

Diversity of Chrysomelidae (Coleoptera) in Galicia, Northwest Spain: estimating the completeness of the regional inventory

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Abstract. The diversity of Chrysomelidae (Coleoptera) in Galicia, Northwest Spain was examined. A long-term sampling was conducted during 1996–2001 and 267 species were collected, but including bibliographic citations a total of 276 species were recorded. As a result of this study the regional inventory has grown from 83 taxa cited before 1998 to the current 276 species. Species accumulation models were used to measure the inventory completeness and estimate the actual species richness of Chrysomelidae occurring in Galicia. Estimates were generated by analyzing both the rarefaction curve from the long-term sampling and the cumulative number of species recorded from Galicia since 1866. Values of total richness predicted by these different methods range between 290 and 323 species. Therefore, it seems that between 85 and 95% of the leaf beetle fauna was recorded and thus the inventory has reached an acceptable level of completeness.

Introduction

The family Chrysomelidae is a highly diverse phytophagous group which represents an important proportion of the Coleoptera, and thus the whole diversity of terrestrial communities. Estimations for Iberian and world Coleoptera indicate that leaf beetles reach about 10% of species within the order (Martin-Piera and Lobo 2000). At local scale the same pattern was observed in Galicia, where Chrysomelidae represent about 15% of the recorded beetles in Natural Park of Fragas del Eume (Baselga and Novoa 2004), though this percentage should be slightly reduced if some incompletely studied families were added to the inventory. Therefore, leaf beetle inventories and reliable estimations of its completeness are interesting tools for assessing biodiversity patterns, and thus optimize the conservation effort.

With this purpose, many papers were focused on the need to determine the degree of completion of faunistic inventories and thus estimate the true species richness for a wide range of taxonomic groups. Two different methods can be applied to this problem. The use of randomized sample accumulation curves was firstly developed for standardized samplings (Soberón and Llorente 1993;

Colwell and Coddington 1994; Carlton and Robison 1998; Moreno and Halffter 2000; Summerville et al. 2001; Noguera et al. 2002) but also was applied to non-standardized data from museum collections or taxonomic databases (Soberón et al. 2000; Hortal et al. 2001, 2004; Petersen et al. 2003; Martín-Piera and Lobo 2003; Meier and Dikow 2004). A second way to determine the degree of completion of species inventories in a region is the growth over time of the cumulative species number as a function of the year of description (Medellín and Soberón 1999; Cabrero-Sañudo and Lobo 2003).

Knowledge about the Iberian leaf beetle diversity has been notably increased since the last quarter of the 20th century, with many papers dealing with faunistics of mountain areas (Daccordi and Petitpierre 1977; Petitpierre 1981, 1994, 1997; Petitpierre and Gómez-Zurita 1998; García-Ocejo et al. 1992; García-Ocejo and Gurrea 1995) or greater regions (Petitpierre 1980, 1983, 1988, 1999, 2000; Biondi 1991; Bastazo et al. 1993; Doguet et al. 1996). Most of these studies are focused on Mediterranean regions that occupy the greatest part of the Iberian peninsula, whereas Eurosiberian areas located in northern regions are still poorly known. This was the case of Galicia, northwest Spain (Figure 1), with only 83 species cited before 1998 (most of them recorded by López Seoane 1866; Heyden 1870; Chapman and Champion 1907; Iglesias 1928). Galicia is mostly located within the Eurosiberian region, but some southeastern areas are included in the Mediterranean region (Izco 1987; Rivas-Martínez 1987).

We carried out an extensive study of Chrysomelidae fauna from Galicia and some faunistic and taxonomic results were partially published (see Appendix A for references). The purpose of this paper is (i) to describe the regional species richness of this highly diverse group, and (ii) to estimate the completeness of



Figure 1. Location of the studied area in the northwest of the Iberian peninsula. Galicia (shaded) is located in the boundary between Eurosiberian and Mediterranean phytogeographic regions (discontinuous line).

the inventory, assessing both the rarefaction curve generated from one long-term sampling (1996–2001) which was the first attempt to get a significant picture of the regional leaf beetle fauna, and the cumulative number of species recorded since the first citations in 1866.

Materials and methods

Long-term sampling was carried out by Baselga, between 1996 and 2001, studying 191 localities in Galicia that were visited at least once (Figure 2). Among them, eight areas were selected and intensively sampled: coastal dunes and associated marshes (A), agricultural landscape near Santiago de Compostela (B), low altitude Atlantic mixed forest in Fragas del Eume Natural Park (C), medium altitude mountain ranges of Dorsal Gallega (D) and Larouco (E), the temperate valley of the Sil river (G) and high mountain ranges of Ancares (F) and Eixo-Segundera (H). Other localities visited during the field study are noted as X in Appendix A, whereas locations extracted from bibliographic sources are noted as Y. Areas E, G and H are located in the Mediterranean phytogeographic region, all the others in the Eurosiberian region (Izco 1987; Rivas-Martínez 1987). A total of 8602 specimens were collected. Another important source of material was the sampling carried out by G. Cerviño (1190 specimens) between 1991 and 1994. All this material is

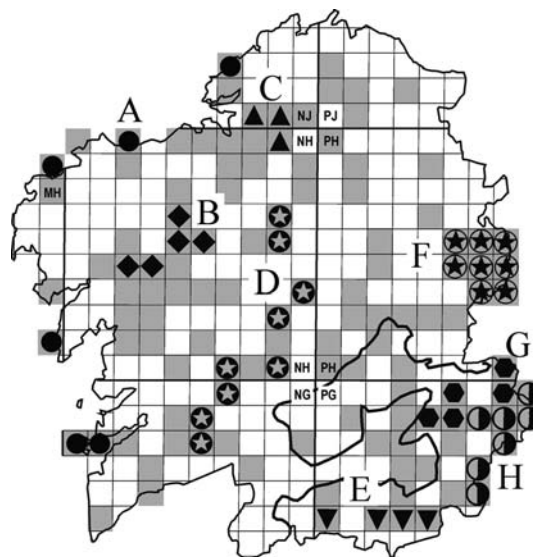


Figure 2. Sampling localities and selected areas noted in Appendix A. The squared pattern corresponds to the 10 km UTM grid. Galicia is located within 100 km squares MH, NG, NH, NJ, PG, PH and PJ. Sampled squares are shaded and intensively sampled areas are noted with different symbols and respective letters. See Materials and methods for further explanation.

deposited in Baselga collection in the Departamento de Biología Animal, Universidad de Santiago de Compostela, Spain.

To assess the completeness of the inventory both asymptotic model and non-parametric estimators (ICE, Chao 2 and jackknife of first order) were used (Colwell and Coddington 1994). Estimations were produced by two different approaches: (i) the rarefaction curve from long-term sampling and (ii) the cumulative number of recorded species since the first citations (López Seoane 1866) to the present.

The rarefaction curve and the non-parametric estimators were generated with EstimateS 6.0 software (Colwell 2000), randomizing the sample order 100 times. Database records were used as a sampling-effort surrogate (Soberón et al. 2000; Hortal et al. 2001; Martín-Piera and Lobo 2003). Our database comprised 3332 records for 10098 specimens and includes the results of the collections by G. Cerviño (1991–1994) and Baselga (1996–2001), along with some other specimens collected by Novoa and collaborators since 1973. Each record is comprised of the following fields: species name, locality, date, host plant, number of specimens and collector. Any difference in any database field value give rise to a new database record, so increments of the number of records provide correlative increments of the sampling effort (Martín-Piera and Lobo 2003). Thereafter, the asymptotic Clench function was fitted to the smoothed curve (Soberón and Llorente 1993; Hortal et al. 2004):

$$S_{(e)} = ae/(1 + be)$$

where $S_{(e)}$ is the number of species found per sampling-effort unit (e); a and b , the parameters of the function. The later were adjusted to the data of each curve by means of a Simplex and Quasi Newton method (StatSoft 2001). The predicted asymptote is calculated as a/b .

The second estimation to determine the degree of completeness of Galician leaf beetle inventory was produced by fitting the Clench function to the cumulative number of recorded species since the first citations in the region (López Seoane 1866) to the present, following Cabrero-Sañudo and Lobo (2003) but considering the first Galician record instead of the year of description. This historic curve was generated taking into account the year of published papers or the year of collection if known. The final section (1991–2001) of this curve seems to get an asymptotic shape due to the increase in sampling effort and thus only this period was selected to adjust the Clench function. We considered the case of the complete sampling with two different collectors (1991–2001) and the case of the final period with an single collector (1996–2001). In the first case the shape of the curve is more irregular due to the lack of sampling effort in 1994 and 1995 but, on the other hand, it is used a higher number of points to estimate the function than in the second case. Therefore, both estimates (and the contrast between them) are interesting for different reasons.

Biogeographic patterns were synthesized following the chorotypes proposed by Vigna Taglianti et al. (1992) and then grouping them into four major

categories: Iberian elements (Ibe), for species endemic from the Iberian Peninsula; Mediterranean elements (Med), for species widespread in the Mediterranean countries; Eurosiberian elements (Eur), for species widespread in Europe, or Europe and the Siberian range; and finally the wide range elements (WR), for species widespread in all or a great part of the Palaearctic region, and reaching parts of both Eurosiberian and Mediterranean areas. These major divisions are established in order to make clear the contrast between Eurosiberian (septentrional) and Mediterranean (meridional) contributions to Galician fauna which is located across the Eurosiberian–Mediterranean boundary. The other two categories are neutral regarding this aspect, because almost all Iberian elements are present in both sides of Eurosiberian–Mediterranean limit, as well as WR elements reach both regions.

Results

A total of 276 species have been recorded from Galicia, including the bibliographic citations (Appendix A) and 267 of them were recorded during the field study. The complete inventory (276 taxa) represents between 34% (Petitpierre 2000) and 44% (Vela and Bastazo 1999) of the total Iberian Chrysomelidae diversity, since there are two different estimations of actual number of Iberian leaf beetles. The Galician fauna of leaf beetles is comprised of about the same proportion of Eurosiberian (Eur: 19.2%) and Mediterranean (Med: 19.6%) elements. Species of wide range (WR) reach near half of the fauna (45.7%) and Iberian endemisms (Ibe) represent the 15.2%.

Two new species were described from Galicia: *Aphthona sandrae* (Baselga and Novoa 2002a) and *Psylliodes cervinoi* (Baselga and Novoa 2003) which are only known from their type localities. Eight taxa were recorded from the Iberian peninsula for the first time: *Oulema erichsonii* (Suffrian), *Phyllotreta exclamatoris* (Thunberg), *Phyllotreta ganglbaueri* Heikertinger, *Longitarsus australis* (Mulsant and Rey), *Longitarsus fulgens* (Foudras), *Chaetocnema confusa* (Boheman), *Psylliodes vindobonensis* Heikertinger and *Cassida subreticulata* Suffrian (Baselga and Novoa 1998, 1999a, b, 2000c, 2001a, b, 2002a, b). Taking into account present new records (22 species) and previous papers, 193 species (69.9% of known richness) have been newly recorded for Galicia since 1998.

The species accumulation curve (Figure 3) generated from the field study (excluding bibliographic records) nearly reaches the asymptote (292) predicted by the Clench function. Moreover, the observed richness ($S = 267$) is not far from the non-parametric estimators ICE (297), Chao 2 (300) and Jackknife 1 (311). Therefore between 85.9 and 91.4% of the estimated number of species living in Galicia seems to be detected in our field study (Table 1), but we should expect that between 24 and 44 taxa will be added to the inventory in the future.

On the other hand, the cumulative number of species recorded per year (Figure 4a) shows a slow growth since 1866 to 1990 and thereafter a great rise

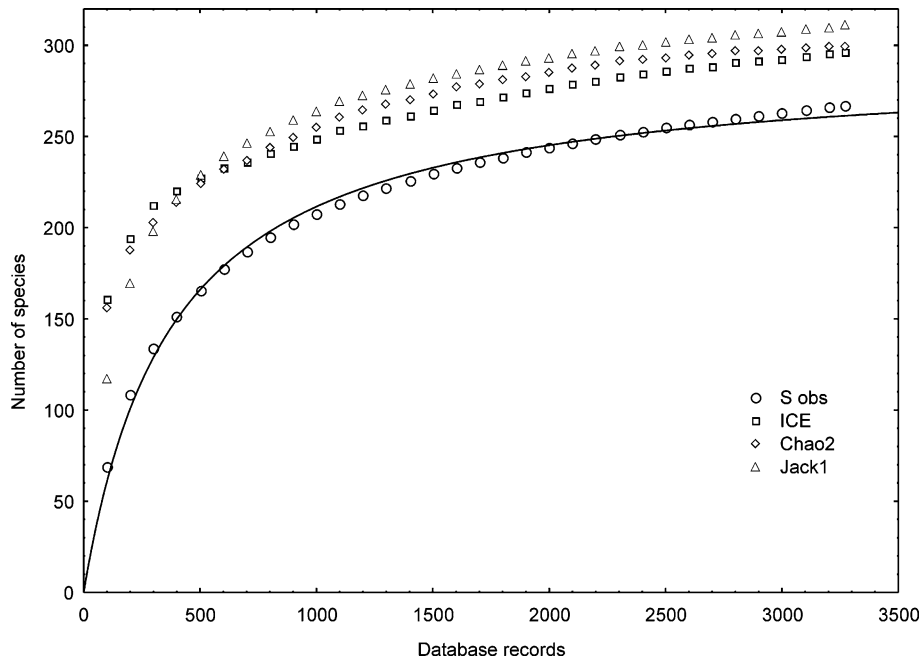


Figure 3. Species accumulation curve generated from the field study with the fitted Clench function and the non-parametric estimators ICE, Chao2 and first-order jackknife.

Table 1. Number of species recorded (S obs), estimates and percentage of the estimated value recorded for the long-term sampling, the whole historic inventory and the citations published before 1998.

Method	S obs	Estimate	%
<i>Rarefaction curve</i>			
Clench asymptote	267	292	91.4
ICE	267	297	89.9
Chao 2	267	300	89.0
Jackknife 1	267	311	85.9
<i>Historic curves</i>			
Clench for 1991–2001	276	322	85.7
Clench for 1996–2001	276	290	95.2
Clench for citations published before 1998	83	128	64.8

in the rate of addition of new records due to the significant increase of sampling effort since 1991 to 2001. In this final section the historic curve becomes asymptotic. The fitted Clench function estimates an asymptote of 322 species for the curve between 1991 and 2001 (Figure 4b), and an asymptote of 290 species if the function is adjusted to the section between 1996 and 2001

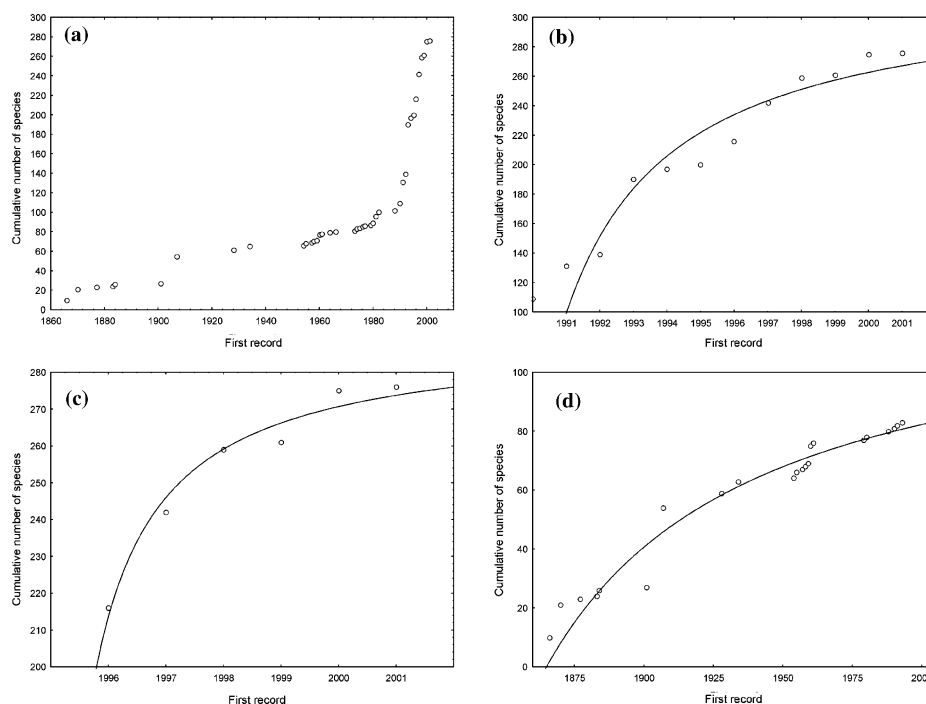


Figure 4. Cumulative number of species recorded per year. (a) Historic curve (1866–2001). (b) Fitted Clench function considering the final period with two collectors (1991–2001). (c) Fitted Clench function considering the final period with a single collector (1996–2001). (d) Cumulative number of citations published before 1998. The curve reaches an asymptote due to the lack of sampling effort and the unrealistic estimation is 128 species.

(Figure 4c). Since the recorded species richness is 276, the estimated completeness of the inventory reaches about 85.7–95.2% (Table 1).

Discussion

The current state of the inventory is considered reasonably complete, because the different estimation methods agree in their values. The Clench function and the non-parametric estimators computed from the sampling rarefaction curve, as well as the historic curve of the cumulative number of recorded species predict a percentage of undetected species between 5 and 15% (14–44 species). The fauna of Chrysomelidae from Galicia (29574 km²) comprises 276 recorded species, but the estimated total richness reaches between 290 and 323. If these values are compared with those of other Iberian regions, Galician diversity is quite similar to the 339 species cited from Aragón (47,6974 km²), though this number might be an underestimation (Vives 2000), but it is far from the 384 taxa recorded from Cataluña (32091 km²) (Petitpierre 1994). The reduced species

richness recorded in Galicia in comparison with Aragón or Cataluña may not reflect sampling deficiencies but real differences in leaf beetle diversity, since the species accumulation curves and the non-parametric estimators nearly reach the predicted values (85.9–95.1% of the estimated richness). Both regions have a higher species richness than Galicia probably due to their marked environmental gradients between the high Pyrenees mountains and the Mediterranean or even arid plains and valleys, that allow the presence of both Eurosiberian and Mediterranean elements, as well as the presence of endemic Pyrenean species not distributed in other regions of the Iberian peninsula. In Galicia the Mediterranean phytogeographic region is restricted to a small southeastern area, and mountain ranges reach maximum altitudes up to 2000 m, whereas in the Pyrenees there are more than 200 summits that rise above 3000 m.

The description of two new species from Galicia and the citation of eight species new for the Iberian peninsula, indicate the previous poor knowledge about the faunas occurring in the northern regions of the Iberian peninsula and the need of further sampling effort in such areas (i.e. Asturias, Cantabria, País Vasco). This poor state of knowledge was particularly pronounced in Galicia, where records for the two thirds of the known species were published since 1998. In fact, the scarcity of published records before 1998 would have avoided even any reliable estimation of the number of species occurring in the region, because the cumulative curve (Figure 4d) reaches an asymptote due to the lack of sampling effort and not to the saturation of the inventory. Only 83 species were cited before 1998 and using these data the estimation generated by the Clench function is 128 species. This fact shows the importance of publishing faunistic inventories, which are the base for research on biodiversity and biogeography.

In summary, the study presented herein points out the need of extensive field work to collect highly diverse groups in still poorly surveyed territories, as well how this knowledge from non-standardized but extensive samplings can be used to get estimates of actual species richness. In the case of Galician leaf beetles, the long-term sampling has showed the previous poor knowledge of Iberian Eurosiberian-type faunas with the discovery of new taxa and the addition of many new records to the Galician and Iberian inventories. Also, the use of different methods in assessing the completeness of the inventory allows us to consider that estimates are accurate, because all non-parametric estimators, sample-based and historic curves predict values of total species richness within a narrow range. The recorded richness represent about 85–95% of the predicted values. Thus, the inventory seems to be reasonably complete and therefore valuable to describe biodiversity patterns of Iberian and European Chrysomelidae.

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Appendix A

See Materials and methods section for explanation of terms.

Species	First record	Published records	Main areas	Dist.
<i>Donacia reticulata</i> (Gyllenhal)	1866	López Seoane (1866)	Y	WR
<i>Donacia galaica</i> Báguena	1959	Báguena (1959), Petitpierre (2000) and Baselga and Novoa (2002b)	B, H, X, Y	Ibe
<i>Donacia marginata</i> Hoppe	1960	Báguena (1960a) and Baselga and Novoa (1999a, 2000a)	A, D, G, X, Y	WR
<i>Donacia bicolora</i> Zschach	1960	Báguena (1960a)	X, Y	WR
<i>Donacia vulgaris</i> Zschach	1992	New record	X	WR
<i>Donacia simplex</i> Fabricius	1960	Báguena (1960a)	Y	WR
<i>Plateumaris sericea</i> (Linné)	1960	Báguena (1960a) and Baselga and Novoa (2000a, b, 2002b)	A, B, C, D, E, F, H, X, Y	WR
<i>Oulema erichsonii</i> (Suffrian)	1990	Baselga and Novoa (1999b, 2000b, 2002b)	E, F, G, X	Eur
<i>Oulema gallaeciana</i> (Heyden)	1870	Heyden (1870), Iglesias (1928), Vives and González (1994) and Baselga and Novoa (1999a, 2000a, b, 2002b)	A, B, C, D, E, F, H, X, Y	Eur
<i>Oulema hoffmannseggii</i> (Lacordaire)	1993	Baselga and Novoa (2000c)	X	Med
<i>Oulema melanopus</i> (Linné)	1993	Baselga and Novoa (1999a, 2000a, b)	A, B, C, D, E, F, X	WR
<i>Oulema duftschmidi</i> (Redtenbacher)	1993	Baselga and Novoa (2000a, b, 2002b)	A, B, C, D, E, F, H, X	WR
<i>Oulema rufocyanea</i> (Suffrian)	2000	Baselga and Novoa (2002b)	H	Eur

Appendix A Continued.

Species	First record	Published records	Main areas	Dist.
<i>Crioceris paracenthesis</i> (Linné)	1997	Baselga and Novoa (2000a)	A	Med
<i>Crioceris asparagi</i> (Linné)	1928	Iglesias (1928), González de Andrés (1934) and Baselga and Novoa (1999a, 2000a)	A, X, Y	WR
<i>Lilioceris lili</i> (Scopoli) ssp. <i>laeviuscula</i> (Weise)	1907	Chapman and Champion (1907) and Baselga and Novoa (2002b)	X, Y	WR
<i>Labidostomis lusitanica</i> (Germar)	1907	Chapman and Champion (1907), Iglesias (1928), Baselga and Novoa (1999a, 2000b, 2002b) and Petitpierre (2000)	E, F, G, X, Y	Med
<i>Labidostomis taxicornis</i> (Fabricius)	1974	Baselga and Novoa (2001a)	X	Med
<i>Lachnaia cylindrica</i> (Lacordaire)	1998	Baselga and Novoa (2000b)	F	Med
<i>Lachnaia hirta</i> (Fabricius)	1998	Baselga and Novoa (1999a, 2000b, 2002b)	D, F, G, X	Med
<i>Lachnaia pubescens</i> (Dufour)	1907	Chapman and Champion (1907), Iglesias (1928) and Baselga and Novoa (1999a, 2000b, 2002b)	E, F, G, H, X, Y	Med
<i>Lachnaia tristigma</i> (Lacordaire)	1907	Chapman and Champion (1907) and Baselga and Novoa (2002b)	D, E, X, Y	Med
<i>Tituboea biguttata</i> (Olivier)	1994	Baselga and Novoa (2002b)	G	Med
<i>Tituboea sexmaculata</i> (Fabricius)	2000	New record	G	Med
<i>Clytra atraphaxidis</i> Pallas	1907	Chapman and Champion (1907) and Baselga and Novoa (2002b)	Y	WR
<i>Clytra quadripunctata</i> (Linné) ssp. <i>quadripunctata</i> (Linné)	1998	Baselga and Novoa (2000b)	F	Eur
<i>Clytra espanoli</i> Daccordi and Petitpierre	1907	Chapman and Champion (1907), Iglesias (1928) and Baselga and Novoa (1999a, 2000b, 2002b)	B, C, F, H, X, Y	Ibe
<i>Smaragdina concolor</i> (Fabricius)	1907	Chapman and Champion (1907) and Baselga and Novoa (1999a, 2000b, 2002b)	B, C, D, E, F, G, H, X, Y	Med
<i>Smaragdina reyi</i> (Brisout)	1960	Báguena (1960b), Cobos (1969), Baselga and Novoa (2000b, 2002b) and Petitpierre (2000)	B, C, D, E, F, G, H, X, Y	Ibe

Appendix A Continued.

Species	First record	Published records	Main areas	Dist.
<i>Coptocephala brevicornis</i> (Lefèvre)	1960	Báguena (1960e) and Baselga and Novoa (1999a, 2000a, 2002b)	A, G, X, Y	Ibe
<i>Coptocephala scopolina</i> (Linné)	1981	Baselga and Novoa (2000a, 2002b)	A, G, H, X	Med
<i>Stylosomus ilicicola</i> Suffrian	1961	Codina Padilla (1961a)	Y	Med
<i>Stylosomus rugithorax</i> Abeille	1907	Baselga and Novoa (2000b, 2002b)	B, C, D, E, F, H, X	Ibe
<i>Pachybrachis pteromelas</i> Graells	2000	New record	G	Ibe
<i>Pachybrachis hippophaes</i> Suffrian	1907	Chapman and Champion (1907) and Baselga and Novoa (2002b)	Y	Eur
<i>Pachybrachis azureus</i> Suffrian	1907	Chapman and Champion (1907) and Baselga and Novoa (1999b, 2000b, 2002b)	D, F, G, H, X, Y	Med
<i>Cryptocephalus excisus</i> Seidlitz	1998	Baselga and Novoa (2000b)	F	Ibe
<i>Cryptocephalus lusitanicus</i> Suffrian	1907	Chapman and Champion (1907) and Baselga and Novoa (2000b, 2002b)	E, F, G, X, Y	Ibe
<i>Cryptocephalus pomitorum</i> Burlini	1907	Chapman and Champion (1907), Bourdonné (1994) and Baselga and Novoa (2000b, 2002b)	F, G, X, Y	Ibe
<i>Cryptocephalus pexicollis</i> Suffrian	1955	Burlini (1955)	Y	Med
<i>Cryptocephalus oblitterifer</i> Pic	1907	Chapman and Champion (1907) and Baselga and Novoa (2002b)	G, Y	Med
<i>Cryptocephalus bipunctatus</i> (Linné)	1980	Chapman and Champion (1907) and Baselga and Novoa (2000b, 2002b)	C, F, G, X, Y	Eur
<i>Cryptocephalus rugicollis</i> Olivier	2000	Baselga and Novoa (2002b)	G	Med
<i>Cryptocephalus aureolus</i> Suffrian	1982	Baselga and Novoa (1999a, 2000a, b, d, 2002b)	A, B, C, D, F, X	Eur
<i>Cryptocephalus globicollis</i> Suffrian	1907	Chapman and Champion (1907) and Baselga and Novoa (2002b)	X, Y	Med
<i>Cryptocephalus cantabricus</i> Franz	1958	Franz (1958) and Baselga and Novoa (2000b, d, 2002b)	B, C, E, F, G, H, X, Y	Ibe
<i>Cryptocephalus violaceus</i> Laicharting	1907	Chapman and Champion (1907), Petitpierre (2000) and Baselga and Novoa (2002b)	Y	Eur

Appendix A Continued.

Species	First record	Published records	Main areas	Dist.
<i>Cryptocephalus tibialis</i> Brisout	1955	Burlini (1955) and Baselga and Novoa (1999a, 2000b, 2002b)	E, F, G, H, X, Y	Eur
<i>Cryptocephalus parvulus</i> Müller	2000	New record	X	WR
<i>Cryptocephalus androgyne</i> Marseul ssp. <i>pelleti</i> Marseul	1993	New record	C, X	Eur
<i>Cryptocephalus cynarae</i> Suffrian	1866	López Seoane (1866), Chapman and Champion (1907) and Baselga and Novoa (1999a, 2002b)	D, G, X, Y	Ibe
<i>Cryptocephalus moraei</i> (Linné)	1907	Chapman and Champion (1907) and Baselga and Novoa (2002b)	B, D, X, Y	Eur
<i>Cryptocephalus crassus</i> Olivier	1907	Chapman and Champion (1907) and Baselga and Novoa (2002b)	G, Y	Med
<i>Cryptocephalus octoguttatus</i> (Linné)	1992	Baselga and Novoa (1999a, 2000b, 2002b)	C, D, E, F, G, H, X	Med
<i>Cryptocephalus vittatus</i> Fabricius	1870	Heyden (1870), Chapman and Champion (1907), Iglesias (1928), Burlini (1955) and Baselga and Novoa (1999a, 2000a, b, 2002b)	A, B, C, D, E, F, G, X, Y	WR
<i>Cryptocephalus celtibericus</i> Suffrian	1877	López Seoane (1877) and Baselga and Novoa (2000b, 2002b)	F, G, Y	Med
<i>Cryptocephalus bilineatus</i> (Linné)	1870	Heyden (1870), Plaza Infante (1979) and Baselga and Novoa (2000b, 2002b)	C, F, H, X, Y	WR
<i>Cryptocephalus mystacatus</i> Suffrian	1907	Chapman and Champion (1907) and Baselga and Novoa (2000b, 2002b)	D, E, F, G, H, X, Y	Ibe
<i>Cryptocephalus labiatus</i> (Linné)	1991	Baselga and Novoa (1999b, 2000b)	C, F, X	Eur
<i>Cryptocephalus pygmaeus</i> Fabricius	1907	Chapman and Champion (1907) and Baselga and Novoa (2000a, b, 2002b)	A, G, X, Y	WR
<i>Cryptocephalus fulvus</i> (Goeze)	1994	Baselga and Novoa (2000a, 2002b)	A, G, H, X	WR
<i>Cryptocephalus macellus</i> Suffrian	1979	Plaza Infante (1979)	Y	Eur
<i>Cryptocephalus pusillus</i> Fabricius	1991	New record	C, X	Eur
<i>Cryptocephalus rufipes</i> (Goeze)	1991	Baselga and Novoa (2000a, b, 2002b)	A, B, C, D, E, F, H, X	WR

Appendix A Continued.

Species	First record	Published records	Main areas	Dist.
<i>Oomorphus concolor</i> (Sturm)	1998	Baselga and Novoa (1999b, 2000b)	C, F	Eur
<i>Bromius obscurus</i> (Linné)	2000	Baselga and Novoa (2001a, 2002b)	H	WR
<i>Timarcha calceata</i> Pérez Arcas	1975	Baselga and Novoa (1999a, 2000b)	F, X	Ibe
<i>Timarcha geniculata</i> (Germar)	1977	Baselga and Novoa (2002b)	F, H, Y	Ibe
<i>Timarcha asturiensis</i> Kraatz	1883	Marseul (1883), Bechyné (1948) and Baselga and Novoa (2000a)	A, Y	Ibe
<i>Timarcha chloropus</i> (Germar)	1884	Fairmaire (1884), Bechyné (1948), Vives and González (1998) and Baselga and Novoa (1999a, 2000a)	A, D, X, Y	Ibe
<i>Timarcha gougeleti</i> Fairmaire	1877	López Seoane (1877), Fairmaire (1884), Bechyné (1948), Vives and González (1998) and Baselga and Novoa (1999a, 2000a)	A, B, C, X, Y	Ibe
<i>Timarcha trapezicollis</i> Fairmaire	1884	Fairmaire (1884)	Y	Ibe
<i>Leptinotarsa decemlineata</i> Say	1993	Baselga and Novoa (1999a, 2000a, 2002b)	A, B, H, X	Intr.
<i>Chrysolina herbacea</i> (Duftschmid)	1866	Baselga and Novoa (1999a, 2000a, b, 2002b)	A, B, D, E, F, G, H, X	WR
<i>Chrysolina fastuosa</i> (Scopoli)	1996	Baselga and Novoa (1999a, 2002b)	B, H, X	WR
<i>Chrysolina polita</i> (Linné)	1982	Baselga and Novoa (1999a, 2000a, b)	A, D, F, X	Eur
<i>Chrysolina bankii</i> (Fabricius)	1928	Iglesias (1928) and Baselga and Novoa (1999a, 2000a, b)	A, B, C, D, F, X, Y	Med
<i>Chrysolina americana</i> (Linné)	1907	Chapman and Champion (1907), Iglesias (1928) and Baselga and Novoa (1999a, 2002b)	G, X, Y	Med
<i>Chrysolina rufoaenea</i> (Suffrian)	1991	New record	D, E, X	Eur
<i>Chrysolina haemoptera</i> (Linné)	1866	López Seoane (1866), Iglesias (1928) and Baselga and Novoa (1999a, 2000a, b, 2002b)	A, C, D, H, X, Y	Eur
<i>Chrysolina mactata</i> (Fairmaire)	1866	López Seoane (1866), López Seoane (1877) and Baselga and Novoa (1998, 1999a, 2000b)	C, F, X, Y	Ibe

Appendix A Continued.

Species	First record	Published records	Main areas	Dist.
<i>Chrysolina gypsophylae</i> (Küster)	1928	Baselga and Novoa (1999a, 2000a)	A, G	WR
<i>Chrysolina latecincta</i> (Demaison) ssp. <i>decipiens</i> (Franz)	1988	Petitpierre (1988) and Baselga and Novoa (2002b)	X, Y	Eur
<i>Chrysolina affinis</i> (Fabricius) ssp. <i>rufofemorata</i> (Heyden)	1973	New record	X	Med
<i>Chrysolina grossa</i> (Fabricius) ssp. <i>chloromaura</i> (Olivier)	1866	López Seoane (1866), Iglesias (1928), Vives and González (1998) and Baselga and Novoa (1999a, 2000a)	A, D, X, Y	Med
<i>Chrysolina lucida</i> (Olivier) ssp. <i>torresi</i> Bechyne	1991	Baselga and Novoa (1999a, 2000a)	A, X	Eur
<i>Chrysolina diluta</i> (Germar)	1907	Chapman and Champion (1907), Codina Padilla (1961b) and Baselga and Novoa (1999a, 2000a, 2002b)	A, X, Y	Ibe
<i>Chrysolina varians</i> (Schaller)	1907	Baselga and Novoa (2000b)	F	Eur
<i>Chrysolina brunsvicensis</i> (Gravenhorst)	1996	Baselga and Novoa (1999b, 2000b)	B, D, F, X	Eur
<i>Chrysolina quadrigemina</i> (Suffrian)	1991	Baselga and Novoa (2000a, b, 2002b)	A, B, F, G, X	WR
<i>Chrysolina interstincta</i> (Suffrian) ssp. <i>graellsii</i> (Pérez Arcas)	1992	Baselga and Novoa (2000c, 2002b)	B, E, H, X	Med
<i>Oreina alpestris</i> (Schummel)	1981	Baselga and Novoa (2000b, c)	F, X	Eur
<i>Oreina ganglbaueri</i> (Jakob)	1998	New record	F	Ibe
<i>Gastrophysa polygoni</i> (Linné)	1990	Baselga and Novoa (2000a)	A, B, G, X	WR
<i>Gastrophysa unicolor</i> (Marsham)	1866	López Seoane (1866) and Baselga and Novoa (1999a, 2000a, b, 2002b)	A, B, C, D, E, F, G, H, X, Y	Ibe
<i>Colaspidema atrum</i> (Olivier)	1934	González de Andrés (1934)	Y	WR
<i>Colaspidema dufouri</i> (Pérez Arcas)	1993	Baselga and Novoa (2000c)	X	Ibe
<i>Phaedon tumidulus</i> (Germar)	1901	Bedel (1901) and Baselga and Novoa (2000a, b)	A, F	WR
<i>Phaedon cochleariae</i> (Fabricius)	1999	Baselga and Novoa (2000a, 2002b)	A, H	WR
<i>Phaedon armoraciae</i> (Linné)	1998	New record	E, X	WR

Appendix A Continued.

Species	First record	Published records	Main areas	Dist.
<i>Cyrtonus corruscans</i> Vuillefroy	1994	New record	X	Ibe
<i>Cyrtonus cupreovirens</i> Pérez Arcas	1998	New record	D	Ibe
<i>Cyrtonus franzi</i> Cobos	1954	Cobos 1954	Y	Ibe
<i>Hydrothassa glabra</i> (Herbst)	1993	Baselga and Novoa (2000a, b, 2002b)	A, B, D, F, H, X	Eur
<i>Hydrothassa fairmairei</i> (Brisout)	1996	Baselga and Novoa (2000a, b)	A, B, C, D, F, X	Ibe
<i>Prasocuris junci</i> (Brahm)	1982	Baselga and Novoa (2000a, b)	A, B, F, G, X	WR
<i>Prasocuris phellandrii</i> (Linné)	2001	New record	X	WR
<i>Plagioderia versicolora</i> (Laicharting)	1907	Chapman and Champion (1907), González de Andrés (1934), Vives and González (1998) and Baselga and Novoa (2000b, 2002b)	B, C, D, E, F, H, X, Y	WR
<i>Plagiosterna aenea</i> (Linné)	1991	Baselga and Novoa (1999a, 2000b)	B, F, G, X	WR
<i>Chrysomela populi</i> Linné	1928	Iglesias (1928), González de Andrés (1934) and Baselga and Novoa (1999a, 2000b)	B, F, X, Y	WR
<i>Gonioctena aegrota</i> Fabricius	2000	New record	G	Med
<i>Gonioctena leprieuri</i> (Pic)	1957	Bechyné (1957) and Baselga and Novoa (2002b)	F, G, H	Ibe
<i>Gonioctena olivacea</i> (Forster)	1991	Baselga and Novoa (1999a, 2000a, b, 2002b)	A, B, C, D, E, F, G, H, X	WR
<i>Phratora vulgatissima</i> (Linné)	1991	Baselga and Novoa (1999b)	B, C, D, X	WR
<i>Phratora tibialis</i> (Suffrian)	1988	Vives and González (1988)	Y	Eur
<i>Phratora laticollis</i> (Suffrian)	1998	Baselga and Novoa (2000b)	F	WR
<i>Phratora vitellinae</i> (Linné)	1998	Baselga and Novoa (2000b)	F	Eur
<i>Entomoscelis adonidis</i> (Pallas)	1974	New record	X	WR
<i>Galerucella lineola</i> (Fabricius)	1993	New record	B, C, D, E, X	WR
<i>Galerucella calmariensis</i> (Linné)	1993	Baselga and Novoa (2000a)	A, B, G, X	WR

Appendix A Continued.

Species	First record	Published records	Main areas	Dist.
<i>Xanthogaleruca luteola</i> (Muller)	1998	Baselga and Novoa (1999a, 2000b)	F, G, X	WR
<i>Galeruca macchoi</i> (Joannis)	1981	Baselga and Novoa (2000b, 2002b)	C, F, H, X	Ibe
<i>Galeruca luctuosa</i> (Joannis)	1934	Laboissière (1934) and Baselga and Novoa (1999a, 2002b)	B, G, X	Eur
<i>Galeruca angusta</i> Küster	1995	Baselga and Novoa (1999a, 2000a, c)	A, X	Med
<i>Lochmaea scutellata</i> (Chevrolat)	1934	Laboissière (1934) and Baselga and Novoa (1999b, 2000b, 2002b)	B, C, E, F, H, X	Ibe
<i>Lochmaea suturalis</i> (Thomson)	1995	Baselga and Novoa (1999b, 2000a, b, 2002b)	A, C, D, E, F, H, X	Eur
<i>Exosoma lusitanica</i> (Linné)	1907	Chapman and Champion (1907), Iglesias (1928) and Baselga and Novoa (1999a, 2000a, b, 2002b)	A, B, C, E, F, G, H, X, Y	WR
<i>Calomicrus circumfusus</i> (Marsham)	1866	López Seoane (1866), Chapman and Champion (1907) and Baselga and Novoa (2000b, 2002b)	B, C, D, E, F, G, H, X, Y	Eur
<i>Calomicrus suturalis</i> (Joannis)	1998	Baselga and Novoa (2000b, 2002b)	F, G	Eur
<i>Luperus flavus</i> Rosenhauer	1998	Baselga and Novoa (2000b, 2002b)	E, F, G, H	Ibe
<i>Luperus sulphuripes</i> Graëlls	1866	López Seoane (1866) and Baselga and Novoa (1999a, 2000b, 2002b)	B, C, D, E, F, G, H, X, Y	Ibe
<i>Agelastica alni</i> (Linné)	1928	Iglesias (1928) and Baselga and Novoa (1999a, 2000b, 2002b)	B, E, F, G, X, Y	WR
<i>Sermylassa halensis</i> (Linné)	1998	Baselga and Novoa (2000b)	F, X	Eur
<i>Leptomona erythrocephala</i> (Olivier)	1907	Heyden (1870) and Baselga and Novoa (2000a, b)	A, B, C, D, F, G, X, Y	Med
<i>Phyllotreta variipennis</i> (Boieldieu)	1993	Baselga and Novoa (2001a)	B, G	Med
<i>Phyllotreta vittula</i> (Redtenbacher)	1993	Baselga and Novoa (1999b)	B, X	WR
<i>Phyllotreta nemorum</i> (Linné)	1993	Baselga and Novoa (2000b)	B, C, D, E, F, X	WR
<i>Phyllotreta undulata</i> Kutschera	1997	Baselga and Novoa (2000a, b)	A, B, C, D, F, X	WR

Appendix A Continued.

Species	First record	Published records	Main areas	Dist.
<i>Phyllotreta tetrastigma</i> (Comolli)	1996	Baselga and Novoa (1998, 2000a, b, 2002b)	A, B, C, D, E, F, H	WR
<i>Phyllotreta striolata</i> (Fabricius)	1870	Heyden (1870), González de Andrés (1934) and Baselga and Novoa (2000a, b)	A, B, D, F, X, Y	WR
<i>Phyllotreta ochripes</i> (Curtis)	1993	Baselga and Novoa (2000c)	G	Eur
<i>Phyllotreta exclamationis</i> (Thunberg)	1997	Baselga and Novoa (1998, 2000a, b)	A, B, C, D, E, F, X	Eur
<i>Phyllotreta atra</i> (Fabricius)	1870	Heyden (1870) and Baselga and Novoa (2000a, 2002b)	A, B, C, D, G, H, X, Y	WR
<i>Phyllotreta cruciferae</i> (Goeze)	1870	Heyden (1870), González de Andrés (1934) and Baselga and Novoa (2000a)	A, B, E, X, Y	WR
<i>Phyllotreta foudrasi</i> Brisout	1993	New record	E, G	Med
<i>Phyllotreta temperei</i> Doguet	1993	Baselga and Novoa (2001a)	X	Ibe
<i>Phyllotreta consobrina</i> (Curtis)	1993	Baselga and Novoa (1999a, 2000a, b, 2002b)	A, B, C, D, E, F, G, X	WR
<i>Phyllotreta nigripes</i> (Fabricius)	1993	Baselga and Novoa (2000b, 2002b)	B, C, D, F, H, X	WR
<i>Phyllotreta ganglbaueri</i> Heikertinger	2000	Baselga and Novoa (2001b)	X	Eur
<i>Phyllotreta procera</i> (Redtenbacher)	1993	Baselga and Novoa (2000a)	A, C, G, X	WR
<i>Aphthona lutescens</i> (Gyllenhal)	1996	Baselga and Novoa (2000a)	A, B, D, X	WR
<i>Aphthona nigriceps</i> (Redtenbacher)	1997	Baselga and Novoa (2000a)	A, X	WR
<i>Aphthona punctiventris</i> Mulsant and Rey	1993	Baselga and Novoa (1998, 2000a)	A, C, G, X	Med
<i>Aphthona occitana</i> Doguet	1997	Baselga and Novoa (1999b)	B	Ibe
<i>Aphthona atrocaerulea</i> (Stephens)	1996	Baselga and Novoa (2000a, 2002b)	A, E, H	WR
<i>Aphthona melancholica</i> Weise	1993	Baselga and Novoa (1999b, 2000b, c)	C, F, X	Ibe
<i>Aphthona sandrae</i> Baselga and Novoa	1994	Baselga and Novoa (2002a)	C, X	Ibe
<i>Aphthona nonstriata</i> (Goeze)	1995	Baselga and Novoa (2000a, 2002b)	A, B, H, X	WR
<i>Aphthona herbigrada</i> (Curtis)	1997	Baselga and Novoa (2001a)	X	WR
<i>Longitarsus pellucidus</i> (Foudras)	1994	Baselga and Novoa (2002b)	G	WR

Appendix A Continued.

Species	First record	Published records	Main areas	Dist.
<i>Longitarsus codinai</i> Madar and Madar	1996	Baselga and Novoa (2000a)	A, X	Med
<i>Longitarsus ochroleucus</i> (Marsham)	1997	Baselga and Novoa (2000a, 2002b)	A, G, X	WR
<i>Longitarsus candidulus</i> (Foudras)	1997	Baselga and Novoa (2000a)	A, G	Med
<i>Longitarsus leonardii</i> Doguet	2000	Baselga and Novoa (2001a)	X	Ibe
<i>Longitarsus flavicornis</i> (Stephens)	1994	Baselga and Novoa (2000a, b, 2002b)	A, C, D, F, G, X	WR
<i>Longitarsus succineus</i> (Foudras)	1991	Baselga and Novoa (2000a)	A, C, X	WR
<i>Longitarsus aeruginosus</i> (Foudras)	1996	Baselga and Novoa (2000a, b)	A, B, C, F, X	WR
<i>Longitarsus rubiginosus</i> (Foudras)	1997	Baselga and Novoa (1999b)	X	Eur
<i>Longitarsus tabidus</i> (Fabricius)	1992	Baselga and Novoa (2000a, b, 2002b)	A, B, E, F, G, X	WR
<i>Longitarsus australis</i> (Mulsant and Rey)	1997	Baselga and Novoa (1998, 2000a)	A, X	Med
<i>Longitarsus foudrasi</i> Weise	2000	Baselga and Novoa (2001a, 2002b)	G	WR
<i>Longitarsus nigrofasciatus</i> (Goeze)	1992	Baselga and Novoa (2000a, b, 2002b)	A, B, E, F, G, H, X	WR
<i>Longitarsus suturatus</i> (Foudras)	1993	Baselga and Novoa (2000a, 2002b)	A, E, G, H, X	Med
<i>Longitarsus rutilus</i> (Illiger)	1993	Baselga and Novoa (1999b, 2000a, b)	A, B, C, E, F, G, X	WR
<i>Longitarsus lycopi</i> (Foudras)	1993	Baselga and Novoa (2000a, b, 2002b)	A, B, F, G, H, X	WR
<i>Longitarsus ordinatus</i> (Foudras)	1993	Baselga and Novoa (2000b, 2002b)	E, F, G, H, X	Med
<i>Longitarsus ferrugineus</i> (Foudras)	1993	Baselga and Novoa (2000a, b)	A, F, G, X	WR
<i>Longitarsus albineus</i> (Foudras)	1993	Baselga and Novoa (2000b)	G	WR
<i>Longitarsus membranaceus</i> (Foudras)	1993	Baselga and Novoa (2000a, b, 2002b)	A, C, D, E, F, G, X	WR
<i>Longitarsus melanocephalus</i> (De Geer)	1870	Heyden (1870) and Baselga and Novoa (2000a, b, 2002b)	A, B, C, D, E, F, G, H, X, Y	WR
<i>Longitarsus kutscherae</i> (Rye)	1997	Baselga and Novoa (2001a)	B	WR
<i>Longitarsus curtus</i> (Allard)	1991	Baselga and Novoa (2000c)	C, G, X	Eur
<i>Longitarsus exsoletus</i> (Linné)	1997	Baselga and Novoa (2000a, b)	A, B, D, F, X	WR

Appendix A Continued.

Species	First record	Published records	Main areas	Dist.
<i>Longitarsus cerinthes</i> (Schrank)	1997	Baselga and Novoa (2000a, b, 2002b)	A, B, F, G, X	WR
<i>Longitarsus scutellaris</i> (Mulsant and Rey)	1993	New record	X	Eur
<i>Longitarsus pratensis</i> (Panzer)	1990	Leonardi and Doguet (1990) and Baselga and Novoa (2000a, b, 2002b)	A, B, C, D, E, F, G, H, X, Y	WR
<i>Longitarsus reichei</i> (Allard)	1870	Heyden (1870), Jolivet (1953), Petitpierre (1999) and Baselga and Novoa (2000b)	B, F, X, Y	Eur
<i>Longitarsus ballotae</i> (Marsham)	1870	Heyden (1870)	G, Y	WR
<i>Longitarsus gracilis</i> Kutschera	1993	Baselga and Novoa (2000a, b, 2002b)	A, B, F, H, X	WR
<i>Longitarsus atricillus</i> (Linné)	1991	Baselga and Novoa (2000b, 2002b)	B, C, D, E, F, G, X	WR
<i>Longitarsus bedeli</i> Uhagón	1993	Baselga and Novoa (2002b)	H	Ibe
<i>Longitarsus lateripunctatus</i> Rosenhauer	1993	Baselga and Novoa (2000a, b)	A, B, F, G, X	WR
<i>Longitarsus dorsalis</i> (Fabricius)	1993	Baselga and Novoa (2000b, 2002b)	F, G, H, X	WR
<i>Longitarsus luridus</i> (Scopoli)	1991	Baselga and Novoa (2000a, b, 2002b)	A, B, C, D, E, F, G, H, X	WR
<i>Longitarsus fulgens</i> (Foudras)	2000	Baselga and Novoa (2001a)	C	Eur
<i>Longitarsus echii</i> (Koch)	1993	New record	E, X	WR
<i>Longitarsus aeneus</i> Kutschera	1993	Baselga and Novoa (2000a, b)	A, F, X	Med
<i>Longitarsus niger</i> (Koch)	1993	New record	X	Eur
<i>Longitarsus parvulus</i> (Paykull)	1870	Heyden (1870) and Baselga and Novoa (2000a, b)	A, D, F, X, Y	WR
<i>Longitarsus obliteratooides</i> Gruev	1997	Baselga and Novoa (2002b)	G	Med
<i>Longitarsus bergeali</i> Doguet and Gruev	1998	Baselga and Novoa (2000b)	F	Eur
<i>Longitarsus anchusae</i> (Paykull)	1993	Baselga and Novoa (2000b)	E, F, X	WR
<i>Altica ampelophaga</i> Guérin	1981	Baselga and Novoa (1999a, 2000a, b, 2002b)	A, C, D, E, F, H, X.	Med.
<i>Altica brevicollis</i> Foudras	1990	Baselga and Novoa (1999b, 2000b)	C, F, X	WR
<i>Altica quercetorum</i> Foudras	1993	Lombardero et al. (1993) and Baselga and Novoa (1999a)	X, Y	Eur.

Appendix A Continued.

Species	First record	Published records	Main areas	Dist.
<i>Altica tamaricis</i> Schrank ssp. <i>franzi</i> Král	1966	Král (1966)	Y	WR
<i>Altica oleracea</i> (Linné)	1981	Baselga and Novoa (2000a, b, 2002b)	A, B, D, E, F, G, H, X	WR
<i>Altica palustris</i> (Weise)	1993	Baselga and Novoa (2000b)	C, G, X	WR
<i>Altica carduorum</i> Guérin	1990	Baselga and Novoa (2000c)	X.	WR.
<i>Altica ericeti</i> (Allard)	1981	Baselga and Novoa (1999a, 2000b, 2002b)	B, C, D, E, F, G, H, X	Eur
<i>Altica longicollis</i> (Allard)	1980	Baselga and Novoa (1999b, 2000b)	F, X	Eur
<i>Hermaeophaga cicatrix</i> (Illiger)	1999	Baselga and Novoa (2001a)	C	WR
<i>Batophila aerata</i> (Marsham)	2000	Baselga and Novoa (2001a, 2002b)	G	WR
<i>Arrhenocoela lineata</i> (Rossi)	1991	Baselga and Novoa (2000b, 2002b)	C, D, F, G, X	Med
<i>Ochrosis ventralis</i> (Illiger)	1997	Baselga and Novoa (2000a, b, 2002b)	A, F, G	WR
<i>Neocrepidodera transversa</i> (Marsham)	1997	Baselga and Novoa (2000b, 2002b)	B, E, F, H, X	Eur
<i>Neocrepidodera impressa</i> (Fabricius)	1976	Baselga and Novoa (2000a)	A, X	Med
<i>Neocrepidodera ferruginea</i> (Scopoli)	1996	Baselga and Novoa (1999a, 2000b)	B, D, F, X	WR
<i>Neocrepidodera crassicornis</i> (Faldermann) ssp. <i>hispanica</i> (J. Daniel)	1996	Baselga and Novoa (2000a, b)	A, B, F, X	Med
<i>Crepidodera fulvicornis</i> (Fabricius)	1996	Baselga and Novoa (2000a, 2002b)	A, B, C, D, E, H, X	WR
<i>Crepidodera aureola</i> (Foudras)	1993	Baselga and Novoa (2000a, b, 2002b)	A, B, C, D, E, F, G, H, X	Med
<i>Crepidodera aurata</i> (Marsham)	1981	Baselga and Novoa (2000b, 2002b)	F, G, X	WR
<i>Epitrix pubescens</i> (Koch)	1907	Chapman and Champion (1907) and Baselga and Novoa (2000a, b)	A, F, X, Y	WR
<i>Epitrix intermedia</i> Foudras	1996	Baselga and Novoa (1999b, 2000b)	F, X	Eur
<i>Podagrica fuscicornis</i> (Linné)	1997	New record	B, X	WR
<i>Podagrica fuscipes</i> (Fabricius)	1993	Baselga and Novoa (2000a, b, 2002b)	A, B, C, E, F, G, H, X	Eur
<i>Mantura chrysanthemii</i> (Koch)	1993	New record	X	WR

Appendix A Continued.

Species	First record	Published records	Main areas	Dist.
<i>Mantura lutea</i> (Allard)	1998	Baselga and Novoa (2000a)	A	Med
<i>Mantura rustica</i> (Linné)	1997	Baselga and Novoa (2000a)	A, D	WR
<i>Chaetocnema chlorophana</i> (Duftschmid)	1993	Baselga and Novoa (2000a, 2002b)	A, E, G, X	WR
<i>Chaetocnema concinna</i> (Marsham)	1992	Baselga and Novoa (1999b, 2000a)	A, B, D, X	WR
<i>Chaetocnema laevicollis</i> (Thomson)	1992	Baselga and Novoa (1999b, 2000a, b)	A, B, C, E, F, X	WR
<i>Chaetocnema tibialis</i> (Illiger)	1993	Baselga and Novoa (2000a, b, 2002b)	A, E, F, G, X	WR
<i>Chaetocnema depressa</i> (Boieldieu)	2000	Baselga and Novoa (2001a, 2002b)	G	Med
<i>Chaetocnema aridula</i> (Gyllenhal)	1996	Baselga and Novoa (2000b)	D, F, X	WR
<i>Chaetocnema confusa</i> (Boheman)	1996	Baselga and Novoa (2000c, 2002b)	H, X	Eur
<i>Chaetocnema arida</i> Foudras	1991	Baselga and Novoa (2000a, b, 2002b)	A, B, C, D, E, F, G, H, X	WR
<i>Chaetocnema paganettii</i> Heikertinger	1964	Baselga and Novoa (2002b)	H	Med
<i>Chaetocnema hortensis</i> (Geoffroy)	1870	Heyden (1870) and Baselga and Novoa (2000a, b, 2002b)	A, B, C, D, E, F, H, X, Y	WR
<i>Oedionychus cinctus</i> (Fabricius)	1928	Iglesias (1928), Biondi (1991), Bastazo et al. (1993) and Baselga and Novoa (1998, 1999a, 2000a, b, 2002b)	A, B, C, D, E, F, G, H, X, Y	Ibe
<i>Sphaeroderma testaceum</i> (Fabricius)	1990	Baselga and Novoa (2000b)	C, D, F, X	Eur
<i>Sphaeroderma rubidum</i> (Graells)	1991	Baselga and Novoa (2000a, b, 2002b)	A, C, F, G, H, X	WR
<i>Apteropeda globosa</i> (Illiger)	1991	Baselga and Novoa (1999b, 2000b)	C, F, X	Eur
<i>Apteropeda orbiculata</i> (Marsham)	1991	Biondi (1991) and Baselga and Novoa (2000a, b)	A, B, C, D, F, X, Y	Eur
<i>Apteropeda ovulum</i> (Illiger)	1996	Baselga and Novoa 1999a	D, X	Med
<i>Dibolia occultans</i> (Koch)	1992	Baselga and Novoa (2000a, b, 2002b)	A, D, E, F, H, X	WR
<i>Psylliodes affinis</i> (Paykull)	1993	Baselga and Novoa (1999b, 2000b, 2002b)	B, C, D, F, G, X	WR
<i>Psylliodes marcidus</i> (Illiger)	1997	Baselga and Novoa (2000a)	A	WR

Appendix A Continued.

Species	First record	Published records	Main areas	Dist.
<i>Psylliodes pallidipennis</i> Rosenhauer	1997	Baselga and Novoa (2000a)	A	Med
<i>Psylliodes chrysocephalus</i> (Linné)	1993	Baselga and Novoa (2000a, b)	A, B, C, E, F, X	WR
<i>Psylliodes napi</i> (Fabricius)	1934	González de Andrés (1934) and Baselga and Novoa (2000a, b)	C, F, X, Y	WR
<i>Psylliodes laticollis</i> Kutschera	1997	Baselga and Novoa (2000a)	A, D	WR
<i>Psylliodes toelgi</i> Heikertinger	1997	Baselga and Novoa (2002b)	G	Eur
<i>Psylliodes cupreus</i> (Koch)	1993	Baselga and Novoa (2000a, b, 2002b)	A, B, E, F, H, X	WR
<i>Psylliodes fusiformis</i> (Illiger)	1997	Baselga and Novoa (2000a)	A	Med
<i>Psylliodes vindobonensis</i> Heikertinger	1982	Baselga and Novoa (2002b)	H	Eur
<i>Psylliodes hispanus</i> Heikertinger	1993	Baselga and Novoa (2001a)	C, X	Ibe
<i>Psylliodes dulcamarae</i> (Koch)	1994	Baselga and Novoa (2001a, 2002b)	G, X	WR
<i>Psylliodes cucullatus</i> (Illiger) ssp. <i>heydeni</i> Weise	1991	Baselga and Novoa (1999b, 2000a, b)	A, B, C, D, F, X	WR
<i>Psylliodes gougeleti</i> All.	1866	López Seoane (1866, 1877) and Baselga and Novoa (2000a, b, 2002b)	A, B, C, D, E, F, H, X, Y	Med
<i>Psylliodes cervinoi</i> Baselga and Novoa	1993	Baselga and Novoa (2003)	H	Ibe
<i>Dicladispa testacea</i> (Linné)	1907	Chapman and Champion (1907) and Baselga and Novoa (1999a, 2000a, b, 2002b)	A, B, F, G, X, Y	Med
<i>Hispa atra</i> Linné	1907	Chapman and Champion (1907) and Baselga and Novoa (2000b, 2002b)	B, C, D, E, F, H, X, Y	WR
<i>Cassida viridis</i> Linné	1993	Baselga and Novoa (1999a, 2000a, 2002b)	A, B, D, E, G, H, X	WR
<i>Cassida hemisphaerica</i> Herbst	1997	Baselga and Novoa (2000a, b, 2002b)	A, F, H, X	WR
<i>Cassida nebulosa</i> Linné	1998	Baselga and Novoa (2000b)	F	WR
<i>Cassida flaveola</i> Thunberg	1993	Baselga and Novoa (1999b, 2000a, b)	A, B, F, X	WR
<i>Cassida seladonia</i> Gyllenhal	1991	Baselga and Novoa (2000b)	B, F, X	WR

Appendix A Continued.

Species	First Published records	Main areas	Dist. record
<i>Cassida vibex</i> Linné	1991 Baselga and Novoa (2000b)	B, D, F, X	WR
<i>Cassida rubiginosa</i> Müller	1990 Baselga and Novoa (2000a, b, 2002b)	A, B, C, D, E, F, H	WR
<i>Cassida inquinata</i> Brullé	1866 López Seoane (1866) and Baselga and Novoa (2000a)	B, Y	WR
<i>Cassida hexastigma</i> Suffrian	1997 Bordy (2000)	A, G	Med
<i>Cassida denticollis</i> Suffrian	1993 Baselga and Novoa (1999b)	B, C, D, X	WR
<i>Cassida subreticulata</i> Suffrian	2000 Baselga and Novoa (1999a, 2001a)	D, X	WR
<i>Cassida vittata</i> Villers	1997 Baselga and Novoa (2000a)	A, B	WR

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