



NOTAS / NOTES

Confirmation of reproductive success of *Rivetina baetica* (Rambur, 1838) (Mantodea), a thermophilous species, in continental areas of Central Spain

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ABSTRACT

The presence of a population of *Rivetina baetica baetica*, a typically littoral taxon endemic to the southernmost regions of Spain and Portugal, was studied for two consecutive reproductive periods in a continental steppe area of Central Spain. Reproduction was successful, representing a considerable range expansion from previous records. Additionally, we revised the entomological collection of the Museo Nacional de Ciencias Naturales (MNCN, Madrid) and available bibliographic records. We recover the only record of *R. baetica* published from Portugal raising the number of known species in the current Portuguese checklist to 12. Our observations demonstrate that the species is able to survive low winter temperatures at La Mancha Plateau (Ciudad Real).

Keywords: Mantodea; Geographic distribution; Steppes; Salt marshes; Iberian Peninsula.

RESUMEN

Confirmación de la reproducción de *Rivetina baetica* (Rambur, 1838) (Mantodea), una especie termófila, en áreas continentales del centro de España

La presencia de una población de *Rivetina baetica baetica*, un taxon típicamente litoral endémico de las regiones más meridionales de España y Portugal, fue estudiada durante dos periodos de reproducción consecutivos en un área esteparia continental de España Central. La reproducción tuvo éxito, lo que representa una extensión considerable del área de distribución conocida. Adicionalmente, se revisó la colección entomológica del Museo Nacional de Ciencias Naturales (MNCN, Madrid) y los registros bibliográficos disponibles. Recuperamos el único registro publicado de *R. baetica* en Portugal elevando a 12 el número de especies conocidas en la lista actual de especies portuguesas. Nuestras observaciones demuestran que la especie es capaz de sobrevivir a las bajas temperaturas invernales de la meseta manchega (Ciudad Real).

Palabras clave: Mantodea; Distribución Geográfica; Estepas; Saladares; Península Ibérica.

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The Iberian Peninsula, situated within the Mediterranean biodiversity hot-spot (Myers *et al.*, 2000), presents a characteristic fauna influenced by both the African and the Euro-Siberian regions. As a consequence a relatively large set of species present in

northern Africa also inhabit the warmest areas of the Iberian Peninsula, particularly along the Mediterranean coast (Recuerdo *et al.*, 2007; Pleguezuelos *et al.*, 2008). This is the case of some species of praying mantises (Mantodea), particularly *Sphodromantis viridis*

(Forsskål, 1775) and *Rivetina baetica* (Rambur, 1838) (La Greca & Lombardo, 1982; Battiston *et al.*, 2012; Marabuto *et al.*, 2014).

Rivetina Berland & Chopard, 1922 (Mantidae: Miomantinae) includes more than 30 species, most of them distributed on the Western Palaearctic, from Southern Europe and North-western Africa to Pakistan and Tajikistan, but also expanding along the Atlantic coast in western Africa to Senegal (Wieland, 2013; Caesar *et al.*, 2015; Otte *et al.*, 2015). The Middle East harbours the largest diversity of species of *Rivetina*, while only one species is present in Africa and the Western Mediterranean region (La Greca & Lombardo, 1982). The distribution of the species of *Rivetina* is often limited to xerothermic environments. Most species present morphological adaptations to these environments, including constant brown or pale colorations (never green), opaque and rugose cuticular surfaces, extra-sclerotized portions of the 7th abdominal segment in females (used to facilitate excavation for egg deposition) and underground oothecae deposition. In Asia the genus is represented in steppes and sub-desert areas, in Northern Africa it occupies a broad area along the Mediterranean and Atlantic coasts, including deep inland populations (Chad), while its range in Europe is limited to discontinuous xerothermic environments, including dune systems, near the coast (La Greca & Lombardo, 1982).

Rivetina baetica (Fig. 1), the westernmost species of the genus, includes two subspecies, *R. b. tenuidentata* La Greca & Lombardo, 1982, widely distributed

in Africa and *R. b. baetica* an endemic subspecies to the Iberian Peninsula (La Greca & Lombardo, 1982). In the Iberian Peninsula its distribution is limited to xerothermic regions close to the Mediterranean Sea, in Portugal (Fernandes, 1960) and the Spanish provinces of Barcelona, Castellón, Valencia, Alicante, Murcia, Almería, Granada, Málaga, Cádiz and Huelva, with limited inland expansions to the province of Albacete (La Greca & Lombardo, 1982; Gómez *et al.*, 1991; MG-P pers. obs.).

In this article we provide the first records and document the reproductive success of *R. b. baetica* in La Mancha, a markedly continental area in Central Spain (Fig. 2). We also revise the Museo Nacional de Ciencias Naturales (MNCN) entomological collection in order to confirm previous localities and to check for the antiquity of the available records. Furthermore, we recover the only record of *R. baetica* published from Portugal raising the number of known species in the current Portuguese checklist, and provide a new record north of the Ebro River in Barcelona expanding its known distribution.

We monitored 27 small lakes and marshes through La Mancha region, from April 2014 to August 2015, to follow up populations of endemic to, or endangered arthropods in Castilla - La Mancha. This study was part of a broader monitoring study of salt marshes and gypsum flats of La Mancha region, within the Life Project: *La Mancha Wetlands* (LIFE+10 NAT/ES/000563), aimed to restore the *Lygeum spartum* (L.) Kunth grasslands and salt flats by reclaiming Mediterranean salt



Fig. 1.— Latest male nymphal stage of *Rivetina baetica baetica* at the margin of Laguna de Las Yeguas (Alcázar de San Juan, Ciudad Real) (Photograph PCR-F).

Fig. 1.— Último estadio ninfal de un macho de *Rivetina baetica baetica* en las márgenes de la Laguna de Las Yeguas (Alcázar de San Juan, Ciudad Real) (Fotografía PCR-F).

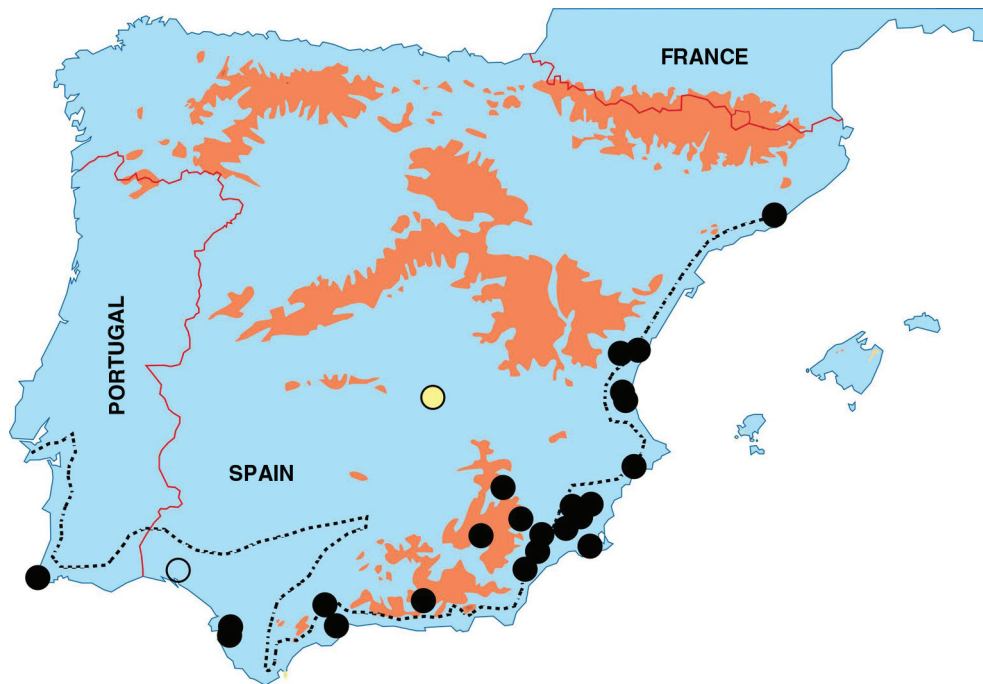


Fig. 2.— Map of the Iberian Peninsula showing known localities for *Rivetina baetica baetica*. Black dots represent data from collections (MNCN), bibliographic records, and unpublished individual observations. The yellow dot corresponds to the population located at Las Yeguas (Alcázar de San Juan, Ciudad Real). The open circle indicates a bibliographic provincial record without precise locality (Province of Huelva). Dotted line represents the limit between the Thermomediterranean and Mesomediterranean bioclimatic zones in the Iberian Peninsula (Rivas-Martínez, 1983, 1987).

Fig. 2.— Mapa de la Península Ibérica con las localidades conocidas de *Rivetina baetica baetica*. Los puntos negros representan datos de colecciones (MNCN), registros bibliográficos y observaciones personales. El punto amarillo corresponde a la población de la Laguna de Las Yeguas (Alcázar de San Juan, Ciudad Real). El círculo vacío indica un registro bibliográfico provincial impreciso (Provincia de Huelva). La línea punteada representa el límite entre las zonas bioclimáticas termomediterránea y mesomediterránea en la Península Ibérica (Rivas-Martínez, 1983, 1987).

steppes (*Limonieta*) designated as a priority habitat (1510) by Habitats Directive 92/43/EEC, and other halophytic formations in the La Mancha wetlands. During the forementioned period, we observed and monitored a population of *R. b. baetica* at the Natural Reserve of the lakes and salt marshes of Alcázar de San Juan, in the Province of Ciudad Real, near the protected salt lake of Las Yeguas (Fig. 3).

Published information on the Iberian populations of *R. baetica* was checked following the revision of La Greca & Lombardo (1982). In order to determine the antiquity of the published records, and to obtain new data on its geographic range we revised the entomological collection of the MNCN.

The observations of *R. b. baetica* made at Las Yeguas Natural Reserve correspond to: 17-V-2014 (39°24'34"N-3°17'02"W, 634 m), 15 specimens in early nymphal stages, running on the ground on prairies dominated by *Suaeda vera* Forssk. ex J.F. Gmel., 1776; 24-V-2014 (39°24'37"N-3°17'00"W, 635 m), two nymphs in similar circumstances; and, 20-VI-2015 (39°24'46"N- 3°16'50"O, 635 m), one adult female, placed near the shed of the latest nymphal stage, and two specimens at last nymphal stages, one of them feeding on a spider of small size (similar to the mantis head, Fig. 1).

The study of the entomological collection of the MNCN provide us with 53 Iberian specimens of *Rivetina baetica* (most of them under the name *Rivetina fasciata* Thunberg, 1815) containing the following data: **Albacete**: Molinicos: 2 female [MNCN]; **Alicante**: Cox: VI-1934, 4 females, 5 nymphs [MNCN]; Orihuela: 5 females (Andreu leg.) [MNCN]; Orihuela: 4 females, 1 male (E. Mor. [Morales leg.]) [MNCN]; **Almería**: Huércal-Overa: VII-1942, 1 male (E. Mor. [Morales leg.]) [MNCN]; Huércal-Overa: VII-1942, 1 female [MNCN]; Huércal-Overa: La Ballabona: VI-1944, 1 female (E. Mor. [Morales leg.]) (*R. baetica* Rambur La Greca det.) [MNCN]; **Barcelona**: Sarrià-Sant Gervasi: Bonanova: 3 nymphs (H. Senén leg.) [MNCN]; **Cádiz**: Cádiz: 1 female (A. Benítez leg.) [MNCN]; **Castellón de la Plana**: Navajas: 1 female (Boscá leg.) [MNCN]; Villarreal: 1 female (Royo leg.) [MNCN]; **Granada**: Puebla de Don Fadrique: 1 female (J. Andréu leg.) [MNCN]; Trevenque, 1700 m: VII-1964, 1 female (F. Fdz. Rubio leg.) [MNCN]; **Málaga**: Carratraca: 1 female (Caparrós leg.) [MNCN]; Torremolinos: 1 female, 1 male [MNCN]; Torremolinos: 17-VII-1985, 2 males [MNCN]; Torremolinos: 26-VIII-1985, 1 female [MNCN]; **Murcia**: Abanilla: VI-1934, 1 male [MNCN]; Caravaca: 1 female (J. Andreu leg.) [MNCN]; Cartagena: 3 females (Sánchez Gómez leg.)



Fig. 3.— Halophytic prairies dominated by *Suaeda vera* at Las Yeguas (Alcázar de San Juan, Ciudad Real) where *Rivetina baetica* was found, in a typically continental area of Central Spain (Photograph PCR-F).

Fig. 3.— Praderas halófilas dominadas por *Suaeda vera* en Las Yeguas (Alcázar de San Juan, Ciudad Real) donde se localizó la población de *Rivetina baetica*, en un área continental del centro de España (Fotografía PCR-F).

(*R. baetica* Rambur La Greca det.) [MNCN]; Lorca: Zarcillo de Ramos: VII-1932, 3 females (J. Espín) [MNCN]; Murcia: 1 female (Andreu leg.) [MNCN]; Sierra Espuña: Río Pliego: 2 females, 2 males (G. Menor leg.) [MNCN]; **Valencia**: Valencia: 2 female (Boscá leg.) [MNCN].

Two additional observations were made at: **Alicante**: La Vila Joiosa: Pantà de l'Amadorio, 134 m, 38°33'13"N-0°15'55"W: 30-VIII-1979, 1 female (M. García-París obs.); **Cádiz**: Puerto de Santa María: Playa de Valdelagrana, 9 m, 36°34'30"N-6°13'19"O: 23-VIII-1977, 1 female (M. García-París obs.) (today urban area).

Based on the data figured on the labels, or in the period of activity of the collectors, we conclude that most of the material held at the MNCN collection correspond to specimens collected in the first third of the XXth century. The collections was, at least in part, revised by La Greca and most of the records included in the revision by La Greca & Lombardo (1982). Two exceptions are the materials from the provinces of Cádiz and Barcelona. The three nymphs from today's urban area of Barcelona represent the northernmost record for the species (Fig. 2), while the records from Cádiz fill a gap, between the published records of Huelva and Málaga (La Greca & Lombardo, 1982).

The presence of *Rivetina baetica* has not been documented in the last checklist of Mantodea from Portugal (Marabuto, 2014). We recover the only record available for the species in Portugal, in particular from the coastal areas in Sagres (Fernandes, 1960; La Greca &

Lombardo, 1982), representing the most occidental record for the species in the Iberian Peninsula (Fig. 2), and raising the known species number of Mantodea in Portugal to 12.

Most of the records of the species are included within the thermomediterranean bioclimatic zone (Rivas-Martínez, 1983, 1987), with a few mountain localities in the provinces of Granada, Murcia and Albacete (MNCN collection, La Greca & Lombardo, 1982; Gómez *et al.*, 1991) located within the mesomediterranean zone in dry areas of south-eastern Spain (Fig. 2).

The population of *R. b. baetica* observed near the salt lake of Las Yeguas (Fig. 3), survived for at least the winters of 2013 and 2014, since early nymphal stages were found in May 2014, and late nymphal stages in late June 2015. The presence of the shedding near the adult specimen, and the last nymphal stage specimens, suggests that the adult stage is achieved between June and July at this locality. All the specimens were found in a limited habitat patch, *Suaeda vera* prairies (Fig. 3), surrounded by the salt crust of the lake and ploughed fields.

The low arbustive vegetation cover, characteristic of the *Suaeda vera* prairies, allowing for a direct and strong insolation, represents a typically favourable habitat for *R. b. baetica* (Fernandes, 1960; La Greca & Lombardo, 1982; Gómez *et al.*, 1991). Because of the strong sexual dimorphism shown by *R. baetica*, presenting females with reduced wings inadequate for flying, and its spawning behaviour, depositing the ootheca

underground, it is highly unlikely that its presence in La Mancha was the result of accidental transportation.

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