

Chrysobyrrhulus bizkaitarra n. sp. from Ordunte Mountains (Bizkaia, northern Iberian Peninsula) (Coleoptera: Byrrhidae)

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Abstract

A new species of the genus *Chrysobyrrhulus* Reitter, 1911 (Coleoptera: Byrrhidae) is described from the beech forests of Ordunte Mountains (Bizkaia, northern Iberian Peninsula). The new species, *Chrysobyrrhulus bizkaitarra* n. sp., was only found on mossy slopes below 1000 m of altitude, often feeding on the liverwort *Diplophyllum albicans* (L.) Dumort. It can be separated from the other four known species of *Chrysobyrrhulus* by both external and genital characters, particularly the lack of a small tubercle in the second sternite and several characters concerning the structure and shape of the aedeagus.

Key words: Coleoptera, Byrrhidae, *Chrysobyrrhulus bizkaitarra* n. sp., Iberian Peninsula.

Resumen

***Chrysobyrrhulus bizkaitarra* n. sp. de los Montes de Ordunte (Bizkaia, norte de la Península Ibérica) (Coleoptera: Byrrhidae)**

Se describe una nueva especie del género *Chrysobyrrhulus* Reitter, 1911 (Coleoptera: Byrrhidae) de hayedos de los Montes de Ordunte (Bizkaia, norte de la Península Ibérica). La nueva especie, *Chrysobyrrhulus bizkaitarra* n. sp., se ha encontrado siempre en taludes musgosos a altitudes inferiores a 1000 m, a menudo alimentándose de la hepática *Diplophyllum albicans* (L.) Dumort. Puede diferenciarse de las cuatro especies conocidas de *Chrysobyrrhulus* tanto por caracteres de la morfología externa como de la genitalia, pero destaca sobre todo la ausencia de tubérculo en el segundo esternito y varios caracteres relativos a la estructura y la forma del edeago.

Palabras clave: Coleoptera, Byrrhidae, *Chrysobyrrhulus bizkaitarra* n. sp., Península Ibérica.

Laburpena

***Chrysobyrrhulus bizkaitarra* n. sp. Ordunte Mendietakoa (Bizkaia, Iberiar Penintsularen iparraldea) (Coleoptera: Byrrhidae)**

Chrysobyrrhulus Reitter, 1911 generoko (Coleoptera: Byrrhidae) espezie berri bat deskribatzen da, Ordunte Mendien pagadietako (Bizkaia, Iberiar Penintsularen iparraldea). Espezie berria, *Chrysobyrrhulus bizkaitarra* n. sp., ezponda goroldiotsuetan eta 1000 m baino altitude txikiagoetan aurkitu da beti, eta askotan *Diplophyllum albicans* (L.) Dumort. hepatikoaz elikatuz. Orain arte ezagunak ziren *Chrysobyrrhulus* generoko beste lau espezieetatik kanpo-morfologiarekin nahiz genitaliaren zenbait karaktererengatik bereiz daiteke. Bereziki, aipatzekoak dira tuberkularik gabeko bigarren esternitoa eta edeagoaren egiturari eta formari dagozkien karaktere batzuk.

Gako-hitzak: Coleoptera, Byrrhidae, *Chrysobyrrhulus bizkaitarra* n. sp., Iberiar Penintsula.

Introduction

During the study of the entomofauna of the Ordunte Mountains (Bizkaia, northern Iberian Peninsula), a great number of specimens belonging to the genus *Chrysobyrrhulus* Reitter, 1911 of the family Byrrhidae were found. They were always observed and collected at the shade of beech forests between 800-950 m, on vertical slopes covered by mosses and liverworts.

The species attracted immediately our attention, since these forests in Bizkaia turned to be the easternmost locality known for the genus. Moreover, the new locality was rather distant (more than 70 km) from the geographically nearest known species, and it was associated to forests. Such habitat is unusual among *Chrysobyrrhulus*, which in daylight are most frequently found hidden under stones, particularly in mountain pastures or meadows with short grass of subalpine facies between 1000 and 1700 m, sometimes in contact with the snow (Allemand, 1997; and pers. obs.). Only a few localities of *Chrysobyrrhulus asturiensis* Allemand, 1997 have been reported from a forest habitat at low altitude (below 600 m) and rather close to the coastline (Baselga and Novoa, 2004).

The thorough study of the collected specimens has revealed that they belong to a new species, which is described below. Some relevant data are also provided on the microhabitat and the feeding habits, which were hitherto unknown for any species of the genus.

The genus *Chrysobyrrhulus* was erected by Reitter (1911) to include two species geographically very distant from each other: *Morychus metallicus* Chevrolat, 1865, from the Cantabrian mountains of Alto Campoo, northern Iberian Peninsula, and *Pedilophorus rutilans* Motschulsky, 1845, largely distributed throughout the Russian territories of Central Asia. Subsequently, Fiori (1964, 1965) dealt with the genus twice: firstly (Fiori, 1964), when he described *Chrysobyrrhulus moltonii* from the Central and Eastern Massifs of Picos de Europa mountain range, also in Cantabria. Shortly after, Fiori (1965) redefined the genus and proposed a key to separate *Chrysobyrrhulus* from the remaining Palaearctic genera of Pedilophorinae, a subfamily which at that time encompassed a number of genera nowadays included in several tribes of the subfamily Byrrhinae (Jäger and Pütz, 2016). In the latter paper, Fiori erected the new

genus *Byrrhobolus* for the Asian species of *Chrysobyrrhulus*. However, *Byrrhobolus* was later downgraded by Paulus (1972) to a subgenus of *Morychus* Erichson, 1847 and finally synonymized with it by Johnson (1985). Consequently, *Chrysobyrrhulus* remained as an Iberian endemic genus, at that time composed of two species.

More recently, the genus was revised by Allemand (1997). After having studied the type material, he could ascertain the true identity of *Chrysobyrrhulus metallicus* (Chevrolat, 1865), a species wrongly interpreted by Fiori (1964). In addition, he redescribed *Chrysobyrrhulus moltonii* and described three new taxa: *Chrysobyrrhulus moltonii montanensis* Allemand, 1997, *Chrysobyrrhulus asturiensis* Allemand, 1997 and *Chrysobyrrhulus triangularis* Allemand, 1997. Following Allemand's (1997) criterion, the genus may be viewed as formed by two groups of species distributed along the Cantabrian Mountain Range («Cordillera Cantábrica»), the Ancares Mountains in the easternmost region of the Galaico-Leónés Massif and a few localities of an isolated, likely relict population very close to the coastline in northwestern Galicia, with the mountains of Alto Campoo (Cantabria) as the easternmost and the forest of Fragas do Eume (A Coruña) as the westernmost localities (Fig. 1). These two groups can be characterised as follows:

- «*asturiensis* group», of western distribution (Asturiano Massif, Ancares Mountains and Fragas do Eume) and characterised by bearing a small tubercle at the basis of the second sternite and the aedeagus with a small, roundish excrescence («excroissance» in Allemand, 1997) on the ventral side of the basal piece, exactly at the articulation with the parameres. Two taxa included:
 - *C. asturiensis*, occurring at 1000-1700 m in the Asturiano Massif (Asturias-León), the Ancares Mountains (Lugo) and the forest of Fragas do Eume (A Coruña) as an isolated population at low altitude (below 600 m) (Allemand, 1997; Baselga and Novoa, 2004).
 - *C. triangularis*, only known from two localities: Somiedo Pass at 1400 m and Palo Pass at 1500 m, both belonging to the Asturiano Massif (Asturias-León) (Allemand, 1997; and unpubl. data).
- «*metallicus* group», of eastern distribution (mountains of Alto Campoo and Picos de Europa)

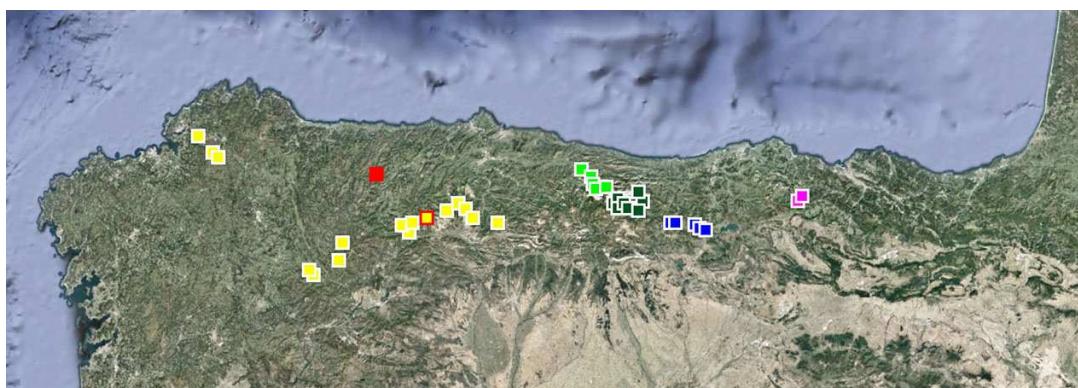


FIGURE 1. Distribution map of all the known species of genus *Chrysobryrulus* Reitter, 1911. From west to east: ■ *C. asturiensis* Allemand, 1997; ■ *C. triangularis* Allemand, 1997; ■ *C. moltonii montanensis* Allemand, 1997; ■ *C. moltonii moltonii* (Fiori, 1964); ■ *C. metallicus* (Chevrolat, 1865); ■ *C. bizkaitarra n. sp.* (map modified from Google Earth).

and characterised by the unarmed basis of the second sternite and the aedeagus with a small, triangular excrescence on the ventral side of the basal piece, exactly at the articulation with the parameres. Three taxa included:

- *C. metallicus*, occurring between 1000-1600 m in the mountains of Alto Campoo (Cantabria) (Allemand, 1997; and pers. obs.).
- *C. moltonii moltonii*, occurring between 1000-1800 m in the Central and Eastern Massifs of Picos de Europa (Cantabria-Asturias) (Allemand, 1997).
- *C. moltonii montanensis*, occurring between 1000-1800 m in the Western Massif of Picos de Europa (Asturias) (Allemand, 1997).

All the material of the new species has been found in the framework of the project «Entomofauna montana de Bizkaia» which is being carried out by one of the authors (SPC). The specimens have been collected by hand by actively searching their microhabitat. Observations of living individuals have been done *in situ*, in order to record and photographically document their behaviour and feeding habits.

Specimens of all other taxa of the genus *Chrysobryrulus* have been checked for comparison with the new species from material in the of NMW and our own collections.

Measurements have been taken with a micrometer adjusted to an stereoscopic microscope Euromex KT2. The habitus photograph has been made with a Canon EOS 760D camera with a Canon MP-E 65 mm objective, and the photographs of the genitalia with a Pentax Optio W60 digital camera attached to a Zeiss Axiostar plus microscope.

The holotype is mounted on a white card; its aedeagus and other structures are included in a DMHF drop mounted on a transparent acetate slide, pinned below the specimen. All the paratypes are preserved in the same way.

Material and methods

Abbreviations used:

APC	Coll. Andreas Pütz, Eisenhüttenstadt, Germany.
CHC	Coll. Carles Hernando, Badalona, Catalonia.
NMW	Naturhistorisches Museum, Wien, Austria.
SPCC	Coll. Santiago Pagola-Carte, Villabona, Basque Country.

Results

Chrysobyrrhulus bizkaitarra n. sp.

Type locality:

Peñalta N, 30TVN6778, 850 m, Karrantza Harana, Ordunte Mountains, Bizkaia, Basque Country, northern Iberian Peninsula.

Type material:

HOLOTYPE: 1 ♂ (CHC), «BIZKAIA: Karrantza Harana: // Ordunte P.N.: Peñalta N beech // forest; 30TVN6778; 850 m // Moss film on vertical slope // 23-06-2015 // S. Pagola Carte leg.».

PARATYPES: 12 exx. (CHC, NMW, APC), same data

as the holotype; 7 exx. (CHC), «BIZKAIA: Karrantza Harana: // Ordunte P.N.: Peñalta N beech // forest; 30TVN6778; 800 m // Moss film on vertical slope // 23-06-2015 // S. Pagola Carte leg.»; 5 exx. (CHC), «BIZKAIA: Karrantza Harana: // Ordunte P.N.: Portillo Medio- // Salduero; 30TVN7178; 850 m // Moss film on vertical slope, // beech forest 14-07-2015 // S. Pagola Carte leg.»; 5 exx. (CHC), «BIZKAIA: Karrantza Harana: // Ordunte P.N.: Balgerri N // 30TVN7279; 850-950 m // Moss film on vertical slope // 7-07-2015 // S. Pagola Carte leg.»; 2 exx. (CHC), «BIZKAIA: Karrantza Harana: // Ordunte P.N.: Peñalta N beech // forest; 30TVN6778; 850 m // *Fagus sylvatica* stump // 3-06-2015 // S. Pagola Carte leg.»; 1 ex. (SPCC), «BIZKAIA: Karrantza Harana: // Ordunte P.N.: Peñalta N beech // forest; 30TVN6778; 850 m // Moss film on vertical slope // 2-06-2016 // S. Pagola Carte leg.».



FIGURE 2. *Chrysobyrrhulus bizkaitarra n. sp.*: Habitus of the holotype.

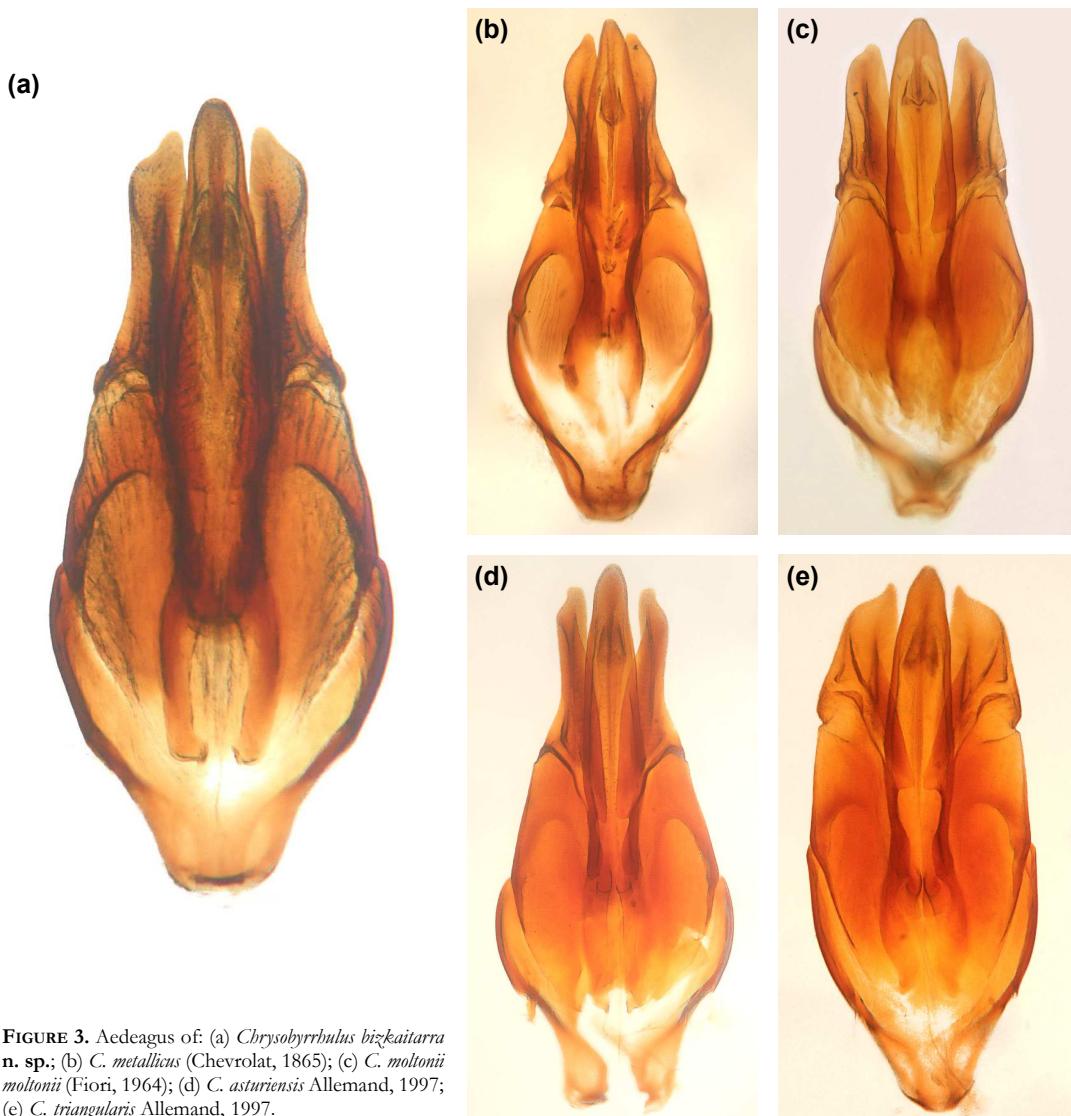


FIGURE 3. Aedeagus of: (a) *Chrysobryrhus bizkaitarra* n. sp.; (b) *C. metallicus* (Chevrolat, 1865); (c) *C. moltonii moltonii* (Fiori, 1964); (d) *C. asturiensis* Allemand, 1997; (e) *C. triangularis* Allemand, 1997.

Description:

Measurements of holotype (in mm): total length = 5.00; length of antennae = 1.73; maximum width of head = 1.66; length of pronotum = 1.33; maximum width of pronotum = 3.00; length of elytra = 3.46; maximum width of elytra = 3.40.

Size ranging from 6.46 to 5.00 mm; habitus as in Fig. 2; body convex, somewhat depressed poste-

riorly, maximum width at about half elytral length; colour of head, pronotum and elytra metallic green, very shiny, some specimens with golden reflections; antennae black; legs and venter brown, very dark.

Head wider than long, surface with dense punctuation, punctures large and deep; with thick and erect pubescence; spaces between punctures smooth and shiny.

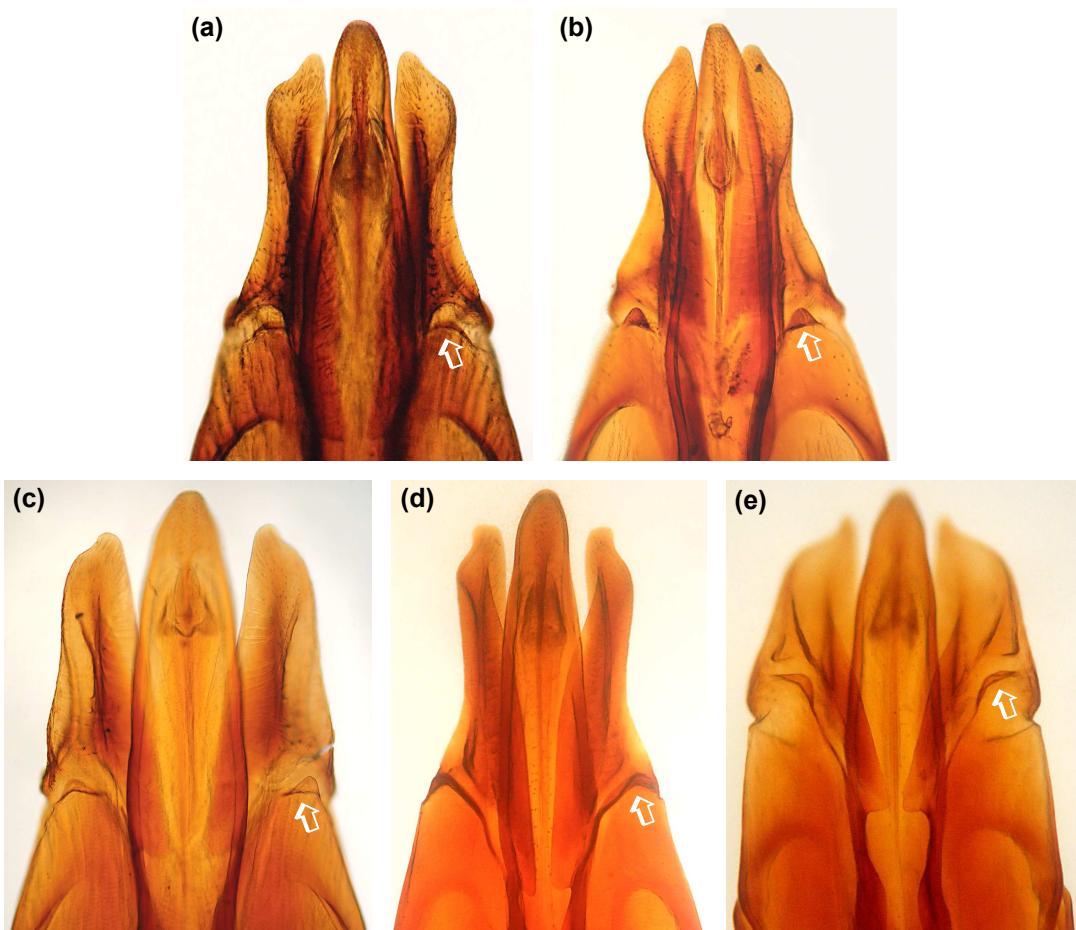


FIGURE 4. Apical part of the aedeagus of: (a) *Chrysobyrrhulus bizkaitarra n. sp.*; (b) *C. metallicus* (Chevrolat, 1865); (c) *C. moltonii moltonii* (Fiori, 1964); (d) *C. asturiensis* Allemand, 1997; (e) *C. triangularis* Allemand, 1997 (Arrows indicate the excrescence at the articulation between basal piece and paramere).

Pronotum trapezoidal, maximum width at posterior angles, which are very acute and produced posteriorly, anterior angles almost not produced; punctuation similar to that on head, equally dense but finer; pubescence long, recumbent; spaces between punctures completely smooth and shiny.

Elytra very convex, longer than wide; with very dense punctuation similar to that on pronotum; pubescence long and evenly reclining backwards; spaces between punctures with a subtle microreticulation formed by isodiametric polygonal meshes; apex somewhat acuminate and slightly explanate.

Abdomen with second sternite unarmed, without any tubercle.

Aedeagus as in Figs. 3a, 4a.

Etymology:

The specific epithet «*bizkaitarra*» is an invariable noun in apposition. It is the Basque word to mean «from/of Bizkaia (= Biscay)», the province where all the specimens of the new species have been collected.

Comparative note:

The new species cannot be ascribed to either of the two groups of species considered until now (see Introduction), since it combines diagnostic characters of both: the excrescences on the ventral side of the basal piece of the aedeagus are small and

roundish, as in the species of the «*asturiensis* group», whereas the basis of the second sternite lacks any tubercle, similarly to the species of the «*metallicus* group». For a correct identification of the new species, the following key is proposed:

Genus *Chrysobyrhulus*

- (1) Base of the second visible sternite with a small tubercle in the middle 2
 - Base of the second visible sternite lacking any tubercle in the middle, at most bearing a tuft of reclining setae 3
- (2) Aedeagus with thin and elongate parameres and with apex truncated; excrescences of the basal piece roundish and less protruding (Figs. 3d, 4d) *C. asturiensis* Allemand, 1997
 - Aedeagus with broad and very short parameres, with apex strongly pointed; excrescences of the basal piece roundish but more protruding (Figs. 3e, 4e) *C. triangularis* Allemand, 1997
- (3) Aedeagus with the excrescences of the basal piece roundish and less protruding (Figs. 3a, 4a) *C. bizkaitarra* n. sp.
 - Aedeagus with the excrescences of the basal piece triangular and very protruding 4
- (4) Aedeagus with the outer margin of parameres sinuate and sharply narrowed in its middle part; excrescences of the basal piece strongly pointed (Figs. 3b, 4b) *C. metallicus* (Chevrolat, 1865)
 - Aedeagus with the outer margin of parameres nearly straight; excrescences of the basal piece pointed but less protruding 5
- (5) Aedeagus with the apex of parameres broad and rounded (Figs. 3c, 4c); body size 5.5–6.5 mm *C. moltonii moltonii* Fiori, 1964
 - Aedeagus with the apex of parameres narrower and pointed (see: Allemand, 1997: fig. 4); body size 6.0–7.0 mm *C. moltonii montanensis* Allemand, 1997

Distribution and ecology:

For what it is known, *Chrysobyrhulus bizkaitarra* n. sp. only occurs in beech forests of the northern slopes of the Ordunte Mountains (Fig. 5a). Ordunte is one of the so-called «Basque Mountains» integrated into the Natura 2000 network as a Special Area of Conservation (SAC). Although the Basque Mountains do not reach the height of the Pyrenees on the east, or the Cantabrian Mountain Range on the west, they (still) harbour some subalpine species of insects. In fact, certain habitats or microhabitats can be considered climatic refugia for a number of relict populations. Recently discovered examples of such

populations are some Hemiptera (Pagola-Carte, 2015) and Coleoptera (Recalde Irurzun and Pagola-Carte, 2015) in the provinces of Gipuzkoa and Bizkaia, respectively.

Chrysobyrhulus bizkaitarra n. sp. does not seem to be a relict montane population of a known subalpine species, but an undescribed species with a montane distribution belonging to an eminently subalpine genus. *Chrysobyrhulus* has undergone an interesting speciation process along the Cantabrian mountains (see Introduction). The new species, with a presumably restricted distribution, was completely overlooked until now despite its conspicuous appearance. Being



FIGURE 5. Habitat and microhabitat of *Chrysobyrhulus bizkaitarra n. sp.*: (a) Montane beech forests on the northern slopes of Ordunte Mountains; (b) Sloping grounds covered by moss and other non-vascular plants; (c) The same microhabitat reproduced «artificially» by the lateral margin of a forest path; (d) One individual on a vertical surface at the margin of a path.

the easternmost member of the genus, a few montane beech forests (*Fagus sylvatica*) at 800–950 m constitute nowadays its only known habitat. The search for individuals that might inhabit higher open areas (pastures and heaths up to 1343 m at the Zalama summit) has been unsuccessful. Furthermore, for many years we have not been able to find *Chrysobyrhulus* in similar beech forests further in the east (Bizkaia and Gipuzkoa provinces).

Concerning the microhabitat of the new species, all the specimens were observed on the forest soil, always on vertical or very steep surfaces covered by a film of mosses and other non-vascular plants. A high degree of moisture and low insolation characterize these sites. We realized that «natural» conditions (see, for example, Fig. 5b) were reproduced «artificially» in the margins of some forest paths (Fig. 5c)

and that the beetles could be found there (Fig. 5d) even more frequently than elsewhere. They were observed in June and July, with a maximum density around the summer solstice and showing a circadian cycle of activity peaking on the morning: the temperature increase seems to favour their appearance onto the substrate, but afterwards, in the heat of midday, they usually disappear until the next day.

Specimens were most often found in isolation (Figs. 5d, 6a-d), with a few events of a higher density of individuals. Several copulas have also been observed (Fig. 6e). More interestingly, many of the beetles were feeding on the mossy substratum. On all occasions when we were able to record the individual plant selected, it was not a true moss (*Bryophyta*) but a liverwort or hepatic (*Marchantiophyta*), identified as *Diplophyllum albicans* (L.) Dumort. (Patxi Heras and



FIGURE 6. *Chrysobryrhulus bizkaitarra n. sp.*: (a)-(d) Isolated individuals; (c)-(d) Feeding and hiding among abundant liverwort *Diplophyllum albicans* (L.) Dumort.; (e) Copula.

Marta Infante, pers. comm.). Apparently adults chew this plant with preference over all other species (see Figs. 6c-d). It is well known that the diet of most Byrrhidae consists almost exclusively of cryptogamic flora, including mosses, lichens, and algae (Maier *et al.*, 2016), but very few records mention liverworts (see, for example: Farrell, 1974). Moreover, the present record for *Chrysobryrhulus bizkaitarra n. sp.* provides the first data on trophic biology for the genus. *Diplophyllum albicans* (L.) Dumort. is a pioneer species which colonizes slopes in humid and acidic conditions, usually inside forests. Being an Atlantic species, it is a common liverwort in the Cantabrian region of the Basque Country (Patxi Heras and Marta Infante, pers. comm.).

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