Ochsenheimer, 1808)

Thymelicus sylvestris (Poda, 1761)

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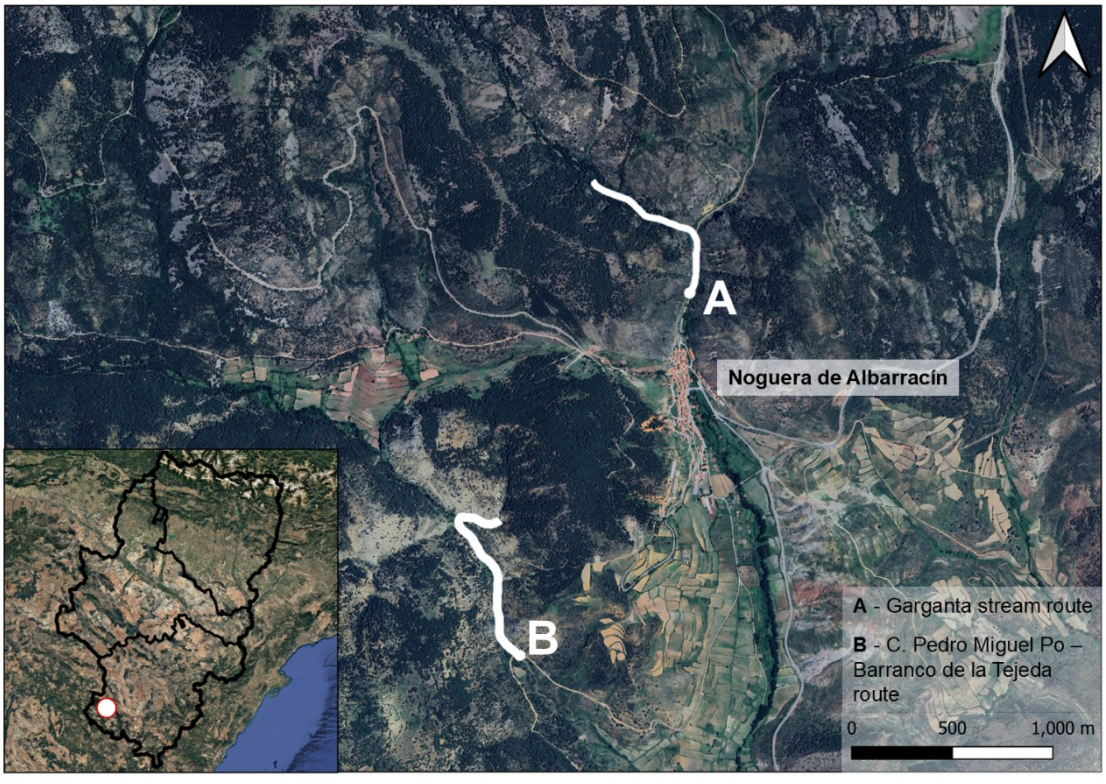
284 FIGURES



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286 **Fig. 1.** Location of the two sampling routes in Noguera de Albarracín (Teruel, Spain). (A)
287 Garganta stream route. (B) C. Pedro Miguel Po–Barranco de la Tejeda route. Inset: position of
288 the study area within Aragón, Spain.