

FIELD-BASED UPDATE ON THE STATUS OF  
*CHAZARA PRIEURI*: DISTRIBUTION AND  
ABUNDANCE ACROSS ITS IBERIAN RANGE



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## EXECUTIVE SUMMARY

1. *Chazara priouri* is an Endangered butterfly endemic to the Ibero-Maghrebian region, with its European distribution confined to the eastern Iberian Peninsula. Despite its conservation status, critical ecological data remain scarce.
2. During the 2025 monitoring campaign, 58 standardized 15-minute counts were conducted across nine provinces. A total of 48 individuals were detected in eight localities, all within six previously known UTM 10 × 10 km grid cells.
3. Sampling was conducted between 9:27 and 17:38; however, all detections occurred between 11:05 and 15:32, under ambient temperatures ranging from 23 °C to 28 °C.
4. The species was consistently found in open, rocky areas with sparse shrubby or arboreal cover, predominantly on carbonate and detrital substrates. This distribution pattern supports its characterization as a petrophilous species.
5. Compared to the 2024 campaign, more individuals were recorded in several localities, notably Fuentes Calientes (23 vs. 3 individuals). This suggests possible interannual fluctuations in detectability or population size, likely influenced by the species' low density and spatially restricted activity hotspots.
6. Unlike other sympatric nymphalids that prefer shaded microsites during thermal peaks, *C. priouri* was observed resting motionless on sun-exposed rocky substrates, using cryptic coloration for camouflage even under high temperatures. This suggests a distinct thermophilic and microhabitat-specialized behavior.
7. Localized clusters of activity (“micro-spots”) were observed within certain transects, particularly in Villar del Saiz, Fuentes Calientes, and Pancrudo. These zones showed concentrated presence and mating behavior, indicating potential spatial aggregation for reproductive purposes.
8. Several ecologically suitable areas yielded no detections. Given the species' cryptic behavior, low density, and spatially restricted activity, these absences may reflect limited detectability rather than true absence. Increased sampling effort is likely required to confirm presence in such sites.
9. Most observations occurred between 1,100 and 1,400 m a.s.l., often on elevated ridges or hilltops. These environments may offer thermally favorable and structurally intact habitats, though further monitoring is needed to evaluate their long-term conservation value.
10. The findings highlight the species' strong habitat specificity and behavioral constraints, which limit detectability and complicate monitoring. Conservation actions should consider these ecological traits to improve survey protocols and ensure effective habitat management.

## INTRODUCTION

*Chazara priouri* (Pierret, 1837) is a stenochorous butterfly of xerophilous habitats, endemic to the Ibero-Maghrebian region, with its European populations confined to the eastern sector of the Iberian Peninsula and its southern range extending into North Africa (García-Barros et al., 2011). The species was recently assessed as Endangered (EN) in its European range, due to its extremely reduced area of occupancy, severe fragmentation, and declines in habitat quality, extent of occurrence, and number of mature individuals (van Swaay *et al.*, 2025). Despite its threatened status, its ecological requirements and population dynamics remain poorly understood.

It is typically associated with substeppe, xerophilous, and calcicolous habitats, favoring rocky slopes and ravines with sparse tree cover (García-Barros et al., 2011). The larval host plant is thought to be primarily *Lygeum spartum*, although other grasses such as *Poa annua*, *Festuca ovina* (Tolman & Lewington, 2002), and potentially *Stipa tenacissima* have been suggested as alternative hosts (Mariposas de Cuenca, n.d.). However, current evidence is scarce and largely anecdotal, and no experimental validation of larval development on these species has been published to date.

Recent surveys in northeastern Spain (Alamo, 2024) revealed extremely low densities and a marked contraction of its known range to a narrow area in the province of Teruel. Observations suggest a strong dependency on xeric calcareous grasslands and a possible local extinction in many historically occupied areas. Habitat encroachment by shrubs and land-use changes—particularly the abandonment of extensive grazing—may be contributing to this decline, although the specific drivers remain unclear.

To effectively inform conservation actions, it is essential to monitor population trends, delimit the current distribution, and gather ecological data on habitat use, phenology, and abundance. This report presents the results of the 2025 monitoring campaign, building upon the previous year's efforts to improve our understanding of *C. priouri* across its Iberian range.

## OBJECTIVES

The main objectives of this study are:

- To continue the systematic exploration and faunistic delimitation of *C. priouri* across its known and potential Iberian range, including historical sites and new localities.
- To assess the current abundance and detectability of populations in 2025, allowing interannual comparison with previous data.
- To improve ecological knowledge of the species through standardized field observations.
- To identify sites of conservation interest and contribute to long-term monitoring efforts for this threatened species.

## METHODS

This study covered the entire Iberian range of *Chazara prieuri*, focusing on provinces with historical and potential presence: Teruel, Soria, Guadalajara, Cuenca, Alicante, Murcia, Granada, Almería, and Albacete. Huesca and Zaragoza were excluded due to consistently low habitat suitability observed during the 2024 surveys (Álamo, 2024).

Sampling sites were selected based on historical 10 × 10 km UTM grid cells provided by the Butterfly Atlas Research Group at Universidad Autónoma de Madrid. Within each selected grid, specific points were identified through visual inspection of satellite imagery, prioritizing areas with habitat features previously associated with the species: open calcareous landscapes with sparse to medium vegetation cover, alkaline-tolerant flora, and well-drained soils. In addition, site selection was informed by a habitat suitability model (Ensemble of Small Models, ESM) developed in parallel to guide field validation.

Priority was given to continuous natural habitats over small, isolated remnants. Sites located within or adjacent to agricultural matrices were only selected if they retained structural connectivity to larger suitable patches. Previous detection points from 2024 were revisited to allow interannual comparisons of abundance and occupancy, and areas previously classified as suitable but unoccupied were also re-sampled to reassess detectability.

At each selected site, one standardized 15-minute timed count was performed by two observers simultaneously, recording all individuals detected within a fixed area, following eBMS protocols (2024a). At each point, the number and sex of individuals were recorded, along with temperature, altitude, and habitat photographs for later verification. All observations were georeferenced using GPS.

Two sampling periods were established to account for geographic variation in phenology. The first campaign (June 16–20, 2025) targeted southern provinces (Albacete, Granada, Almería, Murcia, Alicante, Cuenca), where earlier emergence is expected due to warmer and drier conditions. The second campaign (July 3–7, 2025) focused on northern populations (Soria, Teruel, Guadalajara, Cuenca), aligned with their peak flight activity, which typically occurs from late June to early August.

Subsequently, each sampling point was categorized according to the underlying soil lithology using the 1:50,000 geological cartography provided by the Geological and Mining Institute of Spain (IGME-CSIC), accessed via the GEODE ArcGIS REST service (Instituto Geológico y Minero de España, 2024). Lithological units were reclassified into five ecologically functional categories: carbonated (e.g., limestones, dolomites, marl-limestones), siliceous/metamorphic (e.g., quartzites, phyllites, schists), detrital (e.g.,

sands, gravels, conglomerates), argillaceous/marly (e.g., clays, marls, shales), and indeterminate/mixed (complex units or those lacking diagnostic information).

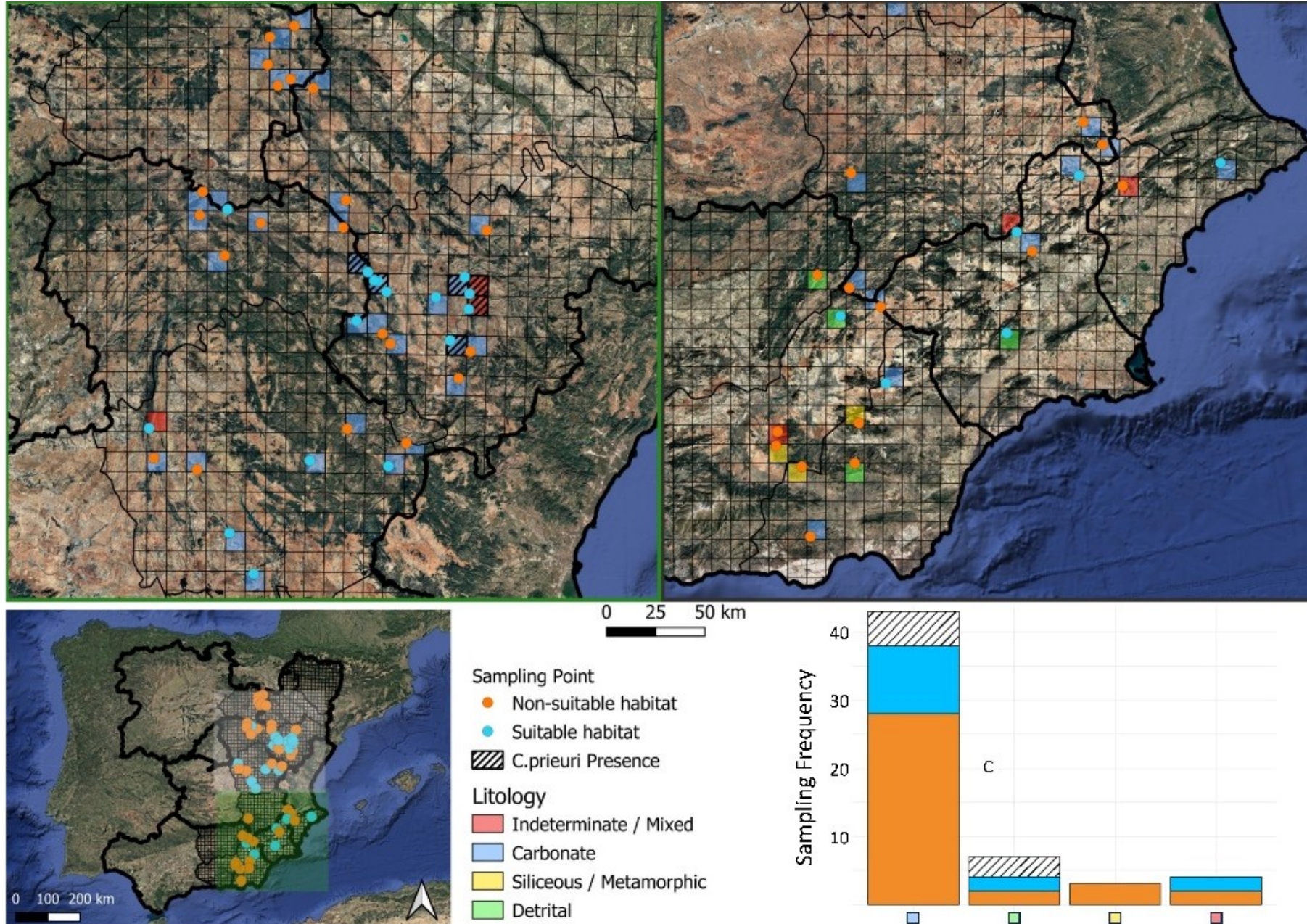
## RESULTS AND DISCUSSION

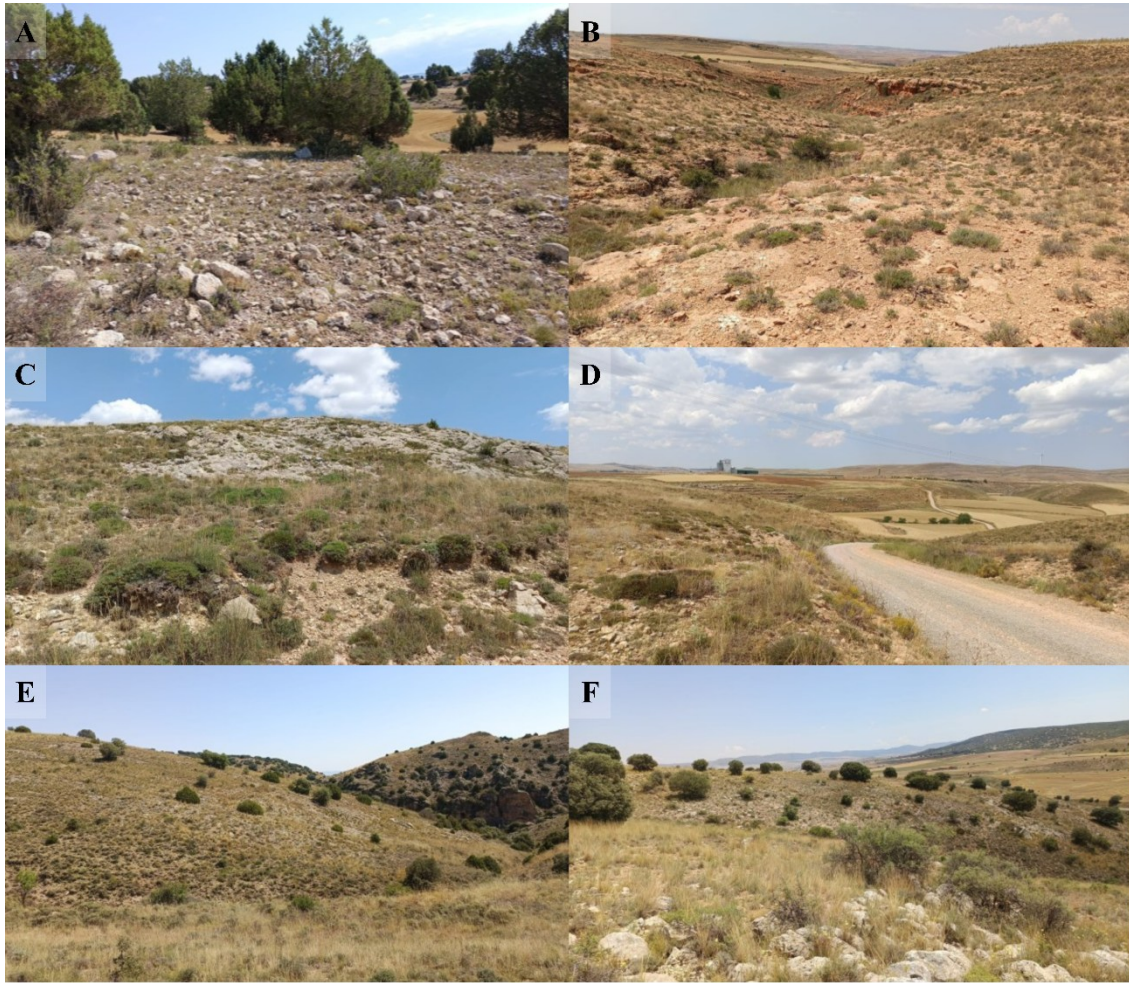
A total of 58 standardized 15-minute counts were conducted across 58 sampling points, covering an area of 317,787 m<sup>2</sup> (Supplementary material, Table S1). *Chazara priouri* was detected in 8 localities and confirmed in 6 UTM 10 × 10 km grid cells with historical presence after 2004 (Fig. 1). The surveys yielded 48 individuals, with the highest single-count total being 23 specimens (Table 1). The species was recorded in transects covering 61,011 m<sup>2</sup>, yielding a mean density of 1 individual per 1,271 m<sup>2</sup>.

**Table 1.** 15-minute counts in which *Chazara priouri* was found. The ID\_Count identifier provides additional geographic and environmental data for these counts, available in eBMS (2024b). M - N° of male individuals, F- N° of female individuals.

ID_Count	Grid reference	Locality	Date	Time	T°C	Altitude	M	F	Total count	2024 count
30647807	40.4695869, -1.0611052	Cuevas Labradas	04-VII-2025	11:05	23	1.120	1	-	1	-
30652031	40.6090924, -0.9505062	Perales de Alfambra	04-VII-2025	13:12	27	1.242	3	-	3	2
30654767	40.7536649, -0.9740704	Pancrudo	04-VII-2025	14:44	28	1.433	7	-	7	-
30655632	40.6784983, -0.946062	Fuentes Calientes	04-VII-2025	15:32	28	1.328	20	3	23	3
30693542	40.7758897, -1.5464949	El Pedregal	06-VII-2025	12:00	28	1.220	3	-	3	-
30693857	40.7346132, -1.4867351	Ojos Negros	06-VII-2025	12:55	28	1.163	1	-	1	1
30694226	40.7378596, -1.5090635	Ojos Negros	06-VII-2025	13:12	27	1.265	1	-	1	-
30694891	40.687221, -1.435169	Villar del Saiz	06-VII-2025	13:38	28	1.153	9	1	10	1

All detection sites shared a characteristic habitat: open, rocky areas with sparse vegetation dominated by thorny shrubs or scattered *Juniperus* and *Quercus* (Fig. 2). Field observations confirm a strong preference for open rocky slopes and screes, which suggests a petrophilous tendency, consistent across all sites with confirmed presence.





**Figure 2.** Representative habitat photographs of *Chazara priouri* occurrence. **(A)** Cuevas Labradas – rocky open woodland dominated by *Juniperus*. **(B)** Perales de Alfambra – semi-arid steppe with scattered shrubs on detrital soils. **(C)** Pancrudo – limestone ridge with open scrubland and sparse vegetation. **(D)** Fuentes Calientes – agricultural mosaic interspersed with grassland patches. **(E)** El Pedregal – south-facing calcareous hillside with shrub-steppe vegetation. **(F)** Villar del Saiz – open pastureland with dispersed *Quercus* and rocky outcrops.

This specialization is particularly evident in the localities with highest abundance (Villar del Saiz, Pancrudo, and Fuentes Calientes; Table 1), where *C. priouri* was detected in bare stony areas (e.g. Fig. 3, panel B), despite the availability of surrounding herbaceous and shrubby patches under scattered trees. While co-occurring nymphalids (e.g., *Hipparchia spp.*, *Pyronia spp.*, *Chazara briseis*; Alamo, 2024) tended to rest or fly in shaded microsites or near tree trunks and foliage canopy during high temperatures, *C. priouri* individuals remained motionless on fully sun-exposed rocky substrates, relying on cryptic coloration for camouflage (Fig. 3, panel E), even under ambient temperatures exceeding 28 °C. This behavior suggests a high degree of thermal tolerance and a marked petrophilous preference, contrasting with the thermoregulatory strategies of sympatric

species. Such microhabitat fidelity, particularly under thermally stressful conditions, likely reflects a combination of behavioral specialization and physiological adaptation.



**Figure 3.** Habitat structure and species observations at Villar del Saiz. **(A)** Elevated hillside with rocky strata and scattered *Quercus*. **(B)** General habitat with open stony ground and sparse shrubs. **(C)** Detail of *Stipa pennata* in situ. **(D)** Mating behavior

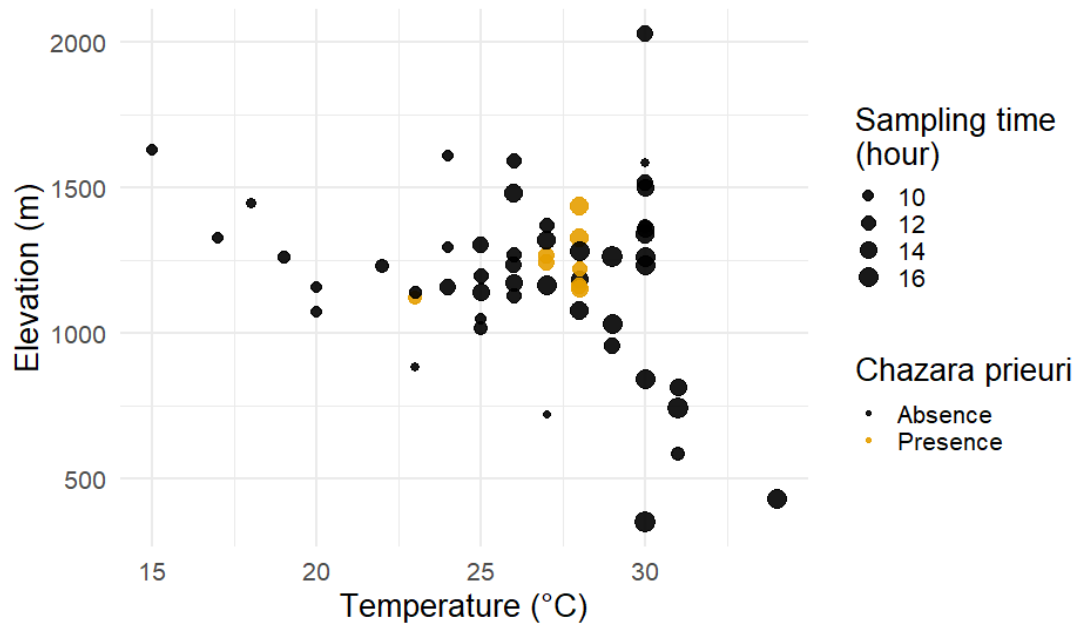
observed: male pursuing female among *Eryngium*. **(E)** Individual resting motionless on sun-exposed rocky substrate, demonstrating cryptic coloration and petrophilous behavior.

In Villar del Saiz, one of the localities with highest abundance (10 individuals; Table 1), a female was observed being actively pursued by multiple males within a confined sunlit area (Fig. 3, panel D). This observation supports the use of spatially restricted microhabitat hotspots as mating arenas, which may concentrate butterfly activity and increase detectability locally. Similar behavioral aggregations were recorded in Pancrudo and Fuentes Calientes, reinforcing the hypothesis that absence in ecologically suitable areas may be a sampling artefact related to spatial mismatch with such functional hotspots, rather than indicative of true absence. The higher number of individuals recorded in 2025 compared to 2024 (Table 1), particularly in sites like Fuentes Calientes (23 vs. 3 individuals), supports the hypothesis that population size and detectability of *C. prieuri* may vary substantially between years. This interannual variation, combined with the species' tendency to aggregate in small microhabitat hotspots and its low local abundance, makes it especially prone to underdetection. This spatial patterning highlights the potential importance of fine-scale habitat structure for reproductive behavior in *C. prieuri* and suggests that microhabitat-level surveys may be necessary to avoid underestimating presence in low-density populations.

Regarding the temporal pattern, sampling hours extended from 9:27 to 17:38, with all detections between 11:05 and 15:32, aligning with peak solar radiation. This diurnal window matches the activity period of thermophilic grassland butterflies, but with a higher tolerance threshold. Temperatures during butterfly counts ranged from 15 to 34 °C, with all *C. prieuri* records occurring between 23 and 28 °C (Fig. 4), and peak abundance at 28 °C, indicating a potential thermal optimum within this range.

Altitudinally, most detections occurred on elevated ridges or hilltops (Fig. 3, panel A) between 1,100 and 1,400 m a.s.l. (Fig. 4), which supports the hypothesis of hilltopping behavior, a known mate-location strategy in many Satyrinae. While some lowland presence sites exist, they are generally more exposed to grazing and land-use pressures. These upland habitats, by contrast, are structurally less disturbed and may act as population refuges. In this context, traditional grazing systems with low intensities and scattered vegetation may play a crucial role in maintaining suitable open habitats for the species.

Lithological classification of sampling sites (Fig. 1) reveals that most presence records occurred on carbonate substrates, followed by detrital formations, with fewer records on siliceous or mixed substrates. This preference suggests a link between bedrock type and the persistence of suitable microhabitats (rocky screes, dry grasslands, exposed soils). Notably, the occurrence on detrital substrates—typically less stable—may indicate either ecological plasticity or the transient formation of favorable microsites within otherwise marginal contexts. The absence of the species from clayey or densely vegetated soils reinforces its association with arid, rocky landscapes.



**Figure 4.** Environmental conditions during butterfly sampling and detection of *Chazara prieuri*. Each point represents a sampling event positioned according to ambient temperature (°C) and elevation (m a.s.l.). Point size indicates the time of day (larger points correspond to later sampling hours), and color denotes presence (yellow) or absence (black) of *C. prieuri*.

In the northern part of the range, *Stipa pennata* was identified (Fig. 3, panel C). While hostplant use was not directly tested, its presence in several occupied sites raises the possibility that it may serve as a larval resource. Despite targeted effort, no individuals were recorded in the southern high plateaus where *Stipa tenacissima* dominates. Although these habitats are structurally open and thermally favorable, they may lack key microclimatic or edaphic features required by the species. However, historical records in nearby mountain ridges suggest that *C. prieuri* may still persist in remnant patches, possibly at low densities or in localized refugia. These areas merit further survey effort.

Finally, while the current data do not allow a definitive conclusion about population decline, the apparent disappearance from historically occupied sites (e.g., in Huesca province) coincides with extensive land-use changes, including agricultural intensification and habitat loss. These findings emphasize the importance of continued monitoring and habitat preservation efforts.

## ACKNOWLEDGEMENTS

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## SUPPLEMENTARY MATERIAL

**Table S1.** Summary of all butterfly counts conducted during the 2025 field campaign in the eastern Iberian Peninsula. Each row corresponds to a single 15-minute standardized count following eBMS protocols, including geographical coordinates, date, time, ambient temperature, area surveyed, altitude, and number of *Chazara prieur*i individuals detected. Counts with suitable habitat presence are shaded in green.

ID_Count	Locality	Grid reference	Date	Start Time	Temperature (T°C)	Area sampled (m2)	Altitude	Count
30216020	Paredes	40.0742417, -2.836705	16-VI-2025	9:35	23	744	885	0
30217948	Zafra de Záncara	39.8874634, -2.5533836	16-VI-2025	11:11	25	10032	1015	0
30221089	Pinarejo	39.5996907, -2.3634613	16-VI-2025	12:43	29	4890	957	0
30221964	Sisante	39.4137504, -2.2200994	16-VI-2025	13:50	31	10554	816	0
30228769	Almansa	38.8489744, -1.111688	16-VI-2025	16:09	30	7851	844	0
30235875	Caudete	38.7450396, -0.998403	16-VI-2025	17:12	31	2226	743	0
30247126	Yecla	38.6022307, -1.1378621	17-VI-2025	9:27	27	1983	724	0
30247706	Cabrerias	38.5547946, -0.8801145	17-VI-2025	10:58	31	4929	585	0
30255700	Camino de Aitana	38.6610313, -0.3029243	17-VI-2025	12:40	NA	4881	1256	0
30255698	Cabezo del Puerto	38.3412528, -1.506588	17-VI-2025	16:49	34	1296	433	0
30269814	Cieza	38.2519645, -1.4139003	17-VI-2025	17:38	30	6633	353	0
30269811	Mora de las Moscas	37.8730125, -1.564295	18-VI-2025	9:57	18	3711	1445	0
30281335	Chirivel	37.6379903, -2.2773673	18-VI-2025	12:22	27	4836	1371	0
30283326	Cerro de la Almaceta	37.4520254, -2.4363538	18-VI-2025	14:23	30	6789	1358	0
30299150	Bacares	37.2634202, -2.4604195	18-VI-2025	15:46	30	2154	1260	0
30299147	Cerro de Miralles	36.9183049, -2.7234782	19-VI-2025	9:37	30	1128	1584	0
30299145	Morrón del Peral	37.1043611, -2.7633299	19-VI-2025	11:25	30	1974	1367	0
30304972	Pico de Ruero	37.2480862, -2.7734021	19-VI-2025	12:46	30	3576	2027	0
30304970	Cerro del Cascarón	37.3450121, -2.9251169	19-VI-2025	13:59	30	2775	1501	0
30338683	Cerro de la Venta	37.4113305, -2.9159145	19-VI-2025	15:24	30	6603	1337	0
NA	La Sagra	37.9514079, -2.54553	20-VI-2025	10:00	24	NA	1609	0
30338679	Almaciles	37.9945196, -2.3090388	20-VI-2025	10:22	24	5202	1295	0
30338681	Casa de la Hoya	38.0821268, -2.4930519	20-VI-2025	11:39	26	3060	1591	0
30338677	Casas de Carrasco	38.1431096, -2.6809833	20-VI-2025	13:00	30	3249	1515	0
30338674	Vianos	38.6136068, -2.4836211	20-VI-2025	16:30	30	7797	1235	0
30620635	Saelices	39.9397322, -2.8084124	3-VII-2025	10:09	25	6798	1050	0
30623020	Rello	39.9276296, -1.8887609	3-VII-2025	11:51	26	12324	1127	0
30624799	Cañete	40.0715397, -1.6666317	3-VII-2025	13:04	25	5997	1304	0
30627557	Fuentespino de Moya	39.90302, -1.4247745	3-VII-2025	14:21	25	1896	1142	0
30628894	Pedro izquierdo	40.0070105, -1.3186341	3-VII-2025	15:49	27	6807	1167	0
30636624	Castralvo	40.2993595, -1.0099018	3-VII-2025	17:20	29	2805	1260	0
30646701	Corbalán	40.4191583, -0.940735	4-VII-2025	10:06	15	7656	1630	0

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IBERIAN RANGE

ID_Count	Locality	Grid reference	Date	Start Time	Temperature (T°C)	Area sampled (m2)	Altitude	Count
30647807	Cuevas Labradas	40.4695869, -1.0611052	4-VII-2025	11:05	23	9531	1120	1
30651416	Camañas	40.6631877, -1.1448145	4-VII-2025	12:18	26	9084	1268	0
30652031	Perales de Alfambra	40.6090924, -0.9505062	4-VII-2025	13:12	27	8811	1242	3
30654767	Pancrudo	40.7536649, -0.9740704	4-VII-2025	14:44	28	6564	1433	7
30655632	Fuentes Calientes	40.6784983, -0.946062	4-VII-2025	15:32	28	8640	1328	23
30658615	Cortes de Aragón	40.962271, -0.8454916	4-VII-2025	16:48	29	3558	1034	0
30671152	Añavieja	41.8671653, -1.9794829	5-VII-2025	10:13	20	3894	1074	0
30672356	Villar del Campo	41.8178057, -2.1233043	5-VII-2025	11:12	22	2664	1230	0
30674470	Castejón del Campo	41.6964942, -2.1374108	5-VII-2025	12:00	25	2745	1197	0
30675101	Sauquillo de Alcázar	41.6034141, -2.0773828	5-VII-2025	12:52	26	8466	1234	0
30676792	Ciria	41.6321511, -2.0015594	5-VII-2025	13:36	28	7275	1185	0
30676926	Malanquilla	41.5921596, -1.868498	5-VII-2025	14:31	28	6711	1076	0
30691314	Cubel	41.096361, -1.6761079	6-VII-2025	10:06	20	7605	1157	0
30691894	Embid	40.9744233, -1.6912404	6-VII-2025	10:49	23	9924	1143	0
30693542	El Pedregal	40.7758897, -1.5464949	6-VII-2025	12:00	28	7662	1220	2
30693857	Ojos Negros	40.7346132, -1.4867351	6-VII-2025	12:55	28	5682	1163	1
30694226	Ojos Negros	40.7378596, -1.5090635	6-VII-2025	13:12	27	6165	1265	1
30694891	Villafranca del Campo	40.687221, -1.435169	6-VII-2025	13:38	28	7956	1153	10
30696455	Orihuela del Tremedal	40.5579624, -1.6126641	6-VII-2025	14:48	26	5727	1481	0
30697512	Monterde de Albarracín	40.5001812, -1.4593196	6-VII-2025	15:30	27	6630	1319	0
30711138	Barranco de Monterde	40.4546911, -1.4130911	6-VII-2025	16:05	28	5631	1280	0
30711136	Mazarete	40.9935313, -2.1764933	7-VII-2025	10:08	17	3021	1327	0
30712335	Aguilar de Anguita	41.0559211, -2.3741471	7-VII-2025	10:54	19	8310	1260	0
30714463	Horna	41.1329251, -2.5213354	7-VII-2025	12:00	-	1548	1186	0
30715327	Sauca	41.0293687, -2.5374979	7-VII-2025	12:58	24	2922	1156	0

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