



A key to distinguish the Spanish glow-worm fireflies based on macroscopic visual traits.

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INTRODUCTION

Most of the ca. 2000 described lamyrid species are distributed in tropical regions.

In regions with more temperate climates however, we deal with much smaller numbers of species. Especially in Europe where the species numbers are quite low, probably due to difficulties in a prehistoric past for species to migrate along a North-South axis to follow changing climate during the last Glaciations and the Mediterranean Sea acting as a barrier.

Although, we deal with much smaller species numbers, often we still face a lot of difficulties in discerning the correct taxonomic status of specimens, especially in citizen science surveys because of a lack of updated, recent, detailed and suitable references, guides and keys. Moreover, in many occasions the scientific references to support the identification are hard to find and the species specific characteristics taken into account in species descriptions are usually based solely on male specimens and often not very useful for the local firefly (citizen) scientist. very popular with the public, are not often the topic of survey studies.

In very recent years, this situation has fortunately changed in some countries thanks to the increasing interest in firefly study and (citizen science) research. Revision of Portuguese, Italian and France lamyrid fauna with accompanied keys have been developed recently. In the case of Spain, the citizen science project "¿Has visto una luciérnaga?" www.gusanosdeluz.com has enabled us to prepare a photo-based taxonomic key to support the identification of males, females and even larvae of the most common species of Spanish fireflies.

OBJECTIVE

To develop a visual key to identify Spanish glow-worms.

In this poster we show the results for the identification of males (for more information, see www.gusanosdeluz.com).

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KEY TO IDENTIFY SPANISH GLOW-WORMS

1. A. Head exposed in front of pronotum, with eyes large and prominent. Elytra blackish, bright. Pronotum orange-reddish, convex, transversely extending, almost two times longer than wide. Both sexes alate and luminous..... *Luciola lusitanica*



Image: Fernando Romao

1. B. Head covered by pronotum (although eyes may be occasionally exposed due to the position of the insect). Pronotum convex, with eyes large and prominent. Elytra blackish, bright. Pronotum orange-reddish, convex, transversely extending, almost two times longer than wide. Both sexes alate and luminous..... 2

2. A. Antennae distinctly longer than the pronotum. 3



Image: Luis Miguel Bugallo

3. A. Males with short elytra and wings. The elytra as long as the third abdominal segment..... *Phosphaenus hemipterus*



Image: Raphaël De Cock

3. B. Males with elytra and wings normally developed covering, may completely cover the abdomen or exposing the last three segment..... *Phosphaenopterus metzneri*

2.B. Antennae shorter than the pronotum or only few millimeters longer..... 4

4.A. Pygidium with sinuate or incised hind border. Pronotum with transparent windows above the eyes like a lense or a pair of glasses. 6 to 13 mm long. 6



Image: Jordi Clavell

6. A. Males with a dark coloured pronotum, with a similar tone of colour like the elytra. Border of elytra are subparallel, giving a slight oblong aspect (elongated and rounded) to the back. Tip of pygidium with a rounded incision in its central part. Abdomen dark brown, with a similar tone like the dorsal aspect. No visible light organs. Size between 8-10 mm..... *Lamprohiza mulsantii*



Image: Fany Martinez

6. B. Males with a pronotum paler than the colour tone of the elytra. Border of elytra are clearly straight and parallel. Tip of pygidium with a large trapezoidal incision in its central part. Abdomen colour is pale yellowish brown, much brighter in tone than the dorsal aspect. Conserve larval light organs internally spread over the abdomen, only emitting glows when disturbed (only visible. About 15 mm..... *Lamprohiza paulinoli*

4.B. Tip of pygidium with the edge rounded or extended. Pronotum with translucent spots above the eyes. Body between 10 to 30 mm long. 6



6.A. Anterior and middle femurs thickened. Penultimate tergite (dorsal segment) extended backwards with two triangular points *Pelania mauritanica*

6.B. Femurs not thickened. Penultimate tergite without triangular extension..... 7



Image: José Ramón Guzmán Álvarez

7.A. Last ventrite (ventral segment) of males with the apical border centrally extended into a blunt triangular point..... 8 (*Nyctophila*)



Image: Pako Rodriguez

8. A. Males with dark brown / chestnut brownish elytra bordered with clear pale yellowish margins. Brown Antennae. Blot on the pronotum of a russet-reddish tone (with or without a darker brownish tinge in central area). Pronotum tends to be wider than long..... *Nyctophila reichii*



Image: José Ramón Guzmán Álvarez

8.B. Males with dark brown / blackish elytra, very finely fringed by paler margins of a tan brownish tone, not pale yellowish. Almost black antennae. Central spot on the pronotum more orange in tone, not reddish. Bulbous pronotum tends to be as long as wide..... *Nyctophila heydeni*



Image: José Ramón Guzmán Álvarez

7.B. Last ventrite of males with an even apical border, without pointed terminacion..... 9 (*Lampyris*)



Image: Javier Soto

9. A. Males with blackish elytra, dark brown to slate brown, with sutures and lateral margins of the same color, little or nothing apparent. Pronotum of a dark tone, with a marked punctuated disc, almost rough. No pale reddish-pinkish marks or pits at the pronotum base. Pygidium uniform in color. Mesosternum and metasternum dark brown..... *Lampyris noctiluca*



Image: Raphaël De Cock

9.B. Males with brown / russet-brown elytra with paler yellowish brown suture and lateral margins, sometimes incomplete. Pronotum of a lighter tone with darker central area, with a finely punctuated disc. Symmetrical reddish or pale pink areas or dots shine through the pronotum at the base ends of the darker area. Pygidium with paler yellowish brown side margins. Meso- and metasternum yellowish brown *Lampyris iberica*

ACKNOWLEDGEMENTS

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

INTRODUCTION

In 2010, we presented a poster at the International Firefly Symposium at Selangor, Malaysia, with preliminary results of a web-survey on the distribution of lampyrid species in Spain based on data of one year (2009-2010) coming from the web-survey “Have you seen a glow-worm?” (<http://gusanosdeluz.es>) and a photo-biodiversity database called “Biodiversidad Virtual” (<http://biodiversidadvirtual.org>).

Based on a literature study 11 lampyrid species are expected in **Spain & Portugal**:

- *Lampyrus noctiluca*, *Lampyrus raymondi* & *Lampyrus iberica*
- *Nyctophila reichei* & *Nyctophila heydeni* (only on the Balearic islands)
- *Lamprohiza mulsantii* & *Lamprohiza paulinoi* (recently discovered for Spain: de la Rosa et al. 2011)
- *Phosphaenus hemipterus*
- *Luciola lusitanica*
- *Phosphaenopterus metzneri* (recently discovered for Spain: de la Rosa et al. 2011)
- *Pelania mauretana*

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, although it was initially developed while one of the authors was Associate Professor at the University of Cordoba. Our website www.gusanosdeluz.es 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.

Some extra insights came from recent discoveries of **new lampyrid species for Spain** in the Tajo International Park (Extremadura, Spain): *Lamprohiza paulinoi* and the extremely rare *Phosphaenopterus metzneri* (de la Rosa et al. 2011).

OBJECTIVE

To present after five years of continued surveying and evaluating of uploaded photos an actualized status of the **presence and distribution** of lampyrid species in Spain.

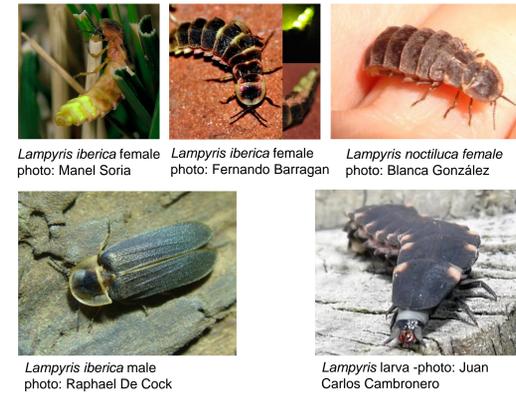


Figure 1. *Lampyrus* sp. distribution in Spain - brown: *L. iberica* & *L. noctiluca*; grey: only *L. noctiluca*; pink: only *L. iberica*; yellow *Lampyrus* sp. without species ID (larvae or unidentifiable from photo). *Lampyrus* sp. show a more Northern and Central-Western distribution. Identification of *Lampyrus* larvae stays difficult: lack of clear discriminating characteristics. Hence, distributions per species cannot always be fully allocated. For *L. raymondi* there is now evidence from literature that historic reports are probably based on false identifications (Corentin 2014). *L. noctiluca* shows an extreme Northern distribution, only present scattered over provinces in the North Atlantic region and Provinces in the Pyrenees, whereas *L. iberica* also occurs in central Northern provinces and the Southern extreme of Spain in Cádiz and the province of Málaga.



Figure 2. *Nyctophila reichei* distribution in Spain. Stays most widespread with omnipresence in its Mediterranean and Southern distribution. Recently also found in northwestern(most) provinces.

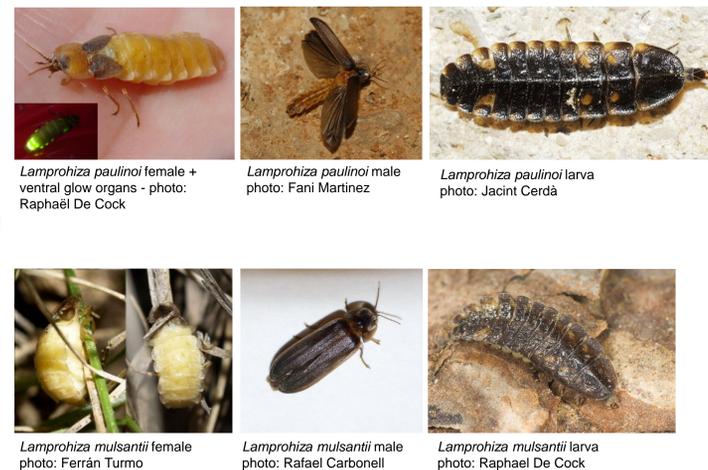


Figure 3. *Lamprohiza* distribution in Spain. green: *L. paulinoi*; blue: *L. mulsantii*. *Lamprohiza mulsantii* is only present in Northeastern-most provinces (Gerona and Barcelona). Some difficult to identify photos of *Lamprohiza* sp. came from the extreme Northwest province A Coruña, Southeastern Mediterranean coast (Alicante) and the Northeast (Barcelona) and still need to be resolved.

RESULTS & DISCUSSION

From May 2009 till December 2013, in total 169 online forms were received and 629 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”. Larvae of *Lampyrus noctiluca* and *L. iberica* are grouped in *Lampyrus* sp.

Species	♂	♀	Larva	Total
<i>Lampyrus</i> sp (<i>L. noctiluca</i> + <i>L. iberica</i>)	10	32	108	150
<i>Lampyrus noctiluca</i>	8	13	incl. in <i>Lampyrus</i> sp.	21
<i>Lampyrus iberica</i>	8	16	incl. in <i>Lampyrus</i> sp.	24
<i>Nyctophila reichei</i>	101	53	312	466
<i>Nyctophila heydeni</i>	6	1	15	22
<i>Lamprohiza</i> sp	10	13	0	23
<i>Lamprohiza mulsantii</i>	4	1	0	5
<i>Lamprohiza paulinoi</i>	13	6	1	20
<i>Phosphaenus hemipterus</i>	1	0	0	1
<i>Phosphaenopterus metzneri</i>	1	0	0	1



Nyctophila heydeni
(Left : male - photo Matilde Martínez; Right: larva - photo Fani Martínez)
Endemic, only firefly from the Balearic Islands; reported each year over.



Phosphaenopterus metzneri
(Left: male; Right: larva (probably) - photos: Raphaël De Cock)
Confirmed presence in West Spain (Extremadura).



Phosphaenus hemipterus
(male - photo: Luis Miguel Bugallo)
This species has been reported in 2010 from A Coruña in the extreme Northwest.

- Our small-scale excursion in 2012 not only confirmed the presence of an isolated population of *L. iberica* in the extreme South (National Park of Grazalema, Cadiz), but also revealed extra populations in West Spain (Extremadura), the confirmation of the presence of *Phosphaenopterus metzneri* and of *Lamprohiza paulinoi* in West Spain (Extremadura). This last sp. was also discovered in the East at an inland location in prov. Albacete (**Fig. 3**), but is more typically known from the entire Mediterranean East coast.
- *Pelania mauretana*: still no recent records to (re)confirm the presence for this typical North-African sp. in Spain: Historic records based on exceptional migratory events? (Constantin 2014)
- *Luciola lucitanica*, although widespread in Portugal, has till so far not been confirmed for Spain. Though, rumors of a recent observation in Palos de la Frontera, Huelva, identified at flight but not documented by a specimen or photo, may yield promises for the coming years.

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