

New record of *Liturgusa maya* Saussure & Zehntner, 1894 (Mantodea, Liturgusidae) in the Province of Limón (Costa Rica) and revision of its distribution along the country

Nuevo registro de *Liturgusa maya* Saussure & Zehntner, 1894 (Mantodea, Liturgusidae) en la Provincia de Limón (Costa Rica) y revisión de su distribución en el país

The order Mantodea, re-established by LEGENDRE *et al.* (2015), is a group of polyneopteran insects distributed throughout tropical and subtropical habitats of the world (PATEL & SINGH, 2016). Praying mantises diversity has become frequently unnoticed probably because of their sedentary and highly cryptic lifestyle (RIVERA & SVENSON, 2014): they use strategies such as mimicry or special aggressive resemblance for avoiding their own predators while securing their prey (EDMUNDS & BRUNNER, 1999). Although it is known that they play a very important role as predators and insect controllers

in the ecosystems they live in (PATEL *et al.*, 2016), our understanding about their geographical patterns of distribution is still poor (RIVERA & SVENSON, 2014).

In the Neotropical region, the mantids rise up to approximately 500 species, represented within 6 families and occupying different environments (AGUDELO *et al.*, 2007; EHRMANN & KÓÇAK, 2009; ARTEAGA *et al.*, 2014): from humid rainforests to dry broadleaf forests. Historically, the inventory of mantid diversity in this area has been chaotic and aimless; however, it has been the subject of increased study in the past



Fig. 1. Specimen (♂) of *Liturgusa maya* found in the main camp of the Pacuare Reserve.

Fig. 1. Especimen (♂) de *Liturgusa maya* encontrado en el campamento principal de la Reserva de Pacuare.

years. Many poorly known families and genera are being reviewed for the first time, new taxa are being described, and regional studies are also being undertaken (RIVERA, 2010).

The family Liturgusidae and particularly the genus *Liturgusa* Saussure, 1869 have been object of recent revision (SVENSON, 2014). The so-called “Neotropical bark mantises” are frequent dwellers of tree trunks and branches, and the different ecomorphotypes present a clear evolutionary pattern towards habitat selection (all exhibiting bark-like or lichen-like coloration) (SVENSON & WHITING, 2009). Conversely, some species such as *Liturgusa maya* Saussure & Zehntner, 1894 seem to have also occupied disturbed environments as reported by MURGAS *et al.* (2019) and our personal observation of a specimen in Costa Rica.

Liturgusa maya is a broadly distributed —contrasting with the common restricted pattern for species within the genus— Centre-South American taxon: it ranges from southern Mexico, passing through Nicaragua and Costa Rica, and right up to Peru (SVENSON, 2014). Patterns of habitat preferences (i.e. lowland rainforests) have been identified, but with some exceptions. Various specimens have been reported from deciduous forests of Nicaragua and anthropogenically disturbed environments (SVENSON, 2014; MURGAS *et al.*, 2019; present study), suggesting a wider plasticity for the species or even the presence of more diversity within the genus (i.e. cryptic species complex) (SVENSON, 2014).

We present here a new record for *L. maya* in the Province of Limón (Costa Rica) and a

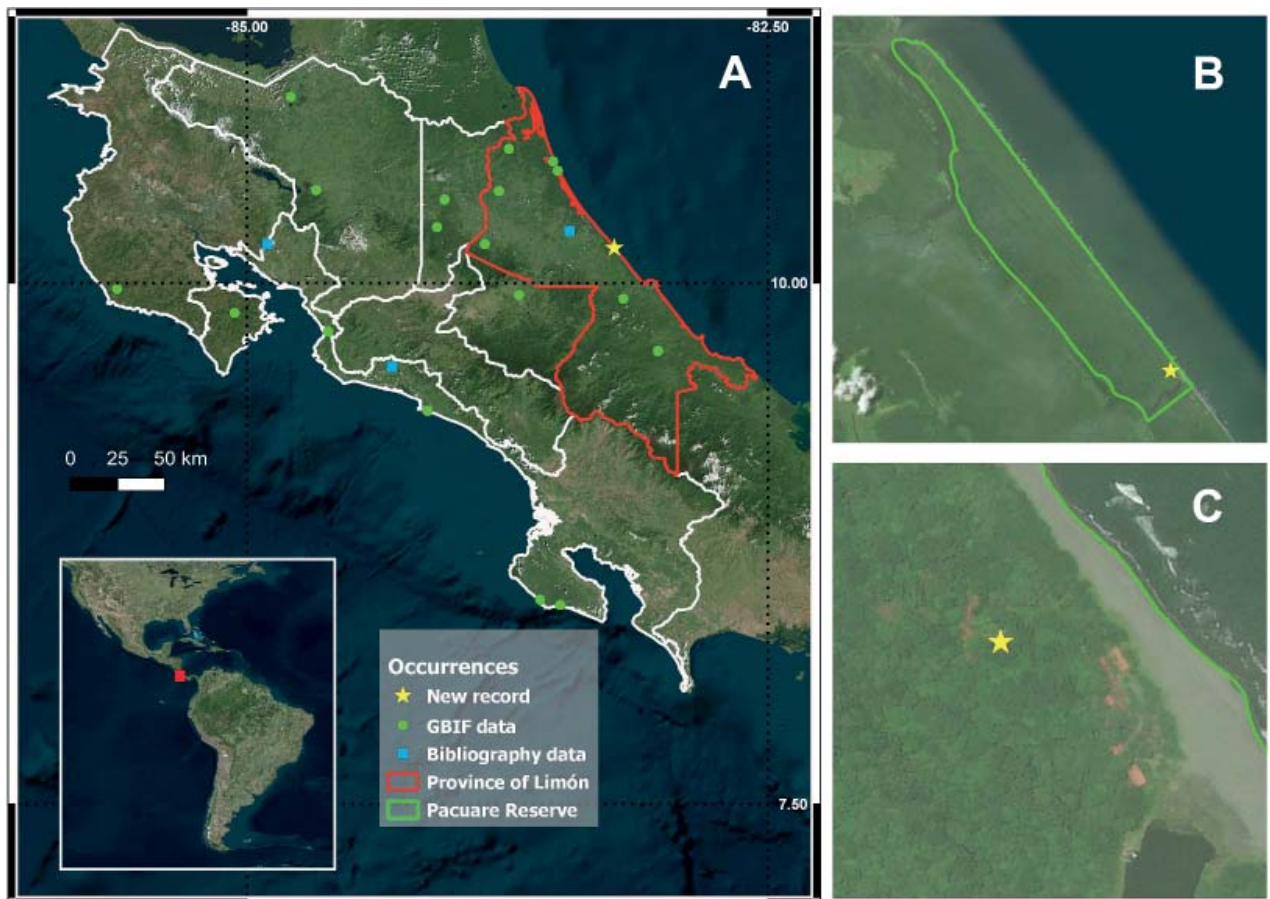


Fig. 2. A) Map of the distribution records of *Liturgusa maya* in Costa Rica. B) Perimeter of the Pacuare Reserve. C) Main camp of the Pacuare Reserve.

Fig. 2. A) Mapa de la distribución de *Liturgusa maya* en Costa Rica. B) Perímetro de la Reserva de Pacuare. C) Campamento principal de la Reserva de Pacuare.

revision of its distribution along the country based on available bibliography and online repositories. Surprisingly, there was scarce information in the bibliography about distributional data of this species in Costa Rica, mainly due to the few works done related to the group. The present record and revision will thus help to gain insight into the ecological distribution within the country and lay the foundations for its collection along the whole distributional range in a future and necessary population genetics study.

We found the specimen (Fig. 1) in the main camp of the Pacuare Reserve on May 11th 2019, attached to the wall of one of the cabins. It was captured for its determination, following the identification keys provided by SVENSON (2014) and NISIP *et al.* (2019), and released afterwards. The coordinates for this individual are recorded in the Annex I, together with the other historical records of *L. maya* in Costa Rica we could find in the bibliography and in the online repositories (<https://www.gbif.org/>).

With these data, we built a map of the Costa Rican region using QGIS v3.8 (QGIS DEVELOPMENT TEAM, 2019), in which we represented every observation of *L. maya* cited on the country, including our own new record (Fig. 2). The result is an extension of its previous known range and an important addition to its occupation of diverse habitats. As aforementioned, this may help to establish clearer boundaries on *L. maya* distribution and expedite its collection for future genetic studies, overall facilitating the assessment of the real conservation status of this species. Or species complex.

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Annex I. Bibliographical, GBIF and personal records of *Liturgusa maya* in Costa Rica.

Anexo I. Reportes bibliográficos, de GBIF y personales de *Liturgusa maya* en Costa Rica.

Longitude	Latitude	Reference	Year
10.539549	-83.506481	GBIF (10.15468/dl.3eh42d)	1989
10.584815	-83.529205	GBIF (10.15468/dl.3eh42d)	1989
10.584815	-83.529205	GBIF (10.15468/dl.3eh42d)	1989
10.401255	-84.049314	GBIF (10.15468/dl.3eh42d)	1990
9.387728	-84.132806	GBIF (10.15468/dl.3eh42d)	1991
9.671765	-83.027702	GBIF (10.15468/dl.3eh42d)	1991
9.767453	-84.608119	GBIF (10.15468/dl.3eh42d)	1991
10.401256	-84.050228	GBIF (10.15468/dl.3eh42d)	1991
9.675378	-83.026776	GBIF (10.15468/dl.3eh42d)	1992
10.893812	-84.788847	GBIF (10.15468/dl.3eh42d)	1992
9.671765	-83.027702	GBIF (10.15468/dl.3eh42d)	1992
9.671765	-83.027702	GBIF (10.15468/dl.3eh42d)	1992
10.644050	-83.742005	GBIF (10.15468/dl.3eh42d)	1993
9.972917	-85.621070	GBIF (10.15468/dl.3eh42d)	1993
9.675378	-83.026776	GBIF (10.15468/dl.3eh42d)	1993
10.644050	-83.742005	GBIF (10.15468/dl.3eh42d)	1993
8.480171	-83.591289	GBIF (10.15468/dl.3eh42d)	1995
10.441667	-83.788889	GBIF (10.15468/dl.3eh42d)	2003
8.454816	-83.495034	GBIF (10.15468/dl.3eh42d)	2003
9.857153	-85.058106	GBIF (10.15468/dl.3eh42d)	2003
10.186737	-83.856943	GBIF (10.15468/dl.3eh42d)	2004
10.269277	-84.086860	GBIF (10.15468/dl.3eh42d)	2006
9.925730	-83.191405	GBIF (10.15468/dl.3eh42d)	2008

Annex I. (Continuation)**Anexo I.** (Continuación)

Longitude	Latitude	Reference	Year
9.925730	-83.191405	GBIF (10.15468/dl.3eh42d)	2008
9.598454	-84.302680	SVENSON (2014)	2014
10.250000	-83.450000	SVENSON (2014)	2014
10.186150	-84.901512	SVENSON (2014)	2014
10.446286	-84.667473	GBIF (10.15468/dl.3eh42d)	2017
9.942946	-83.692464	GBIF (10.15468/dl.3eh42d)	2017
10.168844	-83.235639	Present study	2019