GEA, FLORA ET FAUNA

New records of the Nearctic leafhopper assassin bug, *Zelus renardii* Kolenati, 1857 in the Iberian Peninsula (Hemiptera: Heteroptera: Reduviidae)

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Abstract

After the first record of *Zelus renardii* Kolenati, 1857 in Spain in 2012, the species has been recorded in other provinces in the south of this country, and part of the information is only in the internet. In this paper, the species is reported for the first time from several spanish Provinces: Barcelona (first record for Catalonia), Castellon (Valencia autonomous community), Madrid (first record for Madrid autonomous community) and Sevilla (Andalusia), enlarging the species distribution norhtwards and westwards within the Iberian Peninsula. New data from Valencia province are also included.

Key words: allien invasive species, Iberian Peninsula, faunistics.

Resum

Nous registres de *Zelus renardii* Kolenati, 1857 a la península Ibèrica (Hemiptera: Heteroptera: Reduviidae)

Després del primer registre de *Zelus renardii* Kolenati, 1857 a Espanya el 2012, l'espècie s'ha citada a altres províncies del sud del país, i part d'aquesta informació només es troba a internet. En aquest treball, es cita per primera vegada l'espècie a la província de Barcelona (primera cita per Catalunya), Castelló (Comunitat Valenciana), Madrid (primera cita per aquesta comunitat autònoma), i Sevilla (Andalusia), tot ampliant la seva distribució cap al nord i cap a l'oest de la península Ibèrica. També s'inclouen nous registres de la província de València.

Paraules clau: espècies exòtiques invasores, península Ibèrica, faunística.

Introduction

Assassin bugs, or Reduviidae, are a large Heteropteran family including roughly a thousand genera and seven thousand species distributed worldwide (Henry, 2009), which live predatorily in a large array of prey. In the Iberian fauna, 24 genera and around 60 species have been recorded (Goula & Mata, 2015), and two of them, *Vibertiola cinerea* (Horváth, 1907) and *Polytoxus siculus* (A. Costa, 1842), are included as vulnerable in the Red List of Invertebrates from Spain (Verdú & Galante, 2006).

The genus *Zelus* Fabricius, 1803 includes 71 species (Zhang *et al.,* 2016), of which only *Z. renardii* has largely dispersed all over the world, an invasiveness capacity based on particular ecological, feeding and reproductive biological traits (Weirauch *et al.,* 2012). The leafhopper assassin bug widespread from its native area (North and Central America), to South America, the Pacific Region and the Mediterranean Basin (Weirauch *et al.,* 2012; Zhang *et al.,* 2016). As it is a conspicuous species, the new records come often from pictures uploaded in the internet (i.e., Vivas, 2012; Van der Heyden, 2017; Pinzari *et al.,* 2018), as example of citizen science (Goula *et al.,* 2013).

In Spain, authorship of first report of *Z. renardii* (Figs 1a-b) was either arrogated by Vivas (2012) on September 2012 and Baena & Torres (2012) on December 2012. Report of *Z. renardii* as new from Spain in the supplement of the Palaearctic Catalogue (Aukema *et al.,* 2013) on April 2013 is however sustained in a personal communication published in Weirauch *et al.* (2012). This is an unfortunately coincidence of simultaneous publication, which in any case puts the leafhopper assassin bug in the list of exotic species entering the Iberian Peninsula. From 2012, the species has been recorded from the provinces of Valencia and Alicante through new pictures uploaded in Biodiversidad Virtual website, and from provinces of Alicante, Almeria and Malaga through specimens studied by Rodríguez Lozano *et al.* (2018).

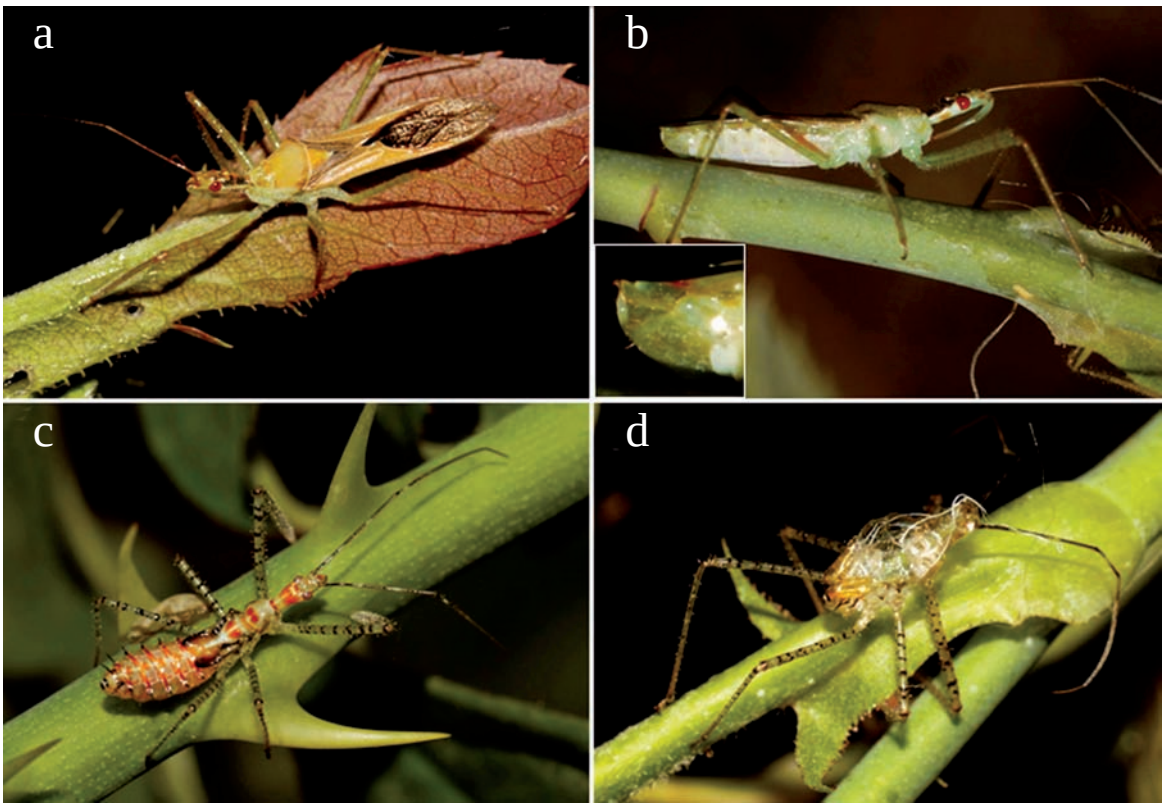

Figure 1. *Zelus renardii*. Photos from Barcelona, 2019: a) adult in dorsal view; b) male in lateral view and detail of pygophore; c) nymph 5th instar; d) exuviae. (Pictures: F. Lizana)

The purpose of this paper is to contribute new records of *Z. renardii* from several provinces in Spain (Barcelona, Castellon, Madrid, Seville and Valencia), thus enlarging the distribution of the species northwards and westwards. It is worth saying that part of the results comes from collected specimens, which could be studied under the binocular microscope, supporting the identification of pictures uploaded elsewhere.

Material and methods

Specimens studied come mainly from pictures uploaded in the photosharig website Biodiversidad Virtual (2019), and in Inaturalist (2019), and from insects collected elsewhere by the authors or communicated to any of them. The samples have been kept dry only in one case (1 male, CRBA collection), while the rest are kept in 70 % ethanol. Insects were studied under a binocular stereomicroscope Leica MZ125. Pictures of nymphs (Fig. 1c) and exuviae (Fig. 1d) are included only when adult specimens have been simultaneously or nearby stated.

Results and discussion

Material studied

Pictures uploaded at Biodiversidad Virtual photosharing website were identified by specialized entomologists collaborating with the website, and checked by the first author, who is also responsible for identification of preserved samples. Records from pictures uploaded in Inaturalist were identified by the French heteropterist Roland Lupoli.

To simplify presentation, the following codes have been used in the list below: **A,** adult; **C**, clutch; **E**, exuviae; **F**, Female; **M**, male; **N**, nymph.

Barcelona province

Barcelona, Hort Urbà Colònia Castells, C/ Montnegre 32 (urban vegetable garden), 31TDF28, 5.X.2019: 1F, 16N and 1C with around 20 eggs (M. Goula leg), in M. Goula coll. and det. preserved in 70 % ethanol.

Barcelona, Faculty of Biology, Av. Diagonal 643, University of Barcelona, 31TDF28, 24.X.2018: 1M (M. Goula leg. and det.). CRBA code 78274.

Barcelona, Jardins de Bacardí (urban garden), 31TDF28, on *Corylus avellana* L., 27.VI.2018: 1M (F. Lizana photoleg), in M. Goula coll. and det. preserved in 70 % ethanol, https://www.biodiversidadvirtual.org/insectarium/Zelus-renardii-6-de-7-img1001407.html; 28.VI.2018: 1A (F. Lizana photoleg.), M. Goula det. https://www.biodiversidadvirtual.org/insectarium/Zelus-renardii-img1001419.html; 27.VIII.2019: 1N on *Teucrium* sp. (F. Lizana photoleg.), M. Goula det. https://www.biodiversidadvirtual.org/insectarium/Zelus-renardii-img1155186.html.

Barcelona, Plaça Sol de Baix (urban green area), 31TDF28, 18.VIII.2019: 1A (F. Lizana photoleg.), M. Goula det. https://www.biodiversidadvirtual.org/insectarium/Zelus-renardii-

img1147271.html; 1N (F. Lizana photoleg.), M. Goula det. https://www.biodiversidadvirtual.org/insectarium/Zelus-renardii-img1147273.html; 1A, (F. Lizana photoleg.), M. Goula det. https://www.biodiversidadvirtual.org/insectarium/Zelus-renardii-2-de-2-img1147275.html.

Barcelona, C/ Rosari 17, 31TDF28, 27.VIII.2019: 1 N (A. Miralles leg.), M. Goula det., in A. Miralles coll., preserved in 70 % ethanol.

L'Hospitalet de Llobregat, 31TDF27, 26.IX.2019: 1A (C. Santaeufemia photoleg.), M. Goula det. https://www.biodiversidadvirtual.org/insectarium/Zelus-renardii-img1162185.html; 04.X.2019, 1N (C. Santaeufemia photoleg.), M. Goula det. https://www.biodiversidadvirtual.org/insectarium/Zelus-renardii-img1162184.html.

Castellon province

Castelló**,** Plaza de Cardona Vives, 30SYK53, 29.IX.2018: 1A (José Luis Greño photoleg.), M. Goula det. https://www.biodiversidadvirtual.org/insectarium/Zelus-renardii-img1047329.html. Urban park, 30SYK53, 13.X.2018: 1A and 1N, (José Luis Greño photoleg.), M. Goula det., respectively https://www.biodiversidadvirtual.org/insectarium/Zelus-renardii-img1052171.html and https://www.biodiversidadvirtual.org/insectarium/Zelus-renardii-img1052172.html. Urban park, 30SYK53, on *Buxus sempervirens* L., 21.X.2018: 1N, 1A (José Luis Greño photoleg.), M. Goula det., respectively https://www.biodiversidadvirtual.org/insectarium/Zelus-renardii-img1054488.html and https://www.biodiversidadvirtual.org/insectarium/Zelus-renardii-img1054489.html.

Madrid province

Madrid, Calle de Guetaria 27, 10.II.2019: 1A; R. Lupoli det. https://www.inaturalist.org/observations/20250956. Madrid, Rosaleda del Parque del Oeste, Calle Rosaleda 1, 15.V.2019: 1 A; R. Lupoli det. https://www.inaturalist.org/observations/25155059.

Madrid, Calle de la Oreja 54, 8.VII.2019: 1 A; R. Lupoli det. https://www.inaturalist.org/observations/28436501.

Madrid, Guindalera. 27.IX.2019: 1 N; R. Lupoli det. https://www.inaturalist.org/observations/33472545.

Madrid, Calle de Gaínza, 22.IX.2019: 1 N; R. Lupoli det. https://www.inaturalist.org/observations/33250410.

Seville province

Seville, Parque del Alamillo, 28.X.2018: 1 A; R. Lupoli det. https://www.inaturalist.org/observations/17903222.

Valencia province

Paterna, 30SYJ27, 10VII.2019: 2 F (A. Casiraghi leg.), preying on a colony of *Aphis cytisorum* Hartig, 1841 (Hemiptera Aphidae) on *Spartium junceum* L., in M. Goula coll. and det., preserved in 70 % ethanol.

In Biodiversidad Virtual photosharing website, there is one picture of a nymph in Tarragona province, which might belong to the leafhopper assassin bug. However, to rely on such scarce information as only source to report the presence of *Z. renardii* in Tarragona is unadvisable, prior to adults to be found.

Identification of samples

Zelus species show a certain variability in their morphology and coloration, thus it is advisable to confirm male species identity by the study of his genitalia, while females may remain uncertain. However, in the case of *Z. renardii*, the only confusion may be with its sister species *Z. cervicalis* Stål, 1872 (Zhang *et al.*, 2016). A reliable character is the proportion of total length/maximum width, 6 in *Z. cervicalis* and less than 5 (around 4.7) in *Z. renardii*. The character is useful even for photographed specimens. In fact, Zhang validated as *Z. renardii* the pictures on which the first species records from Spain were stated (Vivas, 2012), and the subsequent uploaded pictures were considered to fit with this species. It is on favor of this identification the fact that only *Z. renardii* is known to extend all over the world, and all identifications made until present in Europe happen to be of the leafhopper assassin bug.

Moreover, we had the chance to study several specimens, 2 males and 3 females. All the specimens fit with *Z. renardii*, both by their robustness, and for the general coloration, according to abundant iconography in Zhang *et al.* (2016).

Zelus renardii biology

Valuable comments are included accompanying most of the pictures uploaded in Biodiversidad Virtual website, which unfortunately have been neglected in previous publications dealing with Iberian data. The summary of the information provided in the 85 % of the nearly a hundred pictures uploaded until October 2019 follows (Biodiversidad Virtual, 2019). In Spain, the species has been reported in urban, periurban and natural habitats. In the urban habitat, it may be found in private balconies, in streets with rows of trees, in small green areas, in public vegetable gardens or in parks. *Zelus renardii* frequents also mixed orchards (peach trees, critics, apple trees, medlar trees, apricot trees), vegetable gardens next to natural semiarid scrublands and pinewoods, or abandoned cultivated lands with almond, olive and carob trees, now progressively covering with pines, aromatic plants and weeds. Ruderal urban areas have been also recorded as pleasant to *Z. renardii*. Natural habitats reported were scrublands and canes. Precise plant species reported have been: English elm (*Ulmus minor* Mill.), peach tree (*Prunus persica* (L.) Batsch), almond tree (*Prunus dulcis* (Mill.) D.A Webb), carob tree (*Ceratonia siliqua* L.), Chinese hibiscus (*Hibiscus rosa-sinensis* L.), tree mallow (*Lavatera* sp.), lavender (*Lavandula angustifolila* Mill.), Montpelier *cistus* (*Cistus monspeliensis* L.), spearmint (*Mentha spicata* Crantz)**,** and *Bougainvillea* sp.. In two cases, the species was found protecting itself under bark, once of a dead pine and another of eucalyptus. The only prey recorded were a fly, an ichneumon wasp and a bee.

It is worth noting that the female specimen collected in October 5th, 2019 laid a clutch. The total number of eggs was 20, from which 16 neanides were born, which means 80 % eclosion. Unfortunately, neanides did not progress to second

stage. One of the authors (F.L.) could successfully observe the evolution of 5th instar to adult after providing necessary conditions in a terrarium, including feeding with small flies.

Conclusions

From the first records in 2012 in the south of the Iberian Peninsula, *Z. renardii* has enlarged its distribution area. In this paper, reports from several provinces and numerous records in and around Barcelona city are provided, thus enlarging the Iberian distribution of the species northwards and westwards.

In Spain, as in other countries, *Z. renardii* has mainly being found in anthropic environments, either urban or agroecosystems, although some natural habitats have also been reported. As already pointed out (Rodríguez Lozano *et al.*, 2018), the species could either be a sanitary concern due to biting to people and to large number of individuals in certain populations, or of importance as influencing foodwebs in agroecosystems or in nature.

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