

# THE CARABIDAE (INSECTA: COLEOPTERA) OF THE UPPER SALIENTES VALLEY (LEÓN, NORTHERN SPAIN): FAUNA, CHOROLOGY, AND TAXONOMIC NOTES

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## ABSTRACT

Salientes Valley (north of León, Spain) is an area located immediately to the south of the main axis of the Cantabrian Mountains, from which it is relatively isolated due to the erosive processes produced between the headwaters of the Sil and Luna Rivers. This historical-geological fact makes this valley a unique enclave and its biota an interesting study target. This work presents a faunal approach which provides information on the Carabidae (Insecta, Coleoptera) that inhabit this area. Four entomological sampling campaigns were carried out in three consecutive years, over the course of which 1,255 specimens belonging to 101 species were collected at 61 sampling points through active capture and pitfall trapping. The results reveal that, in terms of specific diversity and abundance, most of the specimens belong to the Harpalinae subfamily, with special relevance to Harpalini (18 spp, 167 exx), Zabrinini (11 spp, 55 exx), Pterostichini (10 spp, 200 exx), Sphodrini (9 spp, 150 exx) and Platynini (6 spp, 83 exx). In addition, a biogeographical analysis was carried out that showed the high contribution of Iberian endemisms to the faunal composition of the Carabidae of this area. Finally, taxonomic aspects of some collected species are discussed: 1) the case of *Trechus* (*Trechus*) *suturalis* Putzeys, 1870 and *Trechus* (*Trechus*) *gallaecus* Jeannel, 1921, the aedeagus morphology of which is illustrated in this work, as it is key to the unequivocal distinction of both species; 2) the great variability observed in the external characters of two Iberian species of *Oreophilus* Chaudoir, 1838: *Pterostichus* (*O.*) *cantaber* (Chaudoir, 1868) and *Pterostichus* (*O.*) *franzi* Nègre, 1955, is also highlighted, concluding that their morphological traits are not consistent enough for certain identification, leaving the morphology of the aedeagus as the only completely reliable character to discriminate between both species. In addition, comments related to the autoecology and habitat preference (forest, riparian/marshy, ruderal, and underground habitats) of the most representative species are provided. Finally, the distribution range of the microendemism *Trechus teverganus* Toribio, 2015, is extended despite the presence of apparent geographic and geological barriers for this subterranean species.

**Keywords:** Ground beetles, *Trechus suturalis*, *Trechus gallaecus*, *Trechus teverganus*, *Oreophilus*, abundance, richness, specific diversity, distribution, habitat, Iberian Peninsula.

## RESUMEN

### Los Carabidae (Insecta: Coleoptera) del valle de Salientes (León, norte de España): fauna, corología y notas taxonómicas

El valle de Salientes (norte de León, España) es un área situada inmediatamente al sur del eje principal de la Cordillera Cantábrica, de la que se halla relativamente aislada debido a los procesos erosivos producidos entre las cabeceras de los ríos Sil y Luna. Este hecho histórico/geológico convierte a este valle en un enclave muy singular y a su biota en un interesante objetivo de estudio. Este trabajo, con un enfoque faunístico, aporta información sobre Carabidae (Insecta, Coleoptera) que habitan en esta área. Se realizaron cuatro campañas entomológicas en tres años consecutivos, donde se recogieron 1255 especímenes, pertenecientes a 101 especies, en 61 puntos de muestreo, mediante captura activa e instalación de trampas pitfall. Los resultados revelan que, en términos de diversidad específica y abundancia, la mayoría de los ejemplares pertenecen a la subfamilia Harpalinae, teniendo especial relevancia Harpalini (18 spp, 167 exx), Zabrinini (11 spp, 55 exx), Pterostichini (10 spp, 200 exx), Sphodrini (9 spp, 150 exx) y Platynini (6 spp, 83 exx). Además, se realizó un análisis biogeográfico que puso de manifiesto la elevada contribución que hacen los endemismos ibéricos en la composición faunística de los Carabidae de este enclave geográfico. Finalmente, se discuten aspectos taxonómicos de algunas especies colectadas: 1) el caso de *Trechus* (*Trechus*) *suturalis* Putzeys, 1870 y *Trechus* (*Trechus*) *gallaecus* Jeannel, 1921, cuya morfología del edeago, ilustrada en este trabajo, es clave para

la distinción inequívoca de ambas especies; 2) también se pone de manifiesto la gran variabilidad observada respecto a los caracteres externos de dos especies ibéricas de *Oreophilus* Chaudoir, 1838, *Pterostichus* (*O.*) *cantaber* (Chaudoir, 1868) y *Pterostichus* (*O.*) *franzi* Nègre, 1955, concluyendo que no son lo suficientemente consistentes, teniendo que recurrir a la morfología del edeago como único carácter totalmente fiable para identificar ambas especies. Además, se aportan comentarios en relación con la autoecología y preferencia de hábitat (áreas forestales, riparias/palustres, ruderales y subterráneas) de las especies más representativas. Por último, se amplía el rango de distribución del microendemismo *Trechus teverganus* Toribio, 2015, a pesar de las aparentes barreras geográficas y geológicas que podrían existir para esta especie de vida subterránea.

**Palabras clave:** Carábidos, *Trechus suturalis*, *Trechus gallaecus*, *Trechus teverganus*, *Oreophilus*, abundancia, riqueza, diversidad específica, distribución, hábitat, península ibérica.

**Recibido/Received:** 2/06/2022; **Aceptado/Accepted:** 9/01/2023; **Publicado en línea/Published online:** 20/04/2023

**Cómo citar este artículo/Citation:** Ortuño, V.M., Arribas, O. & Andrés, E. 2023. The Carabidae (Insecta: Coleoptera) of the upper Salientes Valley (León, northern Spain): fauna, chorology, and taxonomic notes. *Graellsia*, 79(1): e189. <https://doi.org/10.3989/graellsia.2023.v79.364>

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## Introduction

Almost two centuries have passed since the first Iberian catalogues of Carabidae were made (Rambur, 1837-1838; Cardona y Orfila, 1872; Pantel, 1888; Champion, 1898; among others) and, since then, the faunistic and chorological knowledge of this family of Coleoptera has increased substantially. The first global vision of carabidological knowledge in Spain is due to Graells (1858), and in Portugal to Putzeys (1874) and Paulino de Oliveira (1894). Later, De la Fuente (1918-1921) provided the first annotated catalogue on the Carabidae of Spain and, years later, elaborated identification keys for the Peninsular cincindelids and carabids known to date (De la Fuente, 1927). Although many entomologists continued to provide data on Iberian Carabidae, it is fair to recognize the decisive contribution of Claude Jeanne who, with his multiple explorations in Spain and Portugal, greatly expanded the knowledge of this group of beetles up to the present (Tamisier, 2017). He expanded the chorological records of numerous species, cited many others for the first time in the Iberian Peninsula, and described a high number of new taxa, most of them endemic to this territory. The synthesis of a large part of the results of his work was recorded in an Iberian catalogue (Jeanne & Zaballos, 1986) that was a reference for any study on Iberian carabids. This catalogue was followed by others in a dynamic of taxonomic and chorological expansion, as well as a systematic update (Zaballos & Jeanne, 1994; Serrano, 2003, 2013), including synthetic electronic versions with a different approach to the previous ones (Serrano, 2020). In this context, studies on carabid fauna from large peninsular regions were also carried out (Herrera & Arricibita, 1990; Ortuño & Toribio, 1996; Ortuño & Marcos, 2003; Campos & Novoa, 2006; Aguiar & Serrano, 2013; López-Pérez et al., 2014; Toribio & Ramos-Abuín, 2018; Serrano et al., 2021; among others), mountainous areas (Mateu & Colás,

1954; Novoa, 1975, 1979; Palanca, 1980; Gimeno, 1984; Zaballos, 1984, 1994; Alonso et al., 1987; Arribas, 1994; Andújar et al., 2000; Ruiz Tapiador & Zaballos, 2001, among others) and various natural spaces such as wetlands and hydrographic basins (Vives & Vives, 1978, 1986; Serrano, 1983; Cárdenas, 1985; Zaballos, 1986; Ortiz et al., 1989; Serrano et al., 1990; Vázquez et al., 1991; Ortuño & Marcos, 1997; Andújar et al., 2001; Ortuño et al., 2004; among others), thus contributing to broaden the faunistic knowledge of the Iberian Carabidae, and enriching the catalogues that followed.

This study falls in line with the faunistic works already mentioned in its goal to offer the most complete set of data possible on an area of special interest, potentially revealing aspects of the uniqueness of the enclave and thus adding relevant knowledge to the Iberian carabid fauna. In this context, the Salientes Valley and its surrounding mountains, offer an especially interesting study area due to a combination of the influence of the nearby Cantabrian Mountains paired with an ongoing process of geographical isolation, especially since the Pliocene. The limited connection and disconnection of the free pass with the northern Cantabrian reliefs is closely linked to the recent history of the Sil River. The ascending erosion of this river has been carving the upper basin of the Luna River and changing the crossing point (from west to east) between both zones: initially (Pliocene) at about 1,600 m between Cueto del Oso (1,904 m) and Cuerno (1,932 m), and currently far to the east, around Puente de las Palomas (1,220 m) (García de Celis, 1997; Alfonso-Gómez 2003). This circumstance makes this valley an area of great interest, especially due to its colonization by species from the Cantabrian range corridor. The relative isolation from the Cantabrian Mountains means that its biota, although related, differs notably. A non-trivial example is the absence of the beech (*Fagus sylvatica* L.) and an important cohort of accompanying species. Being further south of the Cantabrian Mountains and sheltered

from oceanic influence, the climate is much sunnier and more continental, which means drier weather and more extreme temperatures (Walker, 2002). On the other hand, the Salientes Valley is a remote area, far from the travelling paths of the entomologists who studied the Cantabrian carabid fauna in the 19<sup>th</sup> and 20<sup>th</sup> centuries, and therefore, like much of the north of the Montes de León, is still a very poorly known place.

With this study it is expected to expand the faunistic knowledge of this remote valley, contributing for the first time to this area an extensive list of Carabidae species. At the same time it is expected to identify some of its faunal singularities dictated by the presence or absence of certain taxa.

### Material and methods

This study is based on four entomological sampling campaigns carried out during three consecutive years:

1<sup>st</sup> campaign (06, 07, 08, 09, 10, 11-VIII-2019); 2<sup>nd</sup> campaign (04, 05, 06, 07, 08-VIII-2020); 3<sup>rd</sup> campaign (24, 25, 26, 27, 28, 29-VI-2021) and 4<sup>th</sup> campaign (29, 30, 31-VII-2021, 01, 02, 03-VIII-2021). Campaign involvement was as follows: first, second and fourth campaigns: V.M. Ortuño & O. Arribas leg.; third: V.M. Ortuño & E. Andrés leg. Sampling was done by active capture, by pitfall traps baited with vinegar, and by sifting leaf litter and soil with Winkler devices. 61 localities were sampled (Table 1) covering a large part of the upper Salientes Valley and its surrounding mountains (Fig. 1). All collected specimens were prepared following entomological protocols and are kept in the VMO-UAH collection (Vicente M. Ortuño, Department of Life Sciences of Alcalá University, Madrid, Spain) except the Carabinae, which are kept in the Oscar Arribas collection (Soria, Spain). In most species, male identification was completed by studying the aedeagus, which in some cases were included in

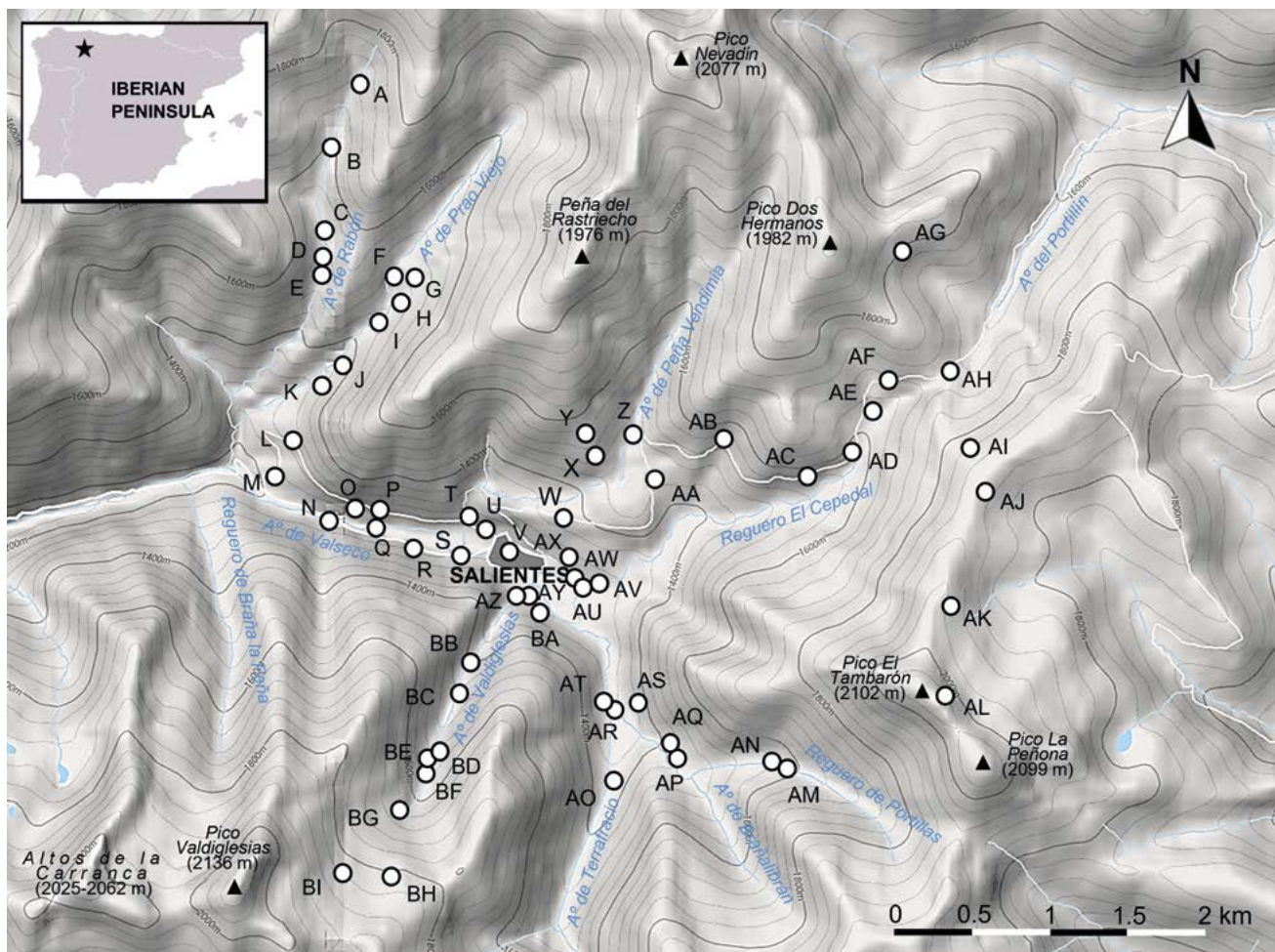


Fig. 1.– Map of the surveyed area, including the main toponyms and the name of the river courses. Each circle with the corresponding letter/s indicates a sampled enclave and corresponds to the data in Table 1 and the fauna list (Results section).

Fig. 1.– Mapa del área prospectada, incluyendo los principales topónimos y el nombre de los cursos fluviales. Cada círculo con letra/s indica un enclave muestreado y tiene correspondencia con los datos de la Tabla 1 y con el listado faunístico (apartado de Resultados).



DMHF (dimethyl hydantoin formaldehyde) resin on transparent acetate sheets.

The taxonomic and nomenclatural criteria used are those included in the latest Iberian Carabidae catalogues (see Serrano, 2013, 2020) with few modifications, and biogeographical analysis is carried out by assigning the same chorological types that appear in the last one (Serrano, 2020). A specimen of *Microlestes* Schmidt-Goebel, 1846 could not be identified to a specific level, so it was not possible to assign it a biogeographical category. In this work, we include the Cicindelidae as a subfamily of the Carabidae, although the last Iberian catalogue (Serrano, 2020) treats this group as a family close to Carabidae (following Duran & Gough, 2020). For *Carabus* nomenclature we follow the latest Deuve monograph (2021).

The study area is located in an intermediate alignment between the main Cordillera Cantábrica and south of Montes de Leon: 42°53' to 43°01'. The most conspicuous peaks are Nevadín (2,082 m), Tambarón (2,102 m), Catoute (2,111 m) and Valdiglesias (2,136 m). They are among the most extensive and complex orographic assemblages of the Cordillera (García de Celis, 1997).

This area is constituted by palaeozoic materials of the Asturoccidental Leonesa Zone, one of the great units in which the Iberian Hercynian Massif is divided. The oldest strata (Precambrian) are from the Villalba Serie (very friable slates –from Nevadín, Puerto del Portillín, etc.–); Lower Cambrian rocks are grouped in the Cándama Formation (microconglomerates, sandstones, slates, and white tabled quartzites –Tambarón, Molar–). Above is the Fm. Vegadeo (marbles, marbled limestones, and solid dolomites very narrow ditches in the Tambarón area) from the Middle Cambrian. And on top of both is the Los Cabos Series (white quartzites alternated with sandstones and quartzites) from the Upper Cambrian to Lower Ordovician (Valdiglesias, Robeza, Catoute, Arcos del Agua, Suspirón). Finally, above all of them is the Luarca Series with solid black slates from the Middle Ordovician (Matas, 1982). Hercynian Orogeny followed by Alpine Orogeny folded the area mainly with NW-SE and NE-SW faults, uplifting these mountain ranges from surrounding areas such as the Bierzo graben. The last touches to the area were due to Quaternary glaciation. During the Upper Pleistocene, most of the valleys housed glacial tongues below 900 m a.s.l. (García de Celis, 1997).

Table 1.– Localities sampled in the high valley and mountainous foothills of Salientes (León). Correspondence with figure 1.

Tabla 1.– Localidades muestreadas en el valle alto y contrafuertes montañosos de Salientes (León). Correspondencia con la figura 1.

Code (Fig. 1)	Location	Altitude (m a.s.l.)	UTM (29TQH...)	Habitat
A	Arroyo de Rabón 1	1,673	18365060	Meadow and short riparian wood
B	Rabón 2	1,617	18225034	Bog
C	Rabón 1	1,525	18154974	Bog
D	Prados de Rabón	1,500	18194952	Meadow
E	Arroyo de Rabón 2	1,479	18144928	Meadow and short riparian wood
F	Arroyo de Prao Viejo 1	1,472	18654938	Meadow and short riparian wood
G	Prado Prao Viejo	1,495	18724937	Meadow and ruderal vegetation
H	Arroyo de Prao Viejo 2	1,458	18714921	Riparian forest
I	Puente del Arroyo de Prao Viejo	1,426	18554907	Birch and hazelnut trees by a stream
J	Camino de Prao Viejo 2	1,383	18354876	Birches and willows by a stream and forest track
K	Camino de Prao Viejo 1	1,350	18224860	Birches and willows by a stream and forest track
L	Camino de Prao Viejo (detour)	1,284	17984827	Ruderal vegetation
M	Track from km 15.600 (LE-3303)	1,230	17894804	Meadow with hedge
N	Route to Braña la Pena	1,193	18244774	Birch and hazelnut forest
O	920 m route to Prao Viejo	1,233	18494781	Pathway with maples and hazelnuts
P	800 m route to Prao Viejo	1,261	18634781	Pathway with elm, maples and ash trees
Q	Arroyo de Valseco	1,183	18594776	Meadow and short riparian wood
R	km 16.800 (LE-3303)	1,220	18824757	Birch and hazelnut forest
S	km 17.000 (LE-3303)	1,218	19084755	Birch and hazelnut forest
T	Arroyo de Peña Vendimia 1	1,240	19194777	Riparian trees near vegetable patch
U	Salientes - Huertos	1,240	19274772	Ruderal vegetation
V	Salientes (village)	1,250	19574760	Village
W	El Cotichón	1,390	19724782	Pathway with oaks trees, broom bushes and meadow
X	Los Chanones 1	1,500	19984823	Broom bushes
Y	Los Chanones 2	1,555	19904841	Broom bushes and mountain meadow
Z	Arroyo de Peña Vendimia 2	1,423	20164827	Meadow and short riparian wood
AA	El Cotichón - La Cárcava	1,440	20354799	Ruderal vegetation

Code (Fig. 1)	Location	Altitude (m a.s.l.)	UTM (29TQH...)	Habitat
AB	Chorrera Braña Redonda	1,530	20824834	Birches and willows by a stream
AC	Route to Vivero 1	1,560	21304811	Ruderal vegetation and flooded areas
AD	Route to Vivero 2	1,590	1704834	Riparian trees with meadows and rural areas
AE	La Forcada	1,621	21734856	Ruderal vegetation
AF	La Forcada - Alto Vivero	1,665	21814876	Ruderal vegetation
AG	Ladera E del Pico Dos Hermanos	1,800	21834949	Ruderal vegetation
AH	Alto de Vivero	1,702	22284882	Grass, broom bushes and heath
AI	La Colchona 1 ridge	1,835	22354833	Grass, broom bushes and heath
AJ	La Colchona 2 ridge	1,911	22504812	Grass, broom bushes and heath
AK	Peñas Rubias	1,970	22304744	Mountain pasture with stones
AL	El Tambarón	2,003	22294685	Colluvial deposit
AM	Route to Reguero de Portillas 2	1,573	21274632	Birch forest
AN	Route to Reguero de Portillas 1	1,556	21174634	Birch forest and ruderal vegetation
AO	Arroyo de Terrafracio 3	1,356	20144616	Birch and hazelnut trees by a stream
AP	Road fork to Portillas and Brañalibrán	1,440	20614630	Birch and hazelnut forest
AQ	Torrentera del Arroyo de Brañalibrán	1,432	20634641	Valley with hygrophilous vegetation, birch, maple and hazelnut.
AR	Arroyo de Terrafracio 2	1,320	20064667	Birch and hazelnut forest
AS	Route to Brañalibrán	1,349	20254672	Ruderal vegetation
AT	Arroyo de Terrafracio 1	1,318	20074665	Birch and hazelnut forest
AU	Meadows close to Reguero El Cepedal	1,274	19814739	Meadow with hedge
AV	Arroyo de Valseco (upper reaches)	1,260	19894736	Birch and hazelnut trees by a stream
AW	Ermita and surroundings	1,260	19824740	Meadow with hedge and ruderal vegetation
AX	Cemetery route	1,285	19804751	Ruderal vegetation
AY	Confluence of Arroyo de Valdiglesias and Arroyo de Terrafracio	1,258	19534728	Birch and hazelnut forest
AZ	Route to Valdiglesias 1	1,257	19504741	Birch and hazelnut trees by a stream
BA	Water tank	1,290	19604719	Birch and hazelnut forest
BB	Route to Valdiglesias 2	1,390	19184681	Birch and hazelnut forest, forest track and dry stream
BC	Arroyo de Valdiglesias	1,424	19114664	Birch and hazelnut forest
BD	Rivulet on the route to Valdiglesias	1,514	18974637	Birch and hazelnut forest
BE	Fuente Chamirales	1,514	18934635	Birch and hazelnut forest
BF	Arroyo de Valdiglesias (upper reaches)	1,546	18954612	Riparian forest
BG	Collado Valdiglesias 1	1,654	18834581	Mountain meadow and short riparian wood
BH	Collado Valdiglesias 2	1,804	18734547	Mountain meadow and bush
BI	Bog in the foothills of Pico Valdiglesias	1,825	18434552	Bog

Unexpectedly by its distance to the main Cantabrian Range, very extensive glaciers developed in this area due to the combination of abundant precipitation coming from the Atlantic Ocean and increasingly colder (more continental) conditions. Glaciers appeared on all the northern slopes of mountains surrounding Salientes and Salentinos valleys: the northern slopes of Nevadín (S<sup>a</sup> del Coto), Tambarón, and to the West (peñas del Lago and Valdiglesias), and also in Catoute. Usually, glacier apparatuses in this area were more developed in valleys oriented to the East (as opposed to the Castilian Meseta, colder and with greater persistence of snow), while those oriented to the West had almost no glacier modelling. Salientes and Salentinos valleys were an exception, with glacier cirques on the highest parts of northern slopes that descend to 1,400 m a.s.l. in some places. Postglacier thaw in the area (Laguna de Villaseca, Laciana) has been dated from 34,000±1,400 years before the present (Jalut *et al.*, 2004). The

peaks were converted into “horns” by glacier erosion, whereas their connecting spurs still preserve rounded and extensive forms, locally called “lombos”. They were a few kilometers long and were located above 1,800 m, marking the paleoreliefs of the area. Around 1,500–1,600 m, another group of plains is on the middle slope. A third and final group of plain forms appears 200 m above the bottom of the valley.

Climate (and therefore the vegetation) is deeply conditioned by oceanic influence, as in other NW Iberian areas. This oceanic influence gradient in the case of Salientes Valley, from the upper valley (moister) to its lower parts (with increasing Mediterranean influence). Climate is Temperate-Humid in Köppen classification with 1,000–1,400 mm of average annual precipitation, 15–20 snowfall days per year, and an average temperature of 7.5°–10°C. Detailed climate data can be found in IGN (1992) and Ninyerola *et al.* (2005). In general, this area is sunnier than the main

Cordillera Cantábrica and it is generally well known that these mountains frequently offer sunshine when it rains or is cloudy in the main Cordillera Cantábrica (Walker, 2002; Álvarez-Ruiz, 2011).

From a biogeographic perspective, the study area is located inside the Eurosiberian Region, specifically in the Orocantabric Province and the Laciano-Ancarensis Sector (Rivas-Martínez, 1987). Pyrenean oak forests grow on acid substrates of the south-facing slopes of the Montane belt, whereas deciduous forests are better represented on the northern, generally wetter slopes (Blanco et al., 2005). Pyrenean oak forests are formed by *Quercus pyrenaica* Willd. frequently accompanied by holly (*Ilex aquifolium* L.), birch (*Betula alba* L.), hazel (*Corylus avellana* L.), ash (*Fraxinus excelsior* L.), and wild cherry (*Prunus avium* L.). These sub-humid forests comprise the Orocantabric and Galician-Asturian mountain acidophilic series of Pyrenean oak: *Linario triornithophorae-Querceto pyrenaicae sigmetum* (Rivas-Martínez, 1987). The original structure of the forest has been lost by successive fellings and burning resulting in a sparse appearance, but with a highly developed understory (Blanco et al., 2005). Mixed forests are mainly composed of birch (*Betula alba* L.) with some sessile oaks (*Quercus petraea* (Mattuschka) Liebl.), holly (*I. aquifolium* L.)

and maples (*Acer pseudoplatanus* L.). They are part of the acidophilic orocantabric highland series of birch: *Luzulo heriquesii-Betuleto celtibericae sigmetum* (Rivas Martínez, 1987). Currently, birch trees are being regenerated due to their pioneering colonizing nature and a lower incidence of agricultural pressure (García de Celis et al., 2004). Valseco River valley presents a riverside forest formed by different species of *Salix* close to the shore. In a second strip, there are poplars (*Populus nigra* L.), ash (*F. excelsior* L.), and elms (*Ulmus glabra* Huds.). In the nearby areas of Salientes village, the riparian forest is altered due to its transformation into cultivation areas and cattle meadows (Ferrerías & Arozena, 1987). On the Subalpine belt (above 1,800 m) dwarf junipers appear that belong to the subalpine orocantabric series of *Juniperus nana* (*Junipero nanae-Vaccinieto uliginosi sigmetum*). Along with *J. nana*, there are two species of blueberry, *Vaccinium myrtillus* L. and *Vaccinium uliginosum* L. (Rivas-Martínez, 1987) which constitute a nutritional resource for the associated fauna. Around the top of Pico Valdiglesias (2,136 m) we find pastures of *Festuca eskia* DC., *Agrostis tileni* Nieto Fel. & Castrov., *Luzula caespitosa* Gay and other herbaceous plants adapted to strong winds and frosts, while wetter areas support *Nardus stricta* L. (Rivas-Martínez,

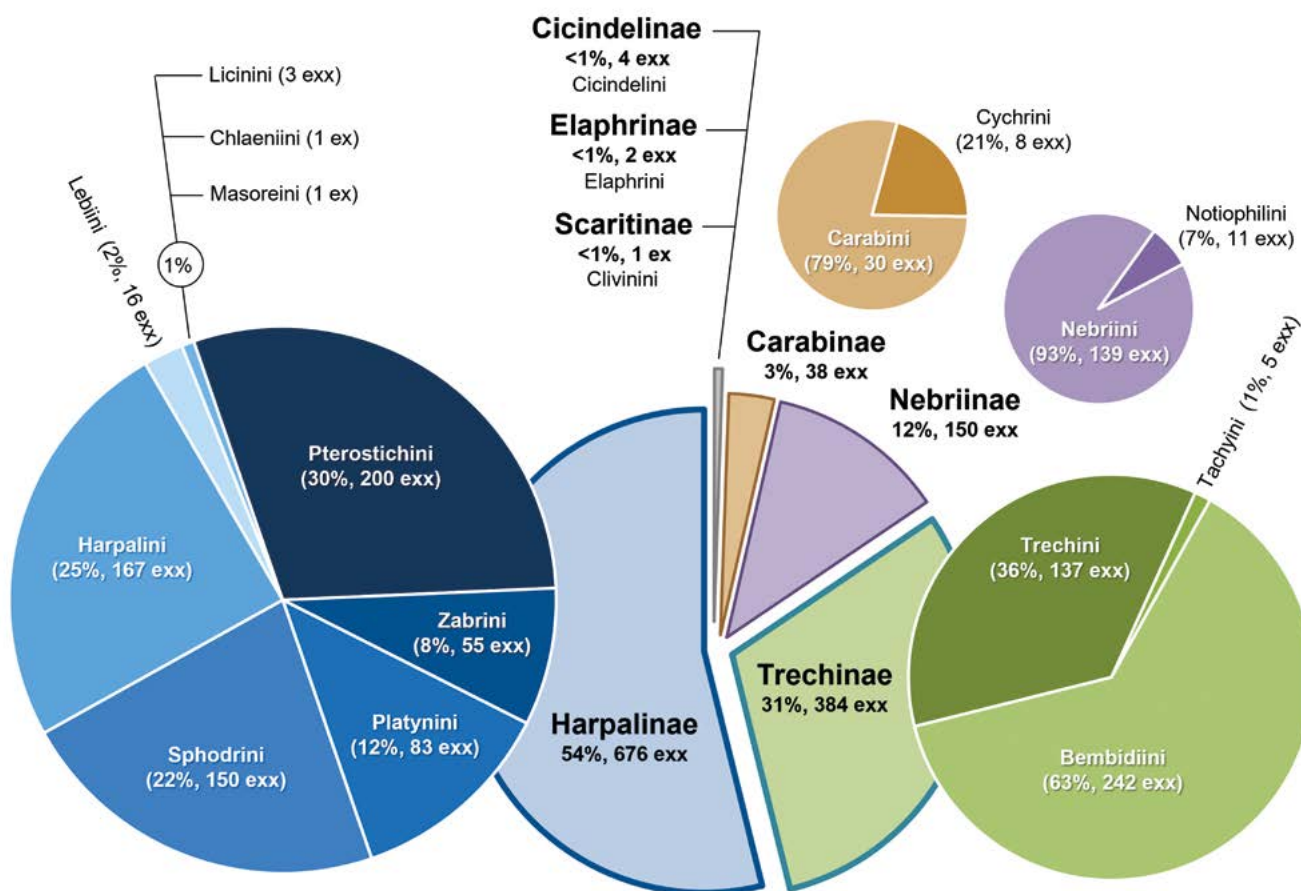


Fig. 2.– Quantitative analysis of the specimens collected in the Salientes Valley, grouped by subfamilies and tribes.

Fig. 2.– Análisis cuantitativo de los especímenes colectados en el valle de Salientes, agrupados por subfamilias y tribus.



1987). It should also be mentioned that the scree vegetation is mainly composed of *Cryptogramma crispera* (L.) R. Br., *Ranunculus parnassiifolius* L. Rothm., and *Spergula viscosa* Lag. (Rivas-Martínez, 1987). *Sphagnum* peat bogs are also common in this area (Fernández-Prieto *et al.*, 1987).

**Results**

**ABUNDANCE AND TAXONOMIC REPRESENTATION**

A total of 1,255 specimens were studied (Fig. 2), the majority, 85%, attributable to one of these two subfamilies: Harpalinae (54%) and Trechinae (31%). The tribes that contributed the most specimens to the Harpalinae samples were Pterostichini (200 exx, 30%), Harpalini (167 exx, 25%), and Sphodrini (150 exx, 22%). In a second-order of importance were Platynini (83 exx, 12%) and Zabryni (55 exx, 8%), and there was also a very small representation of Lebiini, Licinini, Chlaeniini, and Masoreini. The Trechinae are abundantly represented by the tribes Bembidiini (242 exx, 63%) and Trechini (137 exx, 36%), whereas the Tachyini were minimally represented by only one not very abundant species. The Nebriinae represented

12% of all collected carabids, with an unequal representation of the tribes Nebriini (139 exx, 93% of the subfamily) and Notiophilini (11 exx, 7%). The subfamily Carabinae subfamily, with only 3% of the total carabids, was more abundantly represented by the tribe Carabini (79% of Carabinae) than by the Cychrini (21%). Finally, a very low number of specimens belonging to three other subfamilies were recorded, these being the Cicindelinae, Elaphrinae, and Scaritinae.

The taxonomic analysis revealed 101 species with an observed diversity unequally distributed among 7 subfamilies and 19 tribes (Fig. 3). As was the case with the abundance analysis, Harpalinae and Trechinae were also the subfamilies with the greatest diversity of species in the Salientes carabid fauna: 61%, and 23%, respectively. Among the Harpalinae, the Harpalini (18 spp, or 29% of the total subfamily), Zabryni (11 spp, 18%), Pterostichini (10 spp, 16%) and Sphodrini (9 spp, 14%) tribes contributed the highest specific diversity, followed by Platynini (6 spp, 10%) and Lebiini (5 spp, 8%), and finally only one species in Licinini, Chlaeniini, and Masoreini. The Trechinae held a better representation of the Bembidiini tribe (17 spp, 74% of total), than of the

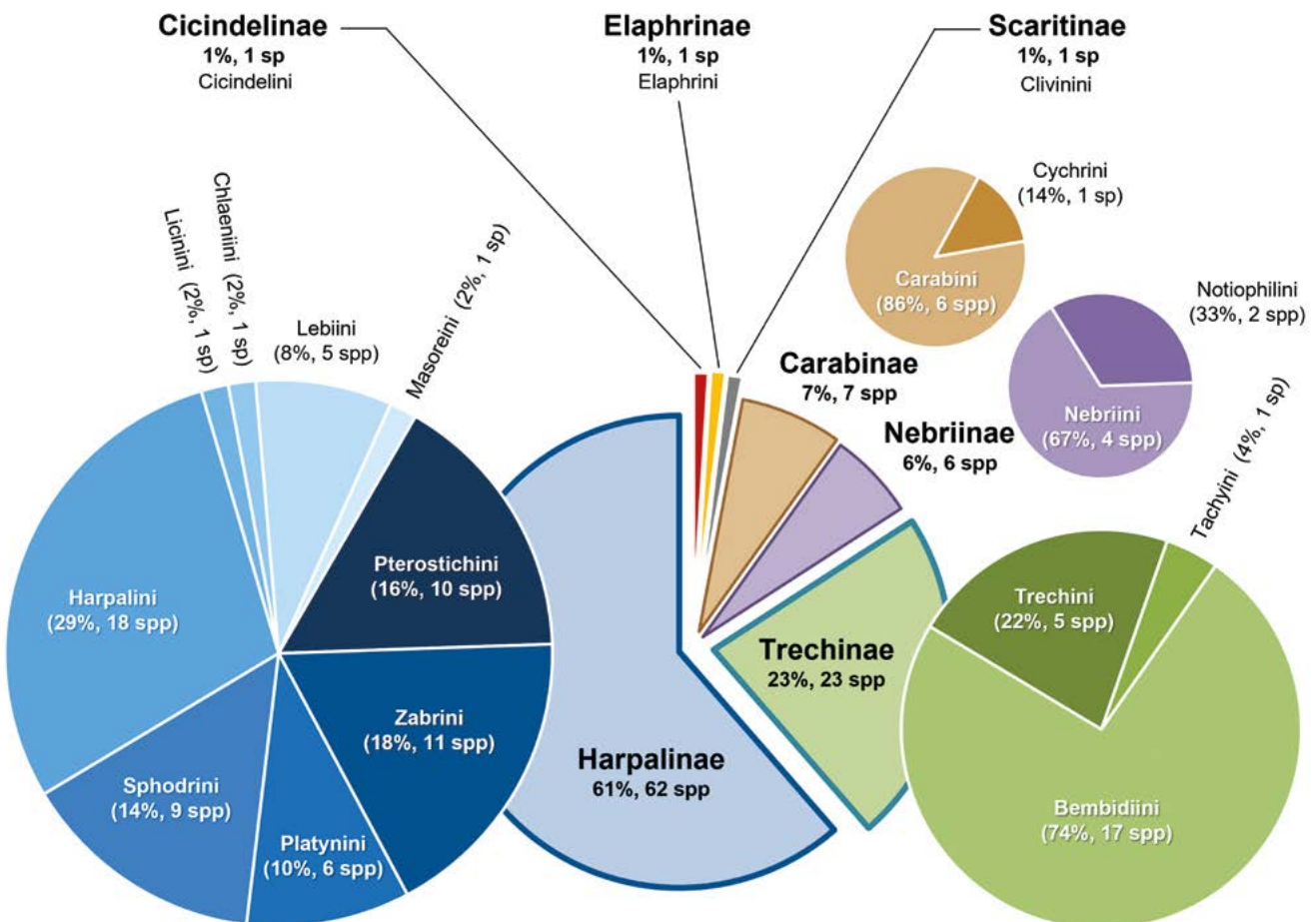


Fig. 3.– Taxonomic analysis of the species collected in the Salientes Valley, grouped by subfamilies and tribes.

Fig. 3.– Análisis taxonómico de las especies colectadas en el valle de Salientes, agrupadas por subfamilias y tribus.

Trechini (5 spp, 22%) and the anecdotal Tachyini (1 sp, 4%) poorly represented. Carabinae was the third subfamily in order of contributed diversity (7% of total carabids; with representatives of the Carabini (6 spp, 86% of the subfamily) and the Cychrini (1 sp, 14%). The subfamily Nebriinae contributed 6% of all carabids. The tribes Nebriini (4 spp, 67% of the total subfamily) and Notiophilini (2 spp, 33%) are included in this group. Three other subfamilies (Cicindelinae, Elaphrinae, and Scaritinae) with their respective tribes were barely represented by single species and very low specimen counts.

#### FAUNISTIC LIST

This section lists all the species collected in this study indicating the sampling locations in an abbreviated form (letter/s that correspond to Table 1 and Fig. 1). For each locality, the number of specimens of each sex and the date of collection is recorded. To shorten this section we have omitted collector names, although the information can be derived from the capture dates (see material and methods). Brief comments regarding habitat are also included. A biogeographic category (biogeographical element) has been assigned to each species in order to allow a biogeographical approximation to the Carabidae of Salientes.

*Cicindela (Cicindela) campestris campestris* Linnaeus, 1758  
G: 1 ♀, 07-VIII-2020. K: 1 ♀, 25-VI-2021. AD: 2 ♂♂, 27-VI-2021. This species was observed on forest tracks and montane meadows between 1,350 and 1,590 m a.s.l. WPAL element.

*Calosoma (Calosoma) sycophanta* (Linnaeus, 1758)  
U: 1 ex., 29-VI-2021. An elytron was found on a forest track at 1,240 m a.s.l. WPAL element.

*Carabus (Archicarabus) nemoralis lamadridae* Born, 1895  
P: 1 ♂, 04-VIII-2020; 1 ♀, 04-VIII-2020/08-VIII-2020; 1 ♂, 25-VI-2021. Epiedaphic and sublaidicolous specimens were collected on a forest path with elm, maple and ash trees at a low altitude (1,261 m a.s.l.). ENDE element.

*Carabus (Chrysocarabus) lineatus lateralis* Chevrolat, 1840.  
F: 1 ♂, 07-VIII-2020. P: 1 ♀, 07-VIII-2019; 1 ♀, 04-VIII-2020/08-VIII-2020. S: 1 ♀, 04-VIII-2020/08-VIII-2020. AB: 1 ♂, 06-VIII-2020. AE: 1 ♂, 1 ♀, 06-VIII-2020. AY: 1 ♂, 04-VIII-2020/08-VIII-2020. BD: 1 ♂, 26-VI-2021. BG: 1 ♂, 26-VI-2021. BH: 1 ♀, 26-VI-2021. This species is widely distributed in the valley, wooded slopes and montane meadows. It shows a predilection for nemoral environments although it is not abundant. It was observed in an altitude range of 1,218 to 1,804 m a.s.l. ENDE element.

*Carabus (Mesocarabus) macrocephalus macrocephalus* Dejean, 1826  
W: 1 ♀, 01-VIII-2021. AF: 1 ♀, 02-VIII-2021. AK: 4 ♂♂, 02-VIII-2021. This sublaidicolous species was found in

forest clearings (Pyrenean oak) and montane meadows located at medium and high altitudes (1,390 to 1,970 m a.s.l.). ENDE element.

The specimens of *C. (M.) macrocephalus* from the area are, without a doubt, similar to those from the axis of the Cantabrian Mountains (ssp. *macrocephalus* Dejean, 1826 or ssp. *joaquina* Breuning & De Toulgoët, 1974). Of the plethora of named forms, the closest is *magdalenai* Meyer & Mollard, 1996 (“magdalenei”, sic! in Mollard, 2013) (described as intermediate between *moroderi* and *asturicus*) (typical locality: Puerto de la Magdalena), in the adjoining valley to the N of this study area. However, this form is not always recognized, and some authors assimilate it to *moroderi* (typical locality: Montes de León, sic) (eg. Toulgoët & Lassalle, 1983; Mollard, 2013), whose morphology is more similar to “*lusitanicus*”. The *moroderi* forms, considered transitional between *lusitanicus* and *macrocephalus* by some authors, inhabit Montes de León (particularly south of Puerto del Manzanal: Teleno, Trevinca, Sanabria, etc..., although also to the north with the border in the Sil and Luna rivers, according to Toulgoët & Lassalle, 1983, for whom *magdalenai* with its longer elytra would be transitional between *moroderi* -already transitional- and *macrocephalus*) and, therefore, quite different from the *Mesocarabus* Thomson, 1875 of the Salientes Valley, that are indistinguishable from those of the nearby Cantabrian axis. Another form described from a more northerly valley (note the “fine grain” of the nomenclature among “carabophiles”) is “*joaquina*” Breuning & De Toulgoët, 1974 (“joacquini”, sic! in Mollard, 2013) (typical locality: near Torrebarrio, León), with a “*macrocephalus*” morphology (although it was described as subspecies of *lusitanicus* when treating both species as only one), already located in the axis of the Cantabrian Mountains, and to which we can attribute, without major problems, the collected specimens (if not best directly to *macrocephalus* Dejean, 1826, a more widespread taxon).

*Carabus (Oreocarabus) luetgensis getschmanni* Lapouge, 1924

O: 1 ♂, 2 ♀♀, 04-VIII-2020/08-VIII-2020. AP: 3 ♀♀, 31-VII-2021. This species was observed in ditches and forest path litter with maple and hazel at low and medium altitudes (1,233 to 1,440 m a.s.l.), Sublaidicolous behaviour. ENDE element.

*Carabus (Rhabdotocarabus) melancholicus costatus* Germar, 1824

AA: 1 ♂, 27-VI-2021. AC: 1 ♂, 1 ♀, 06-VIII-2020. Strongly hygrophilous species that was only found under stones next to puddles in a ruderal environment between 1,440-1,560 a.s.l. ENDE element.

*Cychrus spinicollis* Dufour, 1820

H: 1 ♂, 07-VIII-2019. K: 1 ♀, 30-VII-2021. M: 2 ♀♀, 28-VI-2021; 1 ♀, 03-VIII-2021. AQ: 1 ♂, 1 ♀, 08-VIII-2019. BB: 1 ♀, 26-VI-2021. Observed under stones in a wet birch forest, riparian forest and hedgerows, at



low and medium altitudes (1,230-1,458 m a.s.l.). ENDE element.

*Leistus (Leistus) barnevillei* Chaudoir, 1867

H: 1 ♀, 07-VIII-2020. K: 1 ♂, 25-VI-2021; 1 ♀, 30-VII-2021. AH: 11 ♂♂, 02-VIII-2021. AI: 18 ♂♂, 02-VIII-2021. AO: 1 ♂, 10 ♀♀, 10-VIII-2019. AQ: 1 ♂, 1 ♀, 08-VIII-2019; 1 ♂, 1 ♀, 09-VIII-2019; 4 ♂♂, 31-VII-2021. BA: 1 ♂, 28-VI-2021. BB: 1 ♀, 26-VI-2021. BC: 4 ♀♀, 06-VIII-2019. BD: 1 ♂, 06-VIII-2019. It was collected in a wide altitude range (1,290-1,835 m a.s.l.) closely linked to the edaphic and endogean environment in wooded areas (mixed forest dominated by birch) and mountain scrub. It is often part of the sublupicolous communities. ENDE element.

*Nebria (Eunebria) jockischii orensensis* Breit, 1914

F: 1 ♂, 3 ♀♀, 07-VIII-2020. I: 8 ♂♂, 4 ♀♀, 07-VIII-2019. J: 1 ♂, 07-VIII-2020. K: 1 ♀, 25-VI-2021. Q: 1 ♂, 04-VIII-2020. Z: 3 ♂♂, 2 ♀♀, 09-VIII-2019. AO: 4 ♂♂, 5 ♀♀, 10-VIII-2019. BB: 1 ♂, 04-VIII-2020. BF: 1 ♂, 1 ♀, 05-VIII-2020. This riparian species was observed in almost the entire fluvial network area, from the bottom of the valley (1,183 m a.s.l.) to mid-altitudes of lateral valleys (1,350-1,546 m a.s.l.). ENDE element.

*Nebria (Nebria) asturiensis* Bruneau de Miré, 1964

AF: 1 ♀, 02-VIII-2021. AG: 1 ♂, 2 ♀♀, 06-VIII-2020. AH: 8 ♂♂, 5 ♀♀, 02-VIII-2021. AI: 1 ♂, 2 ♀♀, 02-VIII-2021. BG: 1 ♂, 1 ♀, 26-VI-2021. It seems to be absent in the valley forest, but was found under stones and buried in the ground in supraforestal areas (1,654-1,835 m a.s.l.) dominated by broom and heather. ENDE element.

*Nebria (Nebria) brevicollis* (Fabricius, 1792)

C: 2 ♂♂, 3 ♀♀, 30-VII-2021. K: 1 ♂, 3 ♀♀, 25-VI-2021. Q: 2 ♀♀, 04-VIII-2020. AB: 1 ♀, 02-VIII-2021. AU: 1 ♂, 1 ♀, 25-VI-2021/29-VI-2021. AW: 5 ♀♀, 25-VI-2021; 1 ♂, 2 ♀♀, 29-VII-2021. BA: 1 ♂, 28-VI-2021. Hygrophilous species that was found on riversides, forest environments, bogs, and wet meadows between 1,183-1,530 m a.s.l. EURP element.

*Notiophilus biguttatus* (Fabricius, 1779)

H: 1 ♀, 07-VIII-2019. J: 1 ♂, 07-VIII-2020. AM: 1 ♂, 31-VII-2021. At medium altitude (1,382-1,573 m a.s.l.) in fallen leaves of riverside and under stones of ruderal environments. PALE element.

*Notiophilus rufipes* Curtis, 1829

K: 1 ♀, 25-VI-2021. M: 1 ♀, 03-VIII-2021. W: 2 ♀♀, 06-VIII-2020; 1 ♀, 27-VI-2021. AQ: 1 ♀, 08-VIII-2019; 1 ♀, 09-VIII-2019. AW: 1 ♀, 29-VII-2021. These specimens were found among fallen leaves on wet soil and under track stones at low and medium altitudes (1,230-1,432 m a.s.l.). SOER element.

*Elaphrus (Neolaphrus) pyrenoeus* Motschulsky, 1850

F: 1 ♂, 1 ♀, 07-VIII-2020. It was found on a bog next to the riverside environment at 1,472 m a.s.l. ENDE element.

*Clivina (Clivina) fossor* (Linnaeus, 1758)

AW: 1 ♂, 25-VI-2021. This specimen was collected under a stone on flooded soil on a path at 1,260 m a.s.l. HOLA element.

*Trechus (Trechus) fulvus* Dejean, 1831

H: 1 ♀, 11-VIII-2019. AM: 1 ♀, 31-VII-2021. AO: 1 ♀, 10-VIII-2019. AP: 1 ♂, 31-VII-2021. AQ: 5 ♂♂, 1 ♀, 08-VIII-2019; 2 ♂♂, 09-VIII-2019; 2 ♂♂, 31-VII-2021. BB: 2 ♂♂, 04-VIII-2020. BD: 1 ♂, 1 ♀, 06-VIII-2019. Hygrophilous, lucifugal, and geophilic species. It was found in various localities under stones, and in soil/subsoil micro spaces of streams and valleys without surface circulating water, or among the leaf litter of gallery forest at low and medium altitudes (1,356-1,573 m a.s.l.). WEUR element.

In this study, the specimens of *T. fulvus* are not assigned to any subspecies following the taxonomic criteria established by Ortuño *et al.* (2017) who affirm based exclusively on morphological characters that it is difficult to defend the validity of the subspecies described for Iberian populations of this species. Therefore, the biogeographic category assigned to it corresponds to its species level.

*Trechus (Trechus) gallaecus* Jeannel, 1921 (Figs. 4a, 5–6)

H: 2 ♂♂, 3 ♀♀, 07-VIII-2019; 1 ♂, 11-VIII-2019; 2 ♂♂, 1 ♀, 07-VIII-2020. AO: 8 ♂♂, 2 ♀♀, 10-VIII-2019. AQ: 4 ♂♂, 7 ♀♀, 08-VIII-2019; 1 ♂, 1 ♀, 09-VIII-2019. AT: 1 ♂, 10-VIII-2019. AY: 1 ♀, 04-VIII-2020/08-VIII-2020. BA: 1 ♂, 28-VI-2021. BC: 1 ♂, 1 ♀, 06-VIII-2019. BG: 1 ♀, 05-VIII-2020. Forest species was located in various places between 1,258-1,654 m a.s.l., especially among the humid leaf litter of birch, hazel, maple, willow and rowan forests, and in soil/subsoil interstices. ENDE element.

*Trechus (Trechus) obtusus* Erichson, 1837

B: 1 ♂, 30-VII-2021. J: 1 ♂, 07-VIII-2020. M: 2 ♀♀, 03-VIII-2021. W: 1 ♀, 06-VIII-2020; 2 ♂♂, 2 ♀♀,

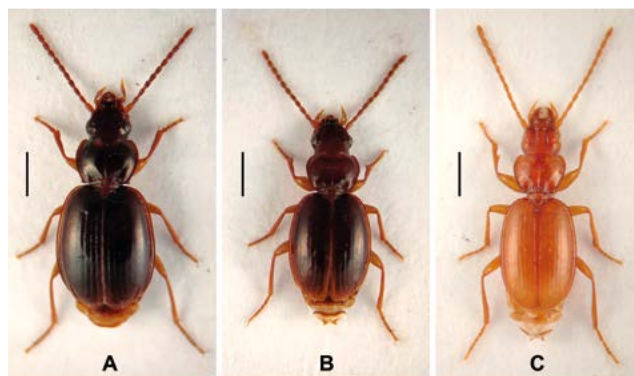


Fig. 4.– Female specimens of *Trechus* collected in the Salientes Valley (León): a) *Trechus (Trechus) gallaecus* Jeannel, 1921; b) *Trechus (Trechus) suturalis* Putzeys, 1870; c) *Trechus (Trechus) teverganus* Toribio, 2015. Scale: 1 mm.

Fig. 4.– Especímenes femeninos de *Trechus* colectados en el valle de Salientes (León): a) *Trechus (Trechus) gallaecus* Jeannel, 1921; b) *Trechus (Trechus) suturalis* Putzeys, 1870; c) *Trechus (Trechus) teverganus* Toribio, 2015. Escala: 1 mm.

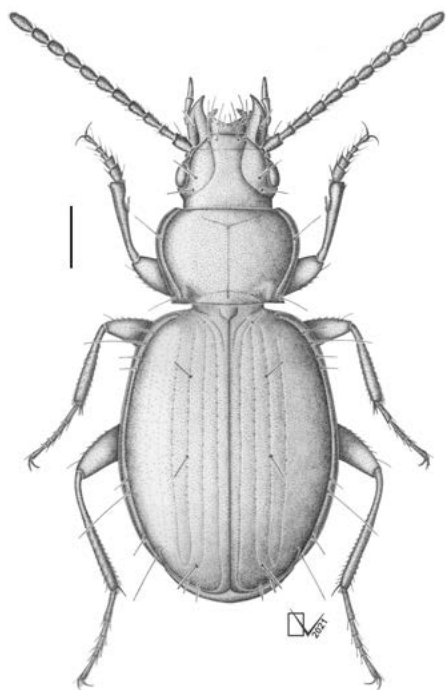


Fig. 5.– Habitus of *Trechus (Trechus) gallaecus* Jeannel, 1921. Scale: 0.5 mm.

Fig. 5.– Habitus de *Trechus (Trechus) gallaecus* Jeannel, 1921. Escala: 0,5 mm.

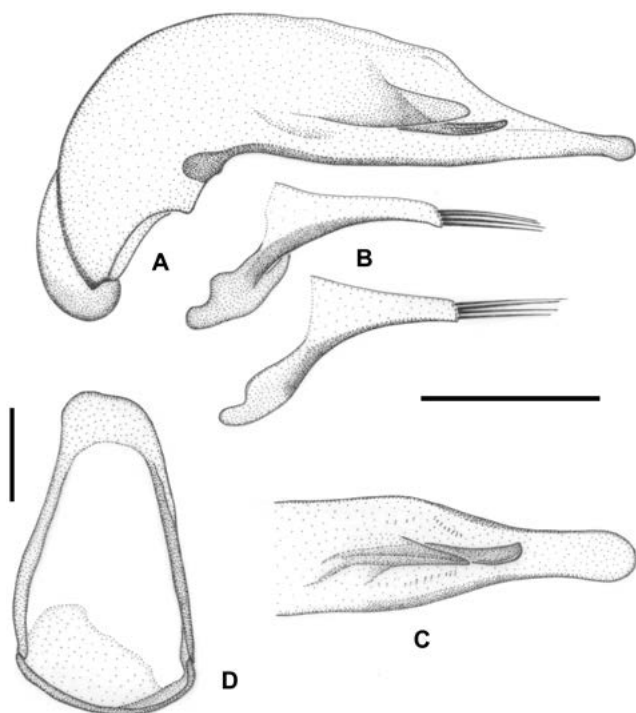


Fig. 6.– Details of the male genitalia of *Trechus (Trechus) gallaecus* Jeannel, 1921; a) middle lobe in left lateral view; b) right and left parameres; c) anterior half of the median lobe in dorsal view; d) aedeagial ring. Scale: 0.3 mm.

Fig. 6.– Detalles de la genitalia masculina de *Trechus (Trechus) gallaecus* Jeannel, 1921; a) lóbulo medio en visión lateral izquierda; b) parámetros derecho e izquierdo; c) mitad anterior del lóbulo medio en visión dorsal; d) anillo edeágico. Escala: 0,3 mm.

27-VI-2021; 1 ♂, 2 ♀♀, 01-VIII-2021. X: 2 ♀♀, 01-VIII-2021. AB: 1 ♂, 06-VIII-2020. AP: 3 ♂♂, 4 ♀♀, 31-VII-2021. AX: 1 ♀, 06-VIII-2020. It was observed under stones of ruderal environments, bogs, and soils with leaf litter (especially of mesothermal vegetation) in localities located at mid-low altitudes (1,230-1,617 m a.s.l.). EUME element.

*Trechus (Trechus) suturalis* Putzeys, 1870 (Figs. 4b, 7)

E: 1 ♂, 2 ♀♀, 07-VIII-2020. H: 4 ♂♂, 5 ♀♀, 11-VIII-2019; 2 ♂♂, 07-VIII-2019; 7 ♂♂, 07-VIII-2020. L: 1 ♀, 25-VI-2021/29-VI-2021. AB: 1 ♀, 06-VIII-2020. AM: 1 ♀, 31-VII-2021. AO: 3 ♂♂, 2 ♀♀, 10-VIII-2019. AP: 1 ♂, 31-VII-2021. AQ: 11 ♂♂, 5 ♀♀, 08-VIII-2019; 2 ♂♂, 2 ♀♀, 09-VIII-2019; 1 ♂, 31-VII-2021. AY: 1 ♀, 04-VIII-2020/08-VIII-2020. Forest species located in several places at low and medium altitudes (1,258-1,573 m a.s.l.) that appear syntopic with *T. gallaecus*. It was observed among deciduous forests with moist leaf litter (birch, hazel, maple, willow, rowan) and in soil/subsoil interstices. ENDE element.

*Trechus (Trechus) teverganus* Toribio, 2015 (Fig. 4c)

AQ: 1 ♂, 1 ♀, 08-VIII-2019; 1 ♂, 1 ♀, 09-VIII-2019. BC: 1 ♀, 06-VIII-2019. BE: 1 ♂, 06-VIII-2019. Species located at medium altitude (1,424-1,514 m a.s.l.) in the subterranean environment of humid places, valleys, and

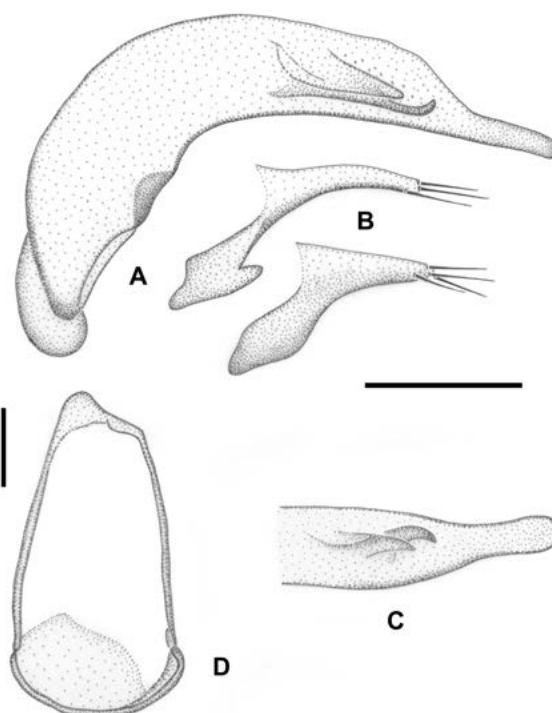


Fig. 7.– Details of the male genitalia of *Trechus (Trechus) suturalis* Putzeys, 1870; a) middle lobe in left lateral view; b) right and left parameres; c) anterior half of the median lobe in dorsal view; d) aedeagial ring. Scale: 0.2 mm.

Fig. 7.– Detalles de la genitalia masculina de *Trechus (Trechus) suturalis* Putzeys, 1870; a) lóbulo medio en visión lateral izquierda; b) parámetros derecho e izquierdo; c) mitad anterior del lóbulo medio en visión dorsal; d) anillo edeágico. Escala: 0,2 mm.

near streams without surface water activity, associated to birch forest. ENDE element.

*Tachyura (Tachyura) parvula* (Dejean, 1831)

K: 1 ♀, 25-VI-2021. AD: 2 ♀♀, 06-VIII-2020; 2 ♀♀, 27-VI-2021. Hygrophilous species that was barely observed on the sunny edge of streams located at medium altitude (1,350-1,590 m a.s.l.). EUME element.

*Ocys (Ocys) tachysoides* (Antoine, 1933)

H: 2 ♀♀, 07-VIII-2019. A hygrophilous species that was found only among the leaf litter of riparian birch forest in a shady environment (1,458 m a.s.l.). IBMG element.

*Sinechostictus (Sinechostictus) stomoides* (Dejean, 1831)

F: 1 ♂, 3 ♀♀, 07-VIII-2020. H: 1 ♀, 07-VIII-2019; 4 ♂♂, 1 ♀, 11-VIII-2019. K: 2 ♀♀, 25-VI-2021. T: 1 ♂, 04-VIII-2020. Z: 1 ♀, 09-VIII-2019. AW: 1 ♂, 24-VI-2021. Strongly hygrophilous species that was usually found under stones on the banks of streams that cross the riparian forest. At low and medium altitudes (1,240-1,472 m a.s.l.). EURP element.

*Bembidion (Emphanes) minimum* (Fabricius, 1792)

AD: 1 ♂, 27-VI-2021. Riparian species which the only specimen was observed at 1,590 m a.s.l. on the sunny edges of a stream. SIER element.

*Bembidion (Trepanes) articulatum* (Panzer, 1796)

AD: 1 ♂, 1 ♀, 27-VI-2021. Hygrophilous species, frequently riparian, that was occasionally observed at 1,590 m a.s.l. on sunny stream banks. ASER element.

*Bembidion (Philochthus) guadarramense* Gautier des Cottes, 1866

E: 1 ♀, 07-VIII-2020. AB: 1 ♀, 06-VIII-2020. BI: 6 ♂♂, 7 ♀♀, 05-VIII-2020. Hygrophilous species settled on riversides and marshy areas between 1,479 and 1,825 m a.s.l. It has been observed abundantly in hygroturbid substrates near Pico Valdiglesias. ENDE element.

*Bembidion (Philochthus) guttula* (Fabricius, 1792)

F: 1 ♂, 07-VIII-2020. J: 1 ♀, 07-VIII-2020. K: 9 ♂♂, 3 ♀♀, 25-VI-2021. M: 1 ♀, 28-VI-2021. W: 1 ♀, 27-VI-2021. AD: 1 ♂, 27-VI-2021. AV: 1 ♀, 04-VIII-2020/08-VIII-2020. Hygrophilous species frequently develops sublapidicolous behaviour in riparian environments or moist grassland. Observed at low and medium altitude localities (1,230-1,590 m a.s.l.). WPAL element.

*Bembidion (Bembidion) quadrimaculatum* (Linnaeus, 1761)

AD: 1 ♂, 06-VIII-2020; 1 ♀, 27-VI-2021. Hygrophilous species, frequently riparian, was occasionally observed on the sunny edge of a stream at 1,590 m a.s.l. HOLA element.

*Bembidion (Nepha) callosum subconnexum* De Monte, 1953

F: 1 ♀, 07-VIII-2020. K: 1 ♂, 25-VI-2021. Q: 9 ♂♂, 2 ♀♀, 04-VIII-2020. AB: 2 ♀♀, 06-VIII-2020. AO: 1 ♂, 10-

VIII-2019. BB: 1 ♂, 04-VIII-2020. BF: 2 ♀♀, 05-VIII-2020. BH: 1 ♀, 26-VI-2021. Hygrophilous and riparian species widely distributed throughout the riverside localities of the sampled area. It dwells among riverside gravel, under boulders, and even buried on temporarily inactive river courses. It has been observed at very different altitudes, from the bottom of the valley to the middle and upper slopes (1,183-1,804 m a.s.l.). ENDE element.

*Bembidion (Nepha) ibericum* Piochard de la Brûlerie, 1867

A: 13 ♂♂, 14 ♀♀, 30-VII-2021. F: 5 ♂♂, 6 ♀♀, 07-VIII-2020. J: 1 ♀, 07-VIII-2020. K: 1 ♂, 25-VI-2021. Z: 1 ♂, 09-VIII-2019. AB: 5 ♀♀, 06-VIII-2020. AD: 1 ♂, 2 ♀♀, 27-VI-2021. BB: 1 ♂, 04-VIII-2020. BE: 1 ♀, 05-VIII-2020. BF: 1 ♀, 05-VIII-2020. Hygrophilous and frequently riparian species, although can seek refuge under stones on humid soils (path ditches, forest clearings, etc.), or even be buried in temporarily inactive fluvial courses. Observed at low and medium altitudes (1,350-1,673 m a.s.l.). ENDE element.

*Bembidion (Omoperiphys) strictum* (Schuler, 1962)

A: 1 ♂, 1 ♀, 30-VII-2021. F: 1 ♂, 1 ♀, 07-VIII-2020. AB: 1 ♀, 06-VIII-2020. BF: 2 ♂♂, 3 ♀♀, 05-VIII-2020. Hygrophilous species that wanders among rivers gravel, sheltering under stones on moist soil near the riverbeds, and even buried in the soil of riverside slopes. It was observed between 1,472-1,673 m a.s.l. ENDE element.

*Bembidion (Peryphanes) deletum schulerianum* Müller-Motzfeld, 1986

K: 2 ♂♂, 2 ♀♀, 29-VI-2021; 1 ♀, 30-VII-2021. AB: 2 ♂♂, 1 ♀, 06-VIII-2020. AM: 2 ♂♂, 31-VII-2021. BA: 1 ♂, 28-VI-2021. Although it is a hygrophilous species, it cannot be considered typically riparian. It is often buried in forest soils rich in organic debris. It was observed at low and medium altitudes (1,290-1,573 m a.s.l.). WEUR element.

*Bembidion (Bembidionetolitzkya) geniculatum geniculatum* Heer, 1837

H: 1 ♂, 07-VIII-2019. I: 1 ♀, 30-VII-2021. Z: 1 ♀, 09-VIII-2019. AO: 1 ♀, 10-VIII-2019. BB: 1 ♂, 2 ♀♀, 04-VIII-2020. Riparian species that tends to settle on gravel river beaches and boulders located at low and medium altitudes (1,356-1,458 m a.s.l.). ALPI element.

*Bembidion (Bembidionetolitzkya) leonense* Jeanne & Muller-Motzfeld, 1982

AO: 1 ♀, 10-VIII-2019. Uncommon riparian species dwells on fluvial areas of the bottom of the valley. The specimen studied was found under a stone on Arroyo de Terrafracio edge, at 1,356 m a.s.l. ENDE element.

*Bembidion (Bembidionetolitzkya) tibiale* (Duftschmid, 1812)

F: 1 ♂, 2 ♀♀, 07-VIII-2020. H: 1 ♀, 07-VIII-2019. I: 1 ♀, 30-VII-2021. Q: 4 ♂♂, 3 ♀♀, 04-VIII-2020. Z: 3 ♂♂, 1 ♀, 09-VIII-2019. AO: 4 ♂♂, 1 ♀, 10-VIII-2019. BB:



1 ♂, 4 ♀♀, 04-VIII-2020. Riparian species that grows on small river beaches composed of gravel and boulders. It was observed between 1,183-1,472 m a.s.l. EURP element.

*Bembidion (Peryphus) tetracolum* Say, 1823

K: 4 ♀♀, 25-VI-2021. AR: 2 ♀♀, 10-VIII-2019. AW: 6 ♂♂, 1 ♀, 24-VI-2021; 3 ♂♂, 25-VI-2021. Hygrophilous species can be found in different humid substrates (riversides, moss pads, wet ditches, etc.) at low altitudes (1,260-1,350 m a.s.l.). HOLA element.

*Bembidion (Metallina) lampros* (Herbst, 1784)

B: 4 ♀♀, 30-VII-2021. F: 1 ♂, 5 ♀♀, 07-VIII-2020. K: 1 ♂, 25-VI-2021. M: 1 ♀, 28-VI-2021. W: 1 ♂, 2 ♀♀, 27-VI-2021. AD: 5 ♂♂, 2 ♀♀, 06-VIII-2020; 6 ♀♀, 27-VI-2021. AF: 1 ♂, 02-VIII-2021. AG: 1 ♂, 06-VIII-2020. AW: 1 ♂, 24-VI-2021; 2 ♂♂, 3 ♀♀, 25-VI-2021; 2 ♂♂, 1 ♀, 29-VII-2021. BA: 1 ♂, 28-VI-2021. BI: 1 ♀, 05-VIII-2020. It usually runs at daylight in open and sunny areas (meadows, roadside ditches, forest clearings) although it also takes refuge under stones. It was collected at very different altitudes from the bottom of the valley to the tops of mountain crests (1,230-1,825 m a.s.l.). PALE element.

*Bembidion (Metallina) properans* (Stephens, 1828)

C: 1 ♂, 30-VII-2021. F: 2 ♂♂, 07-VIII-2020. A less common species than *B. (M.) lampros* in the valley, although it shows similar behaviour and habitat selection. It was observed at mid-altitude (1,472-1,525 m a.s.l.). ASER element.

*Cryobius cantabricus cantabricus* (Schaufuss, 1862)

D: 2 ♂♂, 07-VIII-2019. E: 1 ♂, 07-VIII-2020. H: 2 ♀♀, 11-VIII-2019; 1 ♂, 07-VIII-2020. J: 1 ♂, 3 ♀♀, 07-VIII-2020. K: 1 ♂, 3 ♀♀, 25-VI-2021; 1 ♀, 30-VII-2021. Z: 1 ♂, 09-VIII-2019. AH: 1 ♂, 02-VIII-2021. AJ: 1 ♂, 1 ♀, 02-VIII-2021. AK: 1 ♂, 02-VIII-2021. AO: 1 ♂, 10-VIII-2019. AP: 4 ♂♂, 2 ♀♀, 31-VII-2021. AQ: 2 ♂♂, 3 ♀♀, 08-VIII-2019; 3 ♂♂, 1 ♀, 31-VII-2021. AW: 1 ♀, 04-VIII-2020/08-VIII-2020; 1 ♂, 29-VII-2021. AY: 1 ♂, 1 ♀, 04-VIII-2020/08-VIII-2020. BA: 1 ♂, 2 ♀♀, 28-VI-2021. BB: 1 ♂, 1 ♀, 26-VI-2021. BC: 5 ♀♀, 06-VIII-2019. BD: 2 ♂♂, 1 ♀, 06-VIII-2019. BG: 2 ♀♀, 05-VIII-2020. Species is widely distributed throughout the study area. Very well established in the forest area where it is under stones or in the leaf litter. It has also been observed in roadside ditches and forest trails, in montane meadows, and along with forest river courses. It was found at a wide altitude range (1,258-1,970 m a.s.l.). ENDE element.

*Poecilus (Macropoecilus) kugelanni* (Panzer, 1797)

AC: 3 ♀♀, 27-VI-2021. Species observed at 1,560 m a.s.l. showing a heliophilous behaviour on a forest track. EURP element.

*Poecilus (Poecilus) versicolor* (Sturm, 1824)

K: 1 ♀, 25-VI-2021. AG: 1 ♀, 06-VIII-2020. AU: 1 ♂, 29-VI-2021. This species was observed under stones on meadows and forest road tracks covering an altitudinal range from the bottom of the valley to elevated areas (1,274-1,800 m a.s.l.). SIER element.

*Pterostichus (Argutor) vernalis* (Panzer, 1796)

C: 1 ♂, 30-VII-2021. AX: 1 ♂, 06-VIII-2020. It was punctually found under stones at two well-differentiated localities, a path and a bog at low and medium altitudes (1,285 and 1,525 m a.s.l.). PALE element.

*Pterostichus (Feronidius) brevipennis brevipennis* Chevrolat, 1840

W: 1 ♀, 06-VIII-2020; 1 ♂, 1 ♀, 27-VI-2021; 1 ♂, 1 ♀, 01-VIII-2021. X: 2 ♂♂, 1 ♀, 01-VIII-2021. Z: 1 ♀, 09-VIII-2019. AS: 1 ♂, 31-VII-2021. AW: 1 ♂, 29-VII-2021. BB: 3 ♂♂, 3 ♀♀, 26-VI-2021. Not very abundant species but observed always sheltered under stones in diverse environments (Pyrenean oak and broom path, mowing meadow, birch grove, broom grove, stream bank, track ditch), at low and medium altitudes (1,260-1,500 m a.s.l.). ENDE element.

*Pterostichus (Oreophilus) cantaber* (Chaudoir, 1868) (Figs. 8a–b, d–e, 9a–b)

H: 1 ♂, 07-VIII-2019. K: 1 ♂, 25-VI-2021; 1 ♀, 30-VII-2021. J: 2 ♂♂, 2 ♀♀, 07-VIII-2020. M: 1 ♂, 03-VIII-2021. Q: 1 ♀, 04-VIII-2020. S: 1 ♂, 1 ♀, 04-VIII-2020/08-VIII-2020. Z: 1 ♂, 09-VIII-2019. AB: 1 ♀, 02-VIII-2021. AH: 1 ♀, 02-VIII-2021. AI: 1 ♀, 02-VIII-2021. AP: 4 ♂♂, 31-VII-2021. AQ: 3 ♀♀, 08-VIII-2019; 1 ♀, 09-VIII-2019; 2 ♀♀, 31-VII-2021. AU: 2 ♂♂, 25-VI-2021/29-VI-2021. AW: 2 ♂♂, 3 ♀♀, 04-VIII-2020; 1 ♀, 04-VIII-2020/08-VIII-2020; 1 ♀, 25-VI-2021; 2 ♂♂, 1 ♀, 29-VII-2021. BA: 2 ♂♂, 28-VI-2021. BB: 1 ♀, 04-VIII-2020; 5 ♂♂, 1 ♀, 26-VI-2021. BC: 3 ♀♀, 06-VIII-2019. BD: 1 ♀, 06-VIII-2019. BG: 1 ♀, 05-VIII-2020. It is one of the most conspicuous carabid beetles in the area: large, with sublaidicolous behaviour, it is found in areas with a lot of vegetation (birch trees, gallery forests) or in clearer areas (stream banks, slopes, meadows), at a wide altitude range (1,183-1,835 m a.s.l.). ENDE element.

*Pterostichus (Phonias) strenuus* (Panzer, 1797)

C: 1 ♂, 30-VII-2021. J: 1 ♀, 07-VIII-2020. M: 1 ♂, 28-VI-2021. W: 1 ♂, 06-VIII-2020; 1 ♂, 01-VIII-2021. AW: 1 ♀, 04-VIII-2020. AX: 1 ♀, 06-VIII-2020. This species was observed seeking refuge under stones roadside ditches, meadows, and bogs. Available data locate it in an altitudinal strip between 1,230-1,525 m a.s.l. SIER element.

*Pterostichus (Pseudomaseus) carri* Angus, Galián & Wrase & Chaladze, 2009

C: 2 ♀♀, 30-VII-2021. J: 1 ♂, 07-VIII-2020. Z: 1 ♀, 09-VIII-2019. AC: 1 ♂, 1 ♀, 27-VI-2021. AD: 1 ♂, 06-VIII-2020. AU: 1 ♀, 25-VI-2021/29-VI-2021. AW: 1 ♂, 24-VI-2021; 2 ♂♂, 1 ♀, 25-VI-2021; 1 ♀, 29-VII-2021. Species with a hygrophilous tendency that is preferably



Fig. 8.– Female specimens (scale: 1 mm) and detail of the elytral apex (scale: 0.5 mm) of: a,d and b,e) *Pterostichus (Oreophilus) cantaber* (Chaudoir, 1868) from Salientes Valley (León); c,f) *P. (O.) franzi* Nègre, 1955 from Puerto del Morredero (León).

Fig. 8.– Especímenes femeninos (escala: 1 mm) y detalle del ápice de los élitros (escala: 0,5 mm) de: a,d y b,e) *Pterostichus (Oreophilus) cantaber* (Chaudoir, 1868) del valle de Salientes (León); c,f) *P. (O.) franzi* Nègre, 1955 del Puerto del Morredero (León).

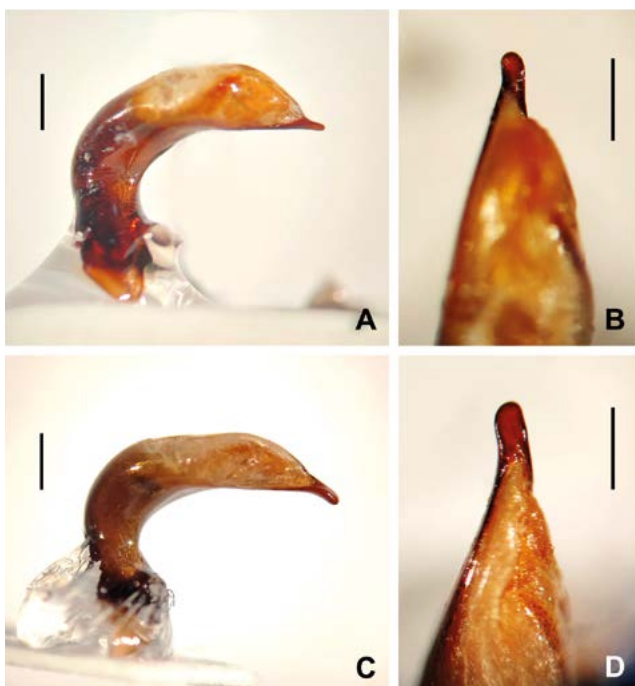


Fig. 9.– Aedeagus in left lateral view (scale: 0.5 mm) and detail of the middle lobe apex in dorsal view (scale: 0.5 mm) of: a,b) *Pterostichus (Oreophilus) cantaber* (Chaudoir, 1868) from Salientes Valley (León); c,d) *P. (O.) franzi* Nègre, 1955 from Puerto del Morredero (León).

Fig. 9.– Edeago en visión lateral izquierda (escala: 0,5 mm) y detalle del ápice del lóbulo medio en visión dorsal (escala: 0,5 mm) de: a,b) *Pterostichus (Oreophilus) cantaber* (Chaudoir, 1868) del valle de Salientes (León); c,d) *P. (O.) franzi* Nègre, 1955 del Puerto del Morredero (León).

located on riverbanks, wet meadows, bogs, or in wet ditches and track slopes. In these places, it usually seeks refuge under stones. It was observed at mid-low altitude (1,260-1,590 m a.s.l.). IBMG element.

*Pterostichus (Pterostichus) cristatus heydenianus* Jacobson, 1907

D: 2 ♀♀, 07-VIII-2019. F: 1 ♂, 4 ♀♀, 07-VIII-2020. H: 3 ♂♂, 1 ♀, 07-VIII-2019. J: 4 ♂♂, 1 ♀, 07-VIII-2020. K: 1 ♂, 2 ♀♀, 25-VI-2021. Q: 1 ♂, 1 ♀, 04-VIII-2020. Z: 4 ♂♂, 1 ♀, 09-VIII-2019. AG: 1 ♀, 06-VIII-2020. AN: 2 ♂♂, 1 ♀, 31-VII-2021. AQ: 1 ♂, 1 ♀, 31-VII-2021. AT: 2 ♂♂, 10-VIII-2019. AW: 1 ♂, 24-VI-2021; 1 ♀, 25-VI-2021; 2 ♂♂, 29-VII-2021. AZ: 1 ♂, 1 ♀, 05-VIII-2020. BB: 2 ♂♂, 3 ♀♀, 04-VIII-2020. BC: 2 ♂♂, 1 ♀, 06-VIII-2019. BE: 1 ♂, 05-VIII-2020. Frequent and widely distributed species in the altitude range from 1,183 to 1,556 m a.s.l., especially in the humid forests (birch groves, riparian forest), or associated with them (stream banks, ditches and slopes of tracks forests, meadows and forest clearings). There is a single record at a high altitude (1,800 m a.s.l.) linked to a moist substrate. It is common to find it in syntopy with *P. (O.) cantaber*. ENDE element.

*Steropus (Steropidius) gallega* (Fairmaire, 1859)

P: 1 ♂, 04-VIII-2020/08-VIII-2020. This species is usually very frequent in forest areas of the Cantabrian zone but is uncommon in this study. Only one specimen was collected by installing pitfall traps in a place with elms, maples and ash trees at 1,261 m a.s.l. ENDE element.

*Amara (Amara) aenea* (DeGeer, 1774)

D: 2 ♀♀, 30-VII-2021. F: 1 ♂, 07-VIII-2020. G: 2 ♂♂, 2 ♀♀, 07-VIII-2020. W: 1 ♀, 06-VIII-2020. AD: 6 ♂♂, 6 ♀♀, 27-VI-2021. AE: 3 ♂♂, 6 ♀♀, 06-VIII-2020. Typical species of open areas more exposed to insolation (sunny meadows and paths). It was located at the bottom of a valley or on south-facing slopes at low and medium altitudes (1,390-1,621 m a.s.l.). PALE element.

*Amara (Amara) communis* (Panzer, 1790)

AW: 1 ♂, 25-VI-2021. Uncommon species of which a single specimen was collected in a meadow at the bottom of the valley (1,260 m a.s.l.). ASER element.

*Amara (Amara) familiaris* (Duftschmid, 1812)

W: 1 ♂, 1 ♀, 06-VIII-2020; 1 ♂, 4 ♀♀, 27-VI-2021. AW: 1 ♀, 24-VI-2021. This species was observed occasionally in open areas (sunny pathway and runway ditch) at low altitudes (1,260-1,390 m a.s.l.). ASER element.

*Amara (Amara) lucida* (Duftschmid, 1812)

W: 1 ♀, 06-VIII-2020; 1 ♀, 27-VI-2021. Uncommon species that was found in a place with Pyrenean oaks, brooms and mowing meadows (1,390 m a.s.l.). TEUM element.

*Amara (Amara) montivaga* Sturm, 1825

AW: 1 ♂, 24-VI-2021. Scarce species that was found wandering along the path ground at bottom of the valley (1,260 m a.s.l.). TUER element.

*Amara (Bradytus) apricaria* (Paykull, 1790)

AF: 1 ♂, 02-VIII-2021. Unusual species whose only specimen was found under a stone in a meadow located at 1,665 m a.s.l. HOLA element.

*Amara (Percosia) equestris equestris* (Duftschmid, 1812)

Y: 2 ♂♂, 1 ♀, 01-VIII-2021. Species that was only observed on slopes facing south (1,555 m a.s.l.), whose specimens were found under stones in an area with brooms and dense grass cover. SIER element.

*Amara (Zezea) kulti* Fassati, 1947

B: 1 ♀, 30-VII-2021. A single specimen was found under a stone in a wet meadow at 1,617 m a.s.l. EUME element.

*Curtonotus aulicus* (Panzer, 1797)

D: 1 ♂, 30-VII-2021. BA: 1 ♂, 28-VI-2021. Unusual species found under stones in birch forest between 1,290-1,500 m a.s.l. ASER element.

*Zabrus (Cantabrozabrus) consanguineus* Chevrolat, 1865

AK: 1 ♂, 02-VIII-2021. AL: 2 ♂♂, 2 ♀♀, 02-VIII-2021. Species that was only observed at high altitudes (1,970-2,002 m a.s.l.), in the surroundings of El Tambarón summit. It was found under stones in montane meadows and at the base of rocky outcrops. ENDE element.

*Zabrus (Iberozabrus) silphoides asturiensis* Heyden, 1880

D: 1 ♀, 07-VIII-2019; 1 ♂, 30-VII-2021. Uncommon species that was only observed under stones of the ditch of a track that runs next to a meadow with brooms in the upper of Rabón valley (1,500 m a.s.l.) ENDE element.

*Agonum (Agonum) muelleri* (Herbst, 1784)

B: 1 ♂, 30-VII-2021. Hygrophilous and scarce species that was only observed in a bog located at 1,617 m a.s.l. SIER element.

*Agonum (Olisares) sexpunctatum* (Linnaeus, 1758)

B: 1 ♂, 1 ♀, 30-VII-2021. F: 1 ♂, 1 ♀, 07-VIII-2020. K: 1 ♂, 25-VI-2021. AD: 1 ♀, 06-VIII-2020; 4 ♂♂, 2 ♀♀, 27-VI-2021. Hygrophilous species found in open and sunny places but with very wet soils located at 1,350-1,617 m a.s.l. SIER element.

*Agonum (Olisares) viridicupreum* (Goeze, 1777)

B: 1 ♀, 30-VII-2021. AD: 1 ♂, 1 ♀, 06-VIII-2020; 2 ♂♂, 27-VI-2021. AW: 1 ♂, 29-VII-2021. Hygrophilous species observed on moist soils of stream edges, bogs and wet meadows at 1,260-1,617 m a.s.l. CAER element.

*Anchomenus (Anchomenus) dorsalis* (Pontoppidan, 1763)

Q: 2 ♂♂, 04-VIII-2020. Very hygrophilous species exclusively found under stones on the edge of a cultivated meadow next to a river (1,183 m a.s.l.). PALE element.

*Limodromus assimilis* (Paykull, 1790)

H: 1 ♂, 07-VIII-2019. K: 1 ♂, 2 ♀♀, 25-VI-2021. J: 1 ♂, 3 ♀♀, 07-VIII-2020. Z: 1 ♀, 09-VIII-2019; 3 ♂♂, 01-VIII-2021. AV: 2 ♂♂, 04-VIII-2020/08-VIII-2020. AW:

2 ♂♂, 1 ♀, 04-VIII-2020; 1 ♂, 4 ♀♀, 04-VIII-2020/08-VIII-2020; 2 ♂♂, 3 ♀♀, 24-VI-2021; 2 ♂♂, 25-VI-2021; 1 ♂, 29-VII-2021. AX: 1 ♀, 06-VIII-2020. BA: 1 ♂, 28-VI-2021. BB: 1 ♀, 04-VIII-2020. Hygrophilous species that seeks refuge under stones and bark of broadleaved trees. It was observed in gallery forest, birch groves, stream banks, sidewalks and roadside ditches with wet substrate between 1,260-1,458 m a.s.l. ASER element.

*Paranchus albipes* (Fabricius, 1792)

B: 2 ♀♀, 30-VII-2021. F: 1 ♂, 2 ♀♀, 07-VIII-2020. H: 1 ♀, 07-VIII-2019; 1 ♂, 07-VIII-2020. J: 1 ♀, 07-VIII-2020. K: 1 ♀, 25-VI-2021. Q: 1 ♂, 2 ♀♀, 04-VIII-2020. T: 1 ♂, 1 ♀, 04-VIII-2020. Z: 3 ♂♂, 2 ♀♀, 09-VIII-2019. AB: 4 ♂♂, 06-VIII-2020; 1 ♀, 02-VIII-2021. AD: 1 ♂, 06-VIII-2020. AW: 1 ♂, 24-VI-2021; 1 ♀, 29-VII-2021. AX: 1 ♂, 06-VIII-2020. Very hygrophilous species, present in different places in the sampled area. It takes refuge under stones on banks of streams, bogs, humid forests and ruderal areas with stagnant rainwater. It was observed at low and medium altitudes (1,183-1,617 m a.s.l.). WPAL element.

*Platyderus* sp.

AK: 1 ♂, 02-VIII-2021. Unusual species with sublapidicolous behaviour found in a montane meadow with calcarenite substrate at 1,970 m a.s.l. ENDE element.

*Calathus (Calathus) brevis* Gautier des Cottés, 1866

AF: 1 ♂, 02-VIII-2021. AI: 1 ♀, 02-VIII-2021. AK: 1 ♂, 02-VIII-2021. BG: 1 ♀, 05-VIII-2020. A species not very abundant in the study area, observed under stones, in open spaces (meadows, ruderal environments, and broom) above the upper limit of forest (1,654-1,970 m a.s.l.). ENDE element.

*Calathus (Calathus) fuscipes punctipennis* Germar, 1823

B: 2 ♂♂, 30-VII-2021. G: 2 ♂♂, 1 ♀, 07-VIII-2020. Z: 1 ♂, 09-VIII-2019. AE: 1 ♂, 2 ♀♀, 06-VIII-2020. AF: 1 ♀, 02-VIII-2021. Species with sublapidicolous behaviour, observed in meadows and ruderal substrates at low and medium altitudes (1,423-1,665 m a.s.l.). MEDT element.

*Calathus (Iberocalathus) rotundatus rotundatus* Jacquelin du Val, 1857

W: 3 ♂♂, 27-VI-2021; 4 ♂♂, 3 ♀♀, 01-VIII-2021. AB: 1 ♂, 06-VIII-2020. AF: 2 ♂♂, 1 ♀, 02-VIII-2021. These specimens were observed on sunny south-facing slopes. They were found under stones in ruderal areas next to meadows and small stands of Pyrenean oak and broom at 1,390-1,665 m a.s.l. ENDE element.

*Calathus (Neocalathus) asturiensis* Vuillefroy, 1866

AI: 1 ♂, 1 ♀, 02-VIII-2021. A not very abundant species, observed under stones next to brooms above the upper limit of the forest (1,835 m a.s.l.). ENDE element.

*Calathus (Neocalathus) melanocephalus* (Linnaeus, 1758)

W: 1 ♂, 2 ♀♀, 01-VIII-2021. X: 1 ♂, 01-VIII-2021. AK: 5 ♂♂, 3 ♀♀, 02-VIII-2021. AN: 1 ♀, 31-VII-2021. AW:



1 ♂, 1 ♀, 04-VIII-2020; 2 ♀♀, 04-VIII-2020/08-VIII-2020; 1 ♂, 29-VII-2021. BG: 1 ♂, 26-VI-2021. Frequent species in open and sunny spaces where it usually finds shelter under stones and fallen trunks. It appears in ruderal areas, mountain meadows, and scattered stands of Pyrenean oak and broom. Observed in almost the entire altitude range studied (1,260-1,970 m a.s.l.). PALE element.

*Calathus (Amphyginus) rotundicollis* Dejean, 1828

H: 3 ♂♂, 2 ♀♀, 07-VIII-2019. J: 2 ♀♀, 07-VIII-2020. K: 3 ♀♀, 25-VI-2021. L: 2 ♀♀, 09-VIII-2019/11-VIII-2019. M: 4 ♂♂, 1 ♀, 28-VI-2021; 4 ♀♀, 03-VIII-2021. N: 1 ♀, 04-VIII-2020/08-VIII-2020. O: 1 ♂, 9 ♀♀, 04-VIII-2020/08-VIII-2020. P: 7 ♀♀, 04-VIII-2020/08-VIII-2020. R: 1 ♂, 3 ♀♀, 04-VIII-2020/08-VIII-2020. S: 1 ♀, 04-VIII-2020/08-VIII-2020. W: 3 ♀♀, 06-VIII-2020; 2 ♂♂, 2 ♀♀, 27-VI-2021; 4 ♂♂, 1 ♀, 01-VIII-2021. Z: 1 ♀, 09-VIII-2019; 1 ♂, 1 ♀, 01-VIII-2021. AC: 2 ♀♀, 27-VI-2021. AP: 1 ♂, 2 ♀♀, 31-VII-2021. AS: 1 ♂, 1 ♀, 31-VII-2021. AW: 2 ♂♂, 8 ♀♀, 04-VIII-2020/08-VIII-2020; 1 ♂, 4 ♀♀, 29-VII-2021. AX: 1 ♀, 06-VIII-2020. AY: 3 ♀♀, 04-VIII-2020/08-VIII-2020. BB: 1 ♂, 26-VI-2021. BC: 2 ♂♂, 3 ♀♀, 06-VIII-2019. Very abundant and widely distributed species throughout the study area, with a special preference for wet birch forest soils or its influenced areas (gallery forests, ditches, slopes of forest tracks, and man-made meadows in the valley). It is observed especially at low altitudes and becomes rarefied when the forest begins to disappear (1,193-1,560 m a.s.l.). WEUR element.

*Laemostenus (Actenipus) oblongus ellipticus* (Schaufuss, 1862)

D: 1 ♀, 07-VIII-2019. R: 1 ♀, 04-VIII-2020/08-VIII-2020. AY: 1 ♀, 04-VIII-2020/08-VIII-2020. Although this species was expected to be found abundantly on forest soils, it is very uncommon. It was only observed in two places of the birch forest, and in a montane meadow near a forest at 1,220-1,500 m a.s.l. ENDE element.

*Synuchus vivalis vivalis* (Illiger, 1798)

V: 1 ♀, 08-VIII-2019. W: 3 ♂♂, 1 ♀, 01-VIII-2021; 1 ♀, 02-VIII-2021. It was only observed in two places: a dead specimen by a village lamppost (probably attracted by artificial light, perhaps flying from a far distance), and the others were collected on a south-facing path with Pyrenean oaks, brooms and near mowed meadows (1,390 m a.s.l.). ASER element.

Its restricted presence in the valley could be related to the limited extension of oak, areas for which this carabid could show preference as it has a certain trophic specificity for *Curculio* species. This has already been suggested by Jeannel (1942), although Lindroth (1956) shows that the distribution area of *Synuchus* is wider than that of these Curculionidae species. *Synuchus vivalis* may show a certain preference but not dependence for this type of prey.

*Anisodactylus (Anisodactylus) binotatus* (Fabricius, 1787)

C: 2 ♂♂, 1 ♀, 30-VII-2021. Z: 1 ♂, 09-VIII-2019. AW: 4 ♂♂, 1 ♀, 29-VII-2021. It was observed under stones in

open spaces with a moist substrate, meadows and bogs, at low and medium altitudes (1,260-1,525 m a.s.l.). PALE element.

*Anisodactylus (Anisodactylus) hispanus* Puel, 1931

C: 2 ♂♂, 30-VII-2021. AA: 2 ♂♂, 3 ♀♀, 27-VI-2021. AC: 3 ♂♂, 2 ♀♀, 27-VI-2021. As in *A. (A.) binotatus*, which is syntopic in some places, it likes open spaces with edaphic moisture. It was observed under stones, in bogs, and in wet ditches of forest tracks at low and medium altitudes (1,440-1,560 m a.s.l.). ENDE element.

*Harpalus (Harpalus) affinis* (Schrank, 1781)

B: 4 ♂♂, 30-VII-2021. C: 6 ♂♂, 3 ♀♀, 30-VII-2021. F: 1 ♀, 07-VIII-2020. G: 1 ♀, 07-VIII-2020. M: 1 ♂, 28-VI-2021. W: 2 ♂♂, 27-VI-2021. Z: 3 ♂♂, 1 ♀, 09-VIII-2019. AC: 3 ♂♂, 2 ♀♀, 27-VI-2021. AE: 2 ♂♂, 06-VIII-2020. AW: 1 ♂, 24-VI-2021. BB: 2 ♂♂, 1 ♀, 26-VI-2021. This species prefers meadows or ruderal areas and usually seeks shelter under stones. In the study area, it is observed mainly on south-facing slopes, at 1,230-1,621 m a.s.l. ASER element.

*Harpalus (Harpalus) contemptus* Dejean, 1829

C: 1 ♂, 1 ♀, 30-VII-2021. M: 1 ♀, 28-VI-2021. AC: 2 ♂♂, 27-VI-2021. Species that usually lives on meadows and ruderal areas and was found at an altitude range between 1,230 and 1,560 m a.s.l. In the study area, syntopy with *H. (H.) affinis* has been observed. ENDE element.

*Harpalus (Harpalus) franzi* Mateu, 1954

BB: 3 ♂♂, 1 ♀, 26-VI-2021. Very rare species with very local distribution in the northwestern quadrant of the Iberian Peninsula. Of the four sampling campaigns carried out, this species was found exclusively at one point (1,390 m a.s.l.). All specimens were collected under stones, on side of a forest track that runs through a birch forest. ENDE element.

*Harpalus (Harpalus) honestus* (Duftschmid, 1812)

K: 1 ♂, 25-VI-2021. Unusual species whose only specimen studied was found under a stone on side of a track that crossed a birch forest (1,350 m a.s.l.). TUEP element.

*Harpalus (Harpalus) decipiens* Dejean, 1829

X: 1 ♂, 01-VIII-2021. AD: 2 ♂♂, 27-VI-2021. AF: 5 ♂♂, 02-VIII-2021. AH: 3 ♂♂, 02-VIII-2021. AI: 1 ♂, 02-VIII-2021. AK: 2 ♀♀, 02-VIII-2021. Specimens were observed in open spaces far from the forest (meadows, brooms, and roadside ditches). In the sampling area, its distribution is limited to slopes of valleys and mountains near La Forcada and Alto de Vivero, in an altitude range between 1,500-1,970 m a.s.l. Of all the *Harpalus* species found, this is the most orophilic. LION element.

*Harpalus (Harpalus) rubripes* (Duftschmid, 1812)

BB: 1 ♂, 26-VI-2021. The only specimen studied was found at a low altitude (1,390 m a.s.l.), under a stone in a birch forest. EURP element.

*Harpalus (Harpalus) rufipalpis rufipalpis* Sturm, 1818

BG: 1 ♂, 26-VI-2021. Rare species in the study area. The only specimen studied was found under a stone on a montane meadow near a stream (1,654 m a.s.l.). SOER element.

*Harpalus (Harpalus) serripes* (Quensel in Schönherr, 1806)

K: 2 ♂♂, 1 ♀, 25-VI-2021. W: 2 ♂♂, 1 ♀, 27-VI-2021. AW: 1 ♀, 24-VI-2021. Species limited to a few low altitude ruderal places (1,260-1,390 m a.s.l.). It was observed wandering along a forest track and under stones in ditches. CAEM element.

*Harpalus (Harpalus) subcylindricus* Dejean, 1829

K: 1 ♂, 25-VI-2021. The unique specimen studied was found under a stone on the path side that crosses the birch forest at a low altitude (1,350 m a.s.l.). CEUR element.

*Harpalus (Harpalus) tardus* (Panzer, 1797)

X: 1 ♀, 01-VIII-2021. The only specimen studied was found under a stone in a broom grove at 1,500 m a.s.l. ASER element.

*Ophonus (Metophonus) rufibarbis* (Fabricius, 1792)

W: 2 ♀♀, 06-VIII-2020; 1 ♀, 01-VIII-2021. AN: 1 ♂, 31-VII-2021. AW: 3 ♂♂, 2 ♀♀, 24-VI-2021; 2 ♂♂, 25-VI-2021; 2 ♂♂, 29-VII-2021. AX: 1 ♂, 06-VIII-2020. BG: 1 ♂, 26-VI-2021. The species was found under stones in open spaces such as meadows, ruderal areas, or sparsely populated paths. It was observed at an altitudinal range between 1,260-1,654 m a.s.l. TUME element.

*Ophonus (Ophonus) ardosiacus* Lutshnik, 1922

AF: 1 ♂, 02-VIII-2021. The unique specimen studied was found under a stone on a montane meadow, at 1,665 m a.s.l. MEDT element.

*Pseudoophonus (Pseudoophonus) rufipes* (DeGeer, 1774)

D: 1 ♂, 1 ♀, 30-VII-2021. F: 2 ♀♀, 07-VIII-2020. G: 7 ♂♂, 1 ♀, 07-VIII-2020. L: 1 ♂, 09-VIII-2019/11-VIII-2019. V: 1 ♀, 07-VIII-2020. W: 1 ♀, 06-VIII-2020. AB: 1 ♂, 06-VIII-2020. AE: 1 ♂, 1 ♀, 06-VIII-2020. AW: 1 ♂, 25-VI-2021. AX: 1 ♀, 06-VIII-2020. Species observed in open spaces such as meadows, ruderal places and sunny paths located at medium-low altitude range (1,260-1,621 m a.s.l.). It was also attracted by the artificial light of the street lamps in the village. PALE element.

*Typsiharpalus bonvouloiri* (Vuillefroy, 1866)

W: 1 ♂, 27-VI-2021. AF: 1 ♂, 02-VIII-2021. AG: 1 ♂, 06-VIII-2020. AP: 1 ♂, 31-VII-2021. BB: 7 ♂♂, 26-VI-2021. BH: 4 ♂♂, 26-VI-2021. Species with sublaidicolous behaviour found in very different localities such as birch forest, montane meadows, Pyrenean oak forest paths and ruderal areas in a wide altitudinal range (1,390-1,804 m a.s.l.). ENDE element.

*Acupalpus (Acupalpus) brunnipes* (Sturm, 1825)

AD: 1 ♀, 06-VIII-2020. The only specimen studied was collected on the sunny bank of a stream that crosses a path located at 1,590 m a.s.l. TEUM element.

*Stenolophus teutonius* (Schrank, 1781)

B: 2 ♂♂, 3 ♀♀, 30-VII-2021. F: 3 ♂♂, 07-VIII-2020. W: 1 ♂, 27-VI-2021. Z: 1 ♀, 09-VIII-2019. AD: 3 ♂♂, 4 ♀♀, 06-VIII-2020; 6 ♂♂, 3 ♀♀, 27-VI-2021. Hygrophilous species was found on the banks of streams, bogs or in soils that temporarily retain high humidity such as road ditches and sidewalks (1,390-1,617 m a.s.l.). WPAL element.

*Badister (Badister) bullatus* (Schrank, 1798)

AD: 1 ♀, 27-VI-2021. AW: 1 ♂, 25-VI-2021. BG: 1 ♂, 05-VIII-2020. Hygrophilous species, not very abundant, living near small river courses and in a ditch with very humid soil, at low and medium altitudes (1,260-1,654 m a.s.l.). WMED element.

*Chlaenius (Chlaeniellus) tristis* (Schaller, 1783)

AD: 1 ♀, 06-VIII-2020. Hygrophilous species was only observed on the sunny edge of a stream that crosses a forest track (1,590 m a.s.l.). PALE element.

*Cymindis (Cymindis) alternans alternans* Rambur, 1837

W: 4 ♂♂, 27-VI-2021; 1 ♀, 01-VIII-2021. AF: 1 ♂, 02-VIII-2021. Species exclusively observed under stones in two places facing south: in a path between Pyrenean oaks and brooms, and on a ditch of a track dominated by brooms (1,390-1,665 m a.s.l.). ENDE element.

*Cymindis (Menas) miliaris* (Fabricius, 1801)

AK: 1 ♀, 02-VIII-2021. Species very localized as sublaidicolous in high montane grassland (1,970 m a.s.l.). TSER element.

*Apristus europaeus* Mateu, 1980

AD: 2 ♀♀, 27-VI-2021. Species located on the strongly insolated substrate of a forest path at medium altitude (1,590 m a.s.l.). TUME element.

*Microlestes* sp.

BH: 1 ♀, 26-VI-2021. Specimen located at a high altitude (1,804 m a.s.l.) under a stone on a mountain meadow next to shrubby vegetation. Element (not stated).

*Syntomus foveatus* (Geoffroy en Fourcroy, 1785)

C: 1 ♀, 30-VII-2021. W: 1 ♂, 27-VI-2021. AD: 1 ♂, 1 ♀, 06-VIII-2020. AF: 1 ♂, 02-VIII-2021. AK: 1 ♀, 02-VIII-2021. Sublaidicolous species, collected at very diverse altitudes (1,390-1,970 m a.s.l.) in open and sunny spaces at the bottom of the valley, slopes and summits. PALE element.

*Masoreus wetterhallii wetterhallii* (Gyllenhal, 1813)

W: 1 ♀, 06-VIII-2020. A specimen found on a path of Pyrenean oaks with brooms, close to mowing meadows located at a low altitude (1,390 m a.s.l.). WPAL element.

## COROTYPES

The biogeographical analysis developed from the carabid species observed in the studied area shows 22 chorological types (Fig. 10) among which the Iberian Endemic element stands out with 35 spp,

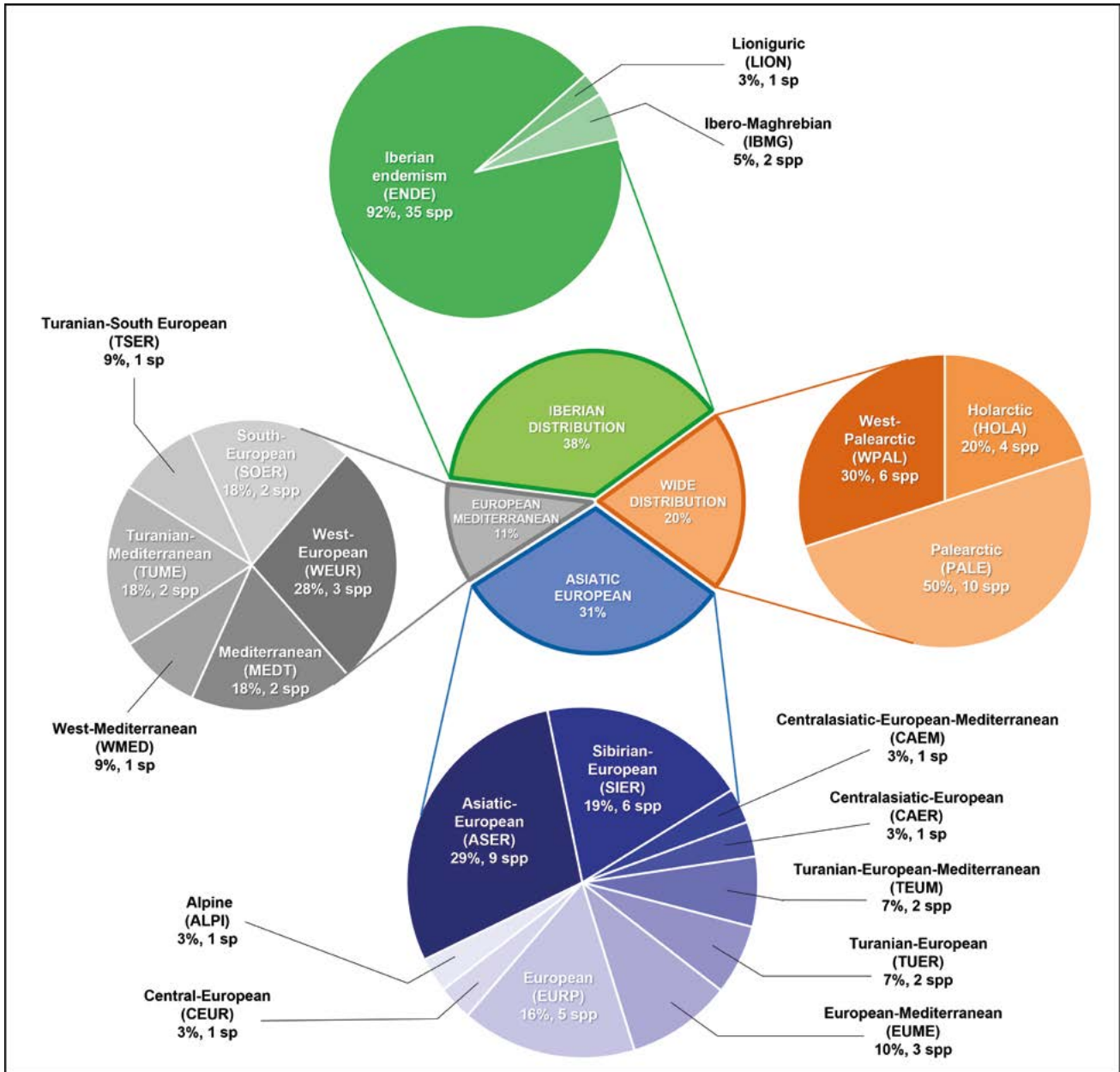


Fig. 10.– Biogeographical analysis of the Carabidae family, based on the species observed in the Salientes Valley. The peripheral sector diagrams show the values (number of species) and percentages of the different biogeographic elements that are grouped into large biogeographic categories (central sector diagram).

Fig. 10.– Análisis biogeográfico de la familia Carabidae, a partir de las especies observadas en el valle de Salientes. Los diagramas de sectores periféricos muestran los valores (número de especies) y porcentajes de los diferentes elementos biogeográficos que se agrupan en grandes categorías biogeográficas (diagrama de sectores central).

which represents 35% of the total and 92% of the biogeographical category “Iberian Distribution”. In the category of “Wide Distribution” (20% of the total), the Palearctic elements are highlighted (10 spp, 20% of the total and 50% of the category). In the “Asiatic European” category (31% of the total) the most important elements are Asiatic-European (9 spp, 9% of the total and 29% of the category), the Sibirian-European elements (6 spp, 6% of the total and 19% of the category) and also European (5 spp, 5% of the total and 16% of the category). Finally, the “European Mediterranean” category (11%

of the total), is scarce representation in the study area, and distributed among several chorological types (biogeographical element) with only one, two or three species, so we cannot highlight any of them (see Fig. 10).

## Discussion

### TAXONOMIC ASPECTS

Three of the species studied offer certain difficulties in their taxonomic identification, so it was considered



appropriate to clarify some doubts and challenges raised with the morphological study of the specimens.

*Trechus (Trechus) gallaecus* (Figs. 4a, 5) is an endemic species of the mountain reliefs of the northwestern quadrant of the Iberian Peninsula. It was described by Jeannel (1921) from a female specimen (type locality: Caboalles, León), so he could not contribute to the study of the aedeagus, not even in his monograph about Trechinae (see Jeannel, 1927: 263). This author recognizes the great resemblance of this species to *T. (T.) suturalis* (Figs. 4b) with the added difficulty that both species live in the Cantabrian mountains. In the identification key provided by Jeannel (1927) on the “*T. pyrenaeus* group”, the observable differences between the females of both species are mostly limited to quantitative traits. In *T. gallaecus* these differences make the specimens slightly larger and with slightly longer antennomeres, while in *T. suturalis*, the specimens are smaller, showing subtly shorter antennomeres. These differences are not completely decisive, especially when both species are syntopic as in a large part of their distribution area. This is the case of the localities sampled in this study. To ratify the presence of one or another species in a certain area it is necessary to observe qualitative characteristics that allow its unequivocal identification. In the genus *Trechus*, this is usually achieved by studying the external morphology of the aedeagus and the shape and arrangement of the sclerotized elements of the internal sac. For this reason, it is essential to have a good understanding of the aedeagus of both species (Figs. 6–7). Although Jeannel (1927) illustrated the aedeagus of *T. suturalis* and later Jeanne (1988) did the same with the aedeagus of *T. gallaecus*, both graphic descriptions do not do justice to the anatomical reality of these structures. In *T. gallaecus* the internal sac was not illustrated, so we only know what the outline of the aedeagus looks like from a very basic drawing. The aedeagus of *T. suturalis* is better known because Jeannel (1927) did draw the pieces of the internal sac, however, the contour (curvature) of the middle lobe does not coincide with the one later drawn (without the detail of the internal sac) in Jeanne (1988).

There are two species of *Oreophilus* Chaudoir, 1838 in the Cantabrian area: *P. (O.) cantaber* (Fig. 8a) and *Pterostichus (Oreophilus) franzi* Nègre, 1955 (Fig. 8c), both endemic and whose distribution overlaps in the western sector of this range. The study of the specimens collected in the high valley and mountainous foothills of Salientes (51 exx) shows that they are all attributable to *P. (O.) cantaber* (Fig. 8a, d). However, two females collected together with other specimens (males and females) in two different places show the habitus of *Pterostichus (Oreophilus) franzi* Nègre, 1955 (Fig. 8b–c): they show a more transverse pronotum than the other specimens and also present a sutural denticle at the apex of the elytra (Fig. 8e–f), a characteristic shared with many other females already

presenting a *Pterostichus (Oreophilus) cantaber* habitus. It would be expected that these features would reveal the syntopic presence of both *Oreophilus* species in this geographical area, but the study of the genitalia of all males confirmed that there is only a single species present, *P. (O.) cantaber* (Fig. 9a–b). This fact evidences the inconsistency or unreliability of the external characters invoked by Nègre (1955) and later ratified by Serrano (2021) in the dichotomous keys to externally differentiate both species. This variability shown by *P. (O.) cantaber* may have led to the number of records (and citations in articles already published) that reveal the syntopy of both species. It would be interesting to study the specimens collected in all these localities again, considering that the external characters that were given as differentiators between both species can only be taken as indicative, and the shape of the aedeagus is for the moment the only reliable character (Fig. 9).

#### CARABID FOREST FAUNA

From the carabid fauna observed in this study, a list of typical forest species that show certain preferences for occupying this type of environment can be drawn up. Due to their abundance and presence in various wooded localities in the area, the most representative species are *C. (A.) rotundicollis*, *P. (O.) cantaber*, *P. (P.) cristatus heydenianus*, *C. cantabricus cantabricus*, *T. (T.) suturalis*, *T. (T.) gallaecus*, *L. (L.) barnevillei*, *C. (Ch.) lineatus lateralis*, and *B. (P.) deletum schulerianum*. Other species that were only observed in the humid forest, albeit not in abundance, are *C. spinicollis*, *C. (O.) luetgensis getschmanni*, *C. (A.) nemoralis lamadridae*, and *O. (O.) tachysoides*. Surprisingly, frequent and even dominant species in other wooded areas of the Cantabrian range such as *S. (S.) gallega* and *L. (A.) oblongus ellipticus*, were almost anecdotal in these forests of Salientes upper valley. *Limodromus assimilis*, *P. (F.) brevipennis brevipennis*, *N. rufipes*, and *N. biguttatus*, were observed in forested areas, but were also present in the faunal composition of other habitats such as riparian environments, ruderal environments that store moisture, etc.

#### RIPARIAN AND MARSHY CARABID FAUNA

A set of species that are forced to live on the banks of running watercourses, still waters, and also in open spaces with high edaphic humidity (bogs, peat bogs, springs, etc.) are presented and commented on in this paragraph. The abundance presence in various localities allows a selection of the most representative species of these wetlands: *N. (E.) jockischii orensis*, *N. (N.) brevicollis*, *B. (N.) ibericum*, *B. (N.) callosum subconnexum*, *B. (B.) tibiale*, *B. (O.) strictum*, *B. (Ph.) guadarramense*, *B. (Ph.) guttula*, *B. (P.) tetracolum*, *P. (Ph.) carri*, *A. (O.) sexpunctatum*, *P. albipes*, and *S. teutonius*. *Sinechostictus (S.) stomoides* especially

noteworthy since, although it was riparian, it was present specifically in fluvial sections that run through the forest and, therefore, are rich in leaf litter, which agrees with the observations of Ortuño & Toribio (2005). The following species were observed more rarely: *C. (R.) melancholicus costatus*, *C. (C.) fossor*, *E. (N.) pyrenoeus*, *T. (T.) parvula*, *B. (E.) minimum*, *B. (T.) articulatum*, *B. (B.) quadrimaculatum*, *B. (B.) geniculatum geniculatum*, *B. (B.) leonense*, *A. (O.) viridicupreum*, *A. (A.) muelleri*, *A. (A.) dorsalis*, *A. (A.) brunripes*, *B. (B.) bullatus*, and *C. (C.) tristis*.

It should be noted that *L. assimilis*, *A. (A.) binotatus*, and *A. (A.) hispanus* are species that, in addition to this kind of environment, can also be observed in other habitats that conserve high edaphic humidity. The same can be said concerning *T. (T.) fulvus*, a highly hygrophilous species that can be found in river courses seeking refuge under stones or in ground interstices.

#### CARABID FAUNA OF RUDERAL AND OPEN SPACES

The most representative set of species typical of spaces without forest cover such as meadows, brooms, sidewalks, ditches and slopes of paths and tracks are discussed below: *C. (C.) campestris campestris*, *C. (M.) macrocephalus macrocephalus*, *B. (M.) lampros*, *A. (A.) aenea*, *C. (C.) fuscipes punctipennis*, *C. (I.) rotundatus rotundatus*, *C. (N.) melanocephalus*, *H. (H.) affinis*, *H. (H.) decipiens*, *O. (M.) rufibarbis*, *P. (P.) rufipes*, and *T. bonvouloiri*.

Other species of *Amara* (7 spp) and *Harpalus* (8 spp) were found less frequently, with the especially noteworthy case of *H. (H.) franzi* as an endemism with a very restricted distribution in the easternmost reliefs of Galicia and the Montes de León (Zaballos & Jeanne, 1994). This new report increases the chorological knowledge of this species.

Other scarce and very localized species typically observed in this type of landscape were *B. (M.) properans*, *P. (M.) kugelanni*, *P. (P.) versicolor*, *P. (A.) vernalis*, *P. (Ph.) strenuus*, *C. aulicus*, *Z. (C.) consanguineus*, *Z. (I.) silphoides asturiensis*, *C. (C.) brevis*, *C. (N.) asturiensis*, *O. (O.) ardosiacus*, *C. (C.) alternans alternans*, *C. (M.) miliaris*, *A. europaeus*, *S. foveatus*, and *M. wetterhallii wetterhallii*.

*Leistus (L.) barnevillei* represents a noteworthy case, being a forest group species that is also present in supraforestal environments, seeking refuge on slopes and at the base of heather and broom, where they can be found buried forming very numerous colonies. Along with this species, inside the soil in these same open spaces was another species, *N. (N.) asturiensis*. It is remarkable that this species has not been located in the forests of this valley, because it has been recognized by diverse entomologists as an eminently forest species throughout its distribution area (see Jeanne, 1966, Zaballos & Jeanne, 1994; Serrano, 2003; Ortuño pers. obs.).

#### UNDERGROUND CARABID FAUNA

Some specimens of the species studied here were found buried in the ground, such as the already mentioned cases of *L. (L.) barnevillei*, *N. (N.) asturiensis*, but also *C. spinicollis*, *T. (T.) gallaecus*, *T. (T.) suturalis*, *B. (Ph.) gadarramense*, *B. (N.) callosum subconnexum*, *B. (N.) ibericum*, *B. (O.) strictum*, and *B. (P.) deletum schulerianum*. This is a normal behaviour in many carabids that, due to their hygrophilous requirements, seek moisture and shelter in deep soil levels. However, among all the faunal groups studied, we can only affirm true underground behaviour for two species. On the one hand, *T. (T.) fulvus*, which is recognized as a troglomorphic species (Ortuño *et al.*, 2017), and for which an important part of the specimens found in this area were observed in cracks and soil interstices. The other species that seem to be fully subterranean is *T. (T.) teverganus*. Until now, only two specimens (male and female) were known from the subterranean environment of two Asturian localities, Puerto de Ventana and Huerta cave in Teverga, which constitute the typical series (Toribio, 2015). The location of six specimens in the subterranean environment (soil interstices at a depth of 40-50 centimetres) in the Salientes Valley considerably expands the distribution of this species. Its obvious troglomorphic features and its subterranean life suggest strong isolation in the subsoil, a circumstance that does not occur despite the barriers that apparently separate the known Asturian and Leonese localities. Of this species, one male (unpublished data, Ortuño & Arribas leg. & det.) has been captured in the neighbouring Salentinos valley. Everything indicates that there is an extensive interstitial network, in which the MSS (Mesovoid Shallow Substratum) must play an important role and being responsible of the *T. (T.) teverganus* distribution over an extensive area of more than 40 km of diameter, strongly broken and separated in valleys and mountains barriers of more than 2,000 m a.s.l.

#### Conclusions

The subfamily with the greatest diversity is Harpalinae (61% of the species), the most strongly represented tribes being Harpalini (18 spp), Zabrinini (11 spp), Pterostichini (10 spp), Sphodrini (9 spp) and Platynini (6 spp). The most abundant species for each tribe are, respectively, *H. (H.) affinis*, *A. (A.) aenea*, *C. cantabricus*, *C. (A.) rotundicollis* and *L. assimilis*. Next in biodiversity is the Trechinae subfamily (23% of the species), with Bembidiini (17 spp) being better represented than Trechini (5 spp). Its most abundant species are, respectively, the riparian *B. (N.) ibericum* and the forestal *T. (T.) suturalis*.

The biogeographical analysis of the carabid fauna indicates that most of the species have an "Iberian Distribution" (38%) and, for the most part, are Iberian

endemism (35 spp). These species mainly belong to lineages with a large presence in the Eurosiberian region, a circumstance that, added to the high presence of “Asiatic-European”. distribution species (31%), reveals the close biogeographical link between the carabid fauna of this valley and the Eurosiberian Europe.

Some of the most frequent forest species in the main axis of the Cantabrian Mountains such as *N. (N.) asturiensis*, *Pterostichus (Pterostichus) dux* Schauffuss, 1862, *S. (S.) gallega*, *Abax parallelepipedus* (Piller & Mitterpacher, 1783), y *L. (A.) oblongus*, were not observed, or were very infrequent in the humid forest of Salientes Valley. This difference is suggestive of the disconnection (or intermittent connection) between both areas, a circumstance that is also evidenced by other examples such as the absence of *Fagus sylvatica* from the study area.

The forest environment was especially humid as revealed by the abundance of birch trees and hosted a wide range of carabid beetles that combined hygrophily and sciophily. The most representative species by abundance and distribution were *C. (A.) rotundicollis*, *P. (O.) cantaber*, *P. (P.) cristatus heydenianus*, *C. cantabricus cantabricus*, *T. (T.) suturalis*, *T. (T.) gallaecus*, *L. (L.) barnevillei*, *C. (Ch.) lineatus lateralis* and *B. (P.) deletum schulerianum*.

In riparian and marshy environments, species that require high edaphic humidity were observed, many of them in substrates exposed to direct sunlight. They often took refuge in gravel or under stones. The most representative species were *N. (E.) jockischii orensis*, *N. (N.) brevicollis*, *B. (N.) ibericum*, *B. (N.) callosum subconnexum*, *B. (B.) tibiale*, *B. (O.) strictum*, *B. (Ph.) guadarramense*, *B. (Ph.) guttula*, *B. (P.) tetracolum*, *P. (Ph.) carri*, *A. (O.) sexpunctatum*, *P. albipes* and *S. teutomus*.

Ruderal environments were numerous, and their great faunal heterogeneity varied according to altitude, orientation, type of nearby vegetation, anthropic impact, etc. However, the most representative species can be summarized as *B. (M.) lampros*, *A. (A.) aenea*, *C. (C.) fuscipes punctipennis*, *C. (I.) rotundatus rotundatus*, *C. (N.) melanocephalus*, *H. (H.) affinis*, *H. (H.) decipiens*, *O. (M.) rufibarbis*, *P. (P.) rufipes* and *T. bonvouloiri*. The location of *H. (H.) franzi* represents a new record that increases the chorological knowledge of this species, which has a very restricted distribution in the northwestern quadrant of the Iberian Peninsula.

The interstices of the edaphic horizons of several places with humid soils in the valley have allowed the discovery of *T. (T.) teverganus*, to date a microendemism of the council of Teverga (Asturias). Accompanying this subterranean element is *T. (T.) fulvus*, well known for being a troglophilous species. Probably due to seeking shelter and edaphic moisture, the occupation of soil interstices by imagoes of some species such as *L. (L.) barnevillei*, *N. (N.) asturiensis*,

*C. spinicollis*, *T. (T.) gallaecus*, *T. (T.) suturalis*, among others was observed.

The inconsistency of the external characters used up to now to externally differentiate *P. (O.) cantaber* and *P. (O.) franzi* is highlighted. This may have caused past identification errors, increasing the number syntopic citations for both species. The aedeagus presents diagnostic characters, so the taxonomic problem of identification especially concerns female specimens.

## Acknowledgements

To Mónica Escudero, Antonio Robles, and family from Salientes (León, Spain) for their warm welcome and local knowledge during the sampling.

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