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A more detailed study on the distribution of Spanish glow-worm fireflies

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INTRODUCTION

In past Firefly Symposia we have presented the combined results from the Spanish web-survey "Have you seen a glow-worm?" (http://gusanosdeluz.com) and from the photo-biodiversity database "BiodiversidadVirtual" (http://biodiversidadvirtual.org). These data have enabled us now to update the Spanish distribution of *Lampyrid* species at a much more detailed provincial (subregional) scale.

Species recorded in Spain since 2009 are:

- ***Lampyris noctiluca* & *Lampyris iberica***
- ***Nyctophila reichii* & *Nyctophila heydeni*** (only on the Balearic islands)
- ***Lamprohiza mulsantii* & *Lamprohiza paulinoi***
- ***Phosphaenus hemipterus***
- ***Phosphaenopterus metzneri*** (recently discovered for Spain: de la Rosa et al. 2011).

In this poster we show more detailed distribution maps of the Spanish species at a county scale.

METHODS

The web project "Have you seen a glow-worm?" is based on other websites, especially on the "UK glow-worm survey" website (http://www.glowworms.org.uk) and the USA Firefly Watch (https://legacy.mos.org/fireflywatch/).

Our project has no official status, funding nor affiliation. Our website **www.gusanosdeluz.com**, recently updated, offers:

- General information about the **ecology and species of glow-worms**
- Online **survey form** that can be filled in by collaborators = website visitors
- **Photos and data** which are updated yearly

Soon after the launch of the site, we were invited to collaborate in a photo-biodiversity database named **"Biodiversidad Virtual"**. Here both authors act as experts on Lampyrids in order to identify the species uploaded by the website members.

OBJECTIVE

To show a detailed distribution maps of the Spanish *Lampyrid* species at a county scale after eight years of surveying and evaluating of uploaded photos.

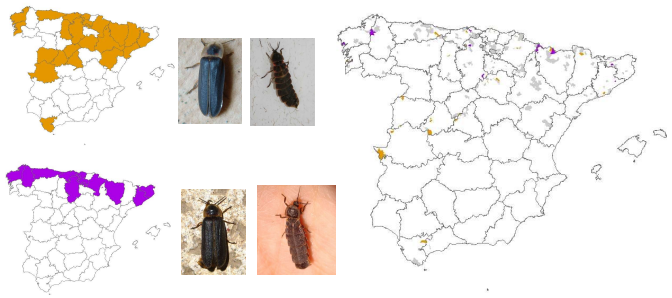

Figure 1. ***Lampyris* sp. distribution in Spain (left: province distribution; right: county distribution) - purple:** ***Lampyris noctiluca*; *orange* *L. iberica*; grey *Lampyris* sp. without species ID** (larvae or unidentifiable from photo). ***L. iberica*** shows a wider distribution than ***L.* noctiluca** with isolated populations in the Southern extreme of Spain. *Images* (from top to bottom: Raphaël De Cock, José Ramón Guzmán Álvarez, Javier Soto, Raphaël De Cock.

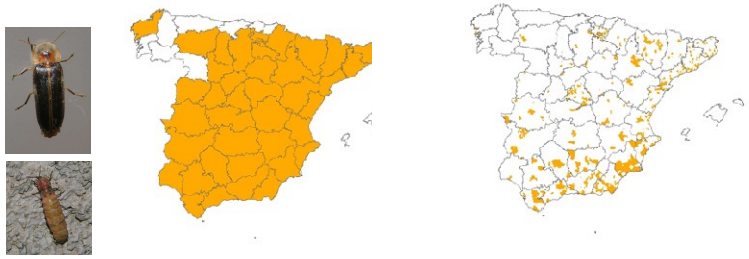

Figure 2. ***Nyctophila reichii* distribution in Spain (left: province ditribution; right: county distribution)**. The species has not so far been registered in the Northern provinces. *Images*: José Ramón Guzmán Álvarez

Figure 3. ***Lamprohiza* distribution in Spain (left: province distribution; right: county distribution). blue:** ***L. paulinoi*; *green*: *L. mulsantii*.** *Lamprohiza mulsantii* is only present in Northeastern-most provinces (Gerona and Barcelona). *Images* (from top to bottom: Raphaël De Cock, Fany Martínez, Xavier Béjar and Rafael Carbonell, Jordi Clavell.

RESULTS & DISCUSSION

From May 2009 till December 2016, in total 209 e-mails and online forms were received with enough information to allow iidentification and 978 photos from the web photo data base Biodiversidad Virtual (www.biodiversidadvirtual.org) were examined; the specimens on photographs assigned to a taxonomic entity as accurately as possible (**Table 1**).

Table 1. Identifications from the survey and the photo-database "Biodiversidad Virtual". Most larvae of *Lampyris noctiluca* and *L. iberica* are grouped in *Lampyris* sp. May 2009 – December 2016.

Species	♂	♀	Larva	Total
Lampyris sp (L. noctiluca + L. iberica)	17	39	182	238
Lampyris noctiluca	12	17	incl. in *Lampyris sp.*	29
Lampyris iberica	25	38	7	70
Nyctophila reichii	177	79	473	729
Nyctophila heydeni	19	1	19	39
Lamprohiza sp	-	2	-	2
Lamprohiza mulsantii	10	8	8	26
Lamprohiza paulinoi	31	23	4	58
Phosphaenus hemipterus	2	-	1	3
Phosphaenopterus metzneri	2	-	-	2

- Our survey shows the isolated presence of ***Lampyris iberica*** in some humid and temperate areas in the South, far from the standard distribution area of this species.
  - Relictual population that persists confined to an available area in a drier Mediterranean context?
- ***Lampyris*** sp. is comparatively more presented in the Northern territories of Spain than ***Nyctophila reichii*** which can be defined as a more Mediterranean species. Cantabrian Mountains, on the North, appears to be as a geographical range limit to *Nyctophila reichii* distribution. However, for the case of *Lampyris* species, climate seems to be the limiting factor.
  - More data are needed to contrast this hypothesis.
- ***Lamprohiza mulsantii*** and ***L. paulinoi*** show an apparently separated distribution (with the first species confined to the North-East, in the border with France). *L. paulinoi* has been registered in the Eastern provinces near to the Mediterranean sea and in the Western province of Cáceres, with a remarkable geographical gap in between.
  - Insufficient data or a disjunct population?
- We have not so far registered ***Pelania mauretanica* neither *Luciola lusitanica*** to (re)confirm the presence of these species in Spain. We have identified two larvae from Cantabria (North of Spain) as *Lampyris raymondi*, but we need more individuals to contrast this identification.

ACKNOWLEDGEMENTS

To all the collaborators of "Biodiversidad Virtual" and "¿Has visto una luciérnaga?"