

# The family Angelidae (Insecta, Mantodea) in Mexico and Central America, new records and two new synonyms

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## Abstract

The stick-like mantis *Angela miranda* Saussure, 1871 (Mantodea, Angelidae) is newly recorded for the state of Chiapas in Mexico as well as for the department of Izabal in Guatemala, and the female is newly described. A re-examination of material from the Colección Nacional de Insectos (CNIN) of the Universidad Nacional Autónoma de México (UNAM) labeled as *Angela miranda* and recorded from Tabasco, Mexico, was conducted, revealing that they were misidentified, belonging instead to the genus *Phasmomantis* Saussure, 1869 (Mantidae: Stagmomantinae). Finally, *Angela perpulchra* Westwood, 1889 and *Angela championi* Saussure & Zehntner, 1894 are hereby relegated as **junior synonyms** of *Angela miranda*.

## Keywords

*Angela championi*, *Angela miranda*, *Angela perpulchra*, natural history collections, taxonomy

## Introduction

The family Angelidae Beier, 1935 includes medium- to large-sized mantises (60–141 mm) that have very elongated stick-like bodies (Figs 1–3), brachypterous wings in both sexes (Figs 1, 3), and laterally flattened cerci (Figs 1A, 2, 3C). This family contains a single genus, *Angela* Audinet-Serville, 1839, with 16 species (Otte et al. 2024) that are endemic to the New World, being found from Mexico throughout Central America, northern South America, and the island of Trinidad. Females exhibit a wide range of intraspecific variation and thus are difficult to delimitate between species. On the other hand, the color and pattern of the hindwings of the males are easily distinguished, which facilitates species' delimitation (Rivera and Svenson 2016, 2020).

Notably, *Angela miranda* Saussure, 1871 was described from Mexico without specifying a locality (Saussure 1871), and many years later, de Luna and Hernández-Baltazar (2020) mention it for the state of Tabasco in the most recent checklist of North American

mantis. This erroneous mention was based on online records from the Colección Nacional de Insectos (CNIN) of the Universidad Nacional Autónoma de México (UNAM) (Departamento de Zoología, Instituto de Biología, 2006), the largest and most important entomological collection in the country. During a brief visit to the CNIN-UNAM, the first and third authors had the challenging opportunity to sort through all the specimens of Mantodea deposited there. In this study, the findings relevant to the family Angelidae are presented.

## Methods

During a visit to the CNIN-UNAM in June 2023, the first and third authors sorted the 1238 pinned specimens of mantises (Insecta: Dictyoptera: Mantodea) deposited there. Three large, brown-colored mantises with the label "*Angela miranda*" were examined; these were identified to family and genus levels as *Phasmomantis* Saussure, 1869 (Mantidae) using keys from de Luna and Hernández-Baltazar (2020). These specimens came from Pantanos de Centla in the state of Tabasco and were registered online as *Angela miranda* (de Luna and Hernández-Baltazar 2020). A single male specimen of *Angela miranda* (Fig. 1A, C) from Agua Azul Chiapas from this collection was identified at the level of family and genus using the aforementioned keys (de Luna and Hernández-Baltazar 2020) and one hindwing was dissected, extended, and mounted on a card (Fig. 1C). It was then identified to species level by comparing the pattern on its hindwing with the original description of Saussure (1871), the keys and figures of Saussure and Zehntner (1893–1899), and photographs of the hindwings of the holotype (Fig. 3A) and two non-types (Fig. 3B–C) deposited at the Muséum national d'Histoire naturelle, Paris (MNHN) as well as with another non-type specimen deposited at the Muséum d'Histoire Naturelle de Genève (MHNG) attributed to *Angela miranda* in Rivera and Svenson (2020). A specimen identified as *Angela* sp. (Fig. 1B) deposited in the Universidad del Valle de Guatemala (UVG) from Guatemala was revised from photographs and also identified as this species.

## Results

## Mantodea: Angelidae

*Angela miranda* Saussure, 1871

Figs 1–3

*Type material*.—Holotype: MEXICO • ♂; “Mexique”; pinned with one tegmina and hindwing extended, damaged (Fig. 3A), MNHN [examined]. The specimen exhibits the distinctive patterning under discussion, but it is remarkable for having its membrane reddish-pink instead of yellow.

*Additional material examined*.—COSTA RICA • 1 ♀; Heredia; pinned with one tegmina and hindwing extended (Fig. 3C), MNHN. GUATEMALA • 1 ♂; Semuc, Sierra de Santa Cruz, department of Izabal; 1 January 1991; leg. J. Monzón; pinned with wings extended (Fig. 1B), UVG. MEXICO • 1 ♂; Agua Azul, state of Chiapas; 1 May 1978; leg. E. Barrera; pinned vertically, with tegmina and hindwings folded (Fig. 1A); one hindwing dissected, spread, and mounted on a card (Fig. 1C); CNIN-UNAM • 1 ♂; unknown label (Fig. 3B); MNHN • 1 ♂; unlabeled; pinned with both tegmina and hindwings extended; MHNG.

*Diagnosis*.—According to the descriptions, keys, and illustrations of Saussure and Zehntner (1893–1899), Rivera and Svenson (2016, 2020), and de Luna and Hernández-Baltazar (2020), the body of *Angela* is very slender and stick-like (Figs 1–3). This char-

acteristic distinguishes it from most North American mantises, except for the only species of Coptopterygidae in the region as well as most Thespidae. *Angela* differs from all the North American mantises by its laterally flattened cerci (Figs 1A, 2, 3C); this character is also present at the nymphal stage, making it very easy to differentiate it, even from other stick-like mantises. Both sexes are brachypterous, with the females having shorter wings and being flightless (Fig. 3C) while the males have larger wings (Figs 1A, B, 2, 3A, B) and are capable of flight. This differs from Coptopterygidae as the populations of its only North American representative are made up entirely of parthenogenetic brachypterous females. Another difference between the two is found in the antennae, as these are filiform in Angelidae (Figs 1A, B, 2, 3B) and thickened in Coptopterygidae. The genus *Angela* does not have evident juxtaocular bulges (Fig. 1A), which are found in all Thespidae of the region, and lacks dorsal spines in their foretibiae (Figs 1A, B, 2, 3B), which are present in most Thespidae. Another difference is that female Thespidae are apterous.

The coloration and consistent patterning of the hindwings of the male of *Angela miranda* make it easily distinguishable from those of male congeners (Figs 1–3A, B): the inner and dorsal margins, as well as the center, are typically opaque and light yellow. This appears to be the most common chromatic form, although some specimens exhibit reddish-colored hindwings, as seen in the holotype of *Angela miranda* (Fig. 3A), or in which the yellow is replaced by white. An irregular black spot is present in the distal third of the hindwing connected to the posterior margin. The posterior margin is black and extends all the way up to



Fig. 1. *Angela miranda*. A. Lateral aspect of male specimen deposited at the CNIN-UNAM, from Chiapas, Mexico. Scale bar: 1 cm. Photo by Manuel de Luna. B. Dorsal aspect of male specimen deposited at the UVG. Mounted with both tegmina and hindwings extended and missing the abdominal apex and a few legs. Photo by Dr. Jiichiro Yoshimoto. C. Dorsal aspect of hindwing of male specimen deposited at the CNIN-UNAM. Photo by Iker Cubillos Macías.



Fig. 2. Illustration of *Angela perpulchra* taken from Saussure and Zehntner (1893–1899).

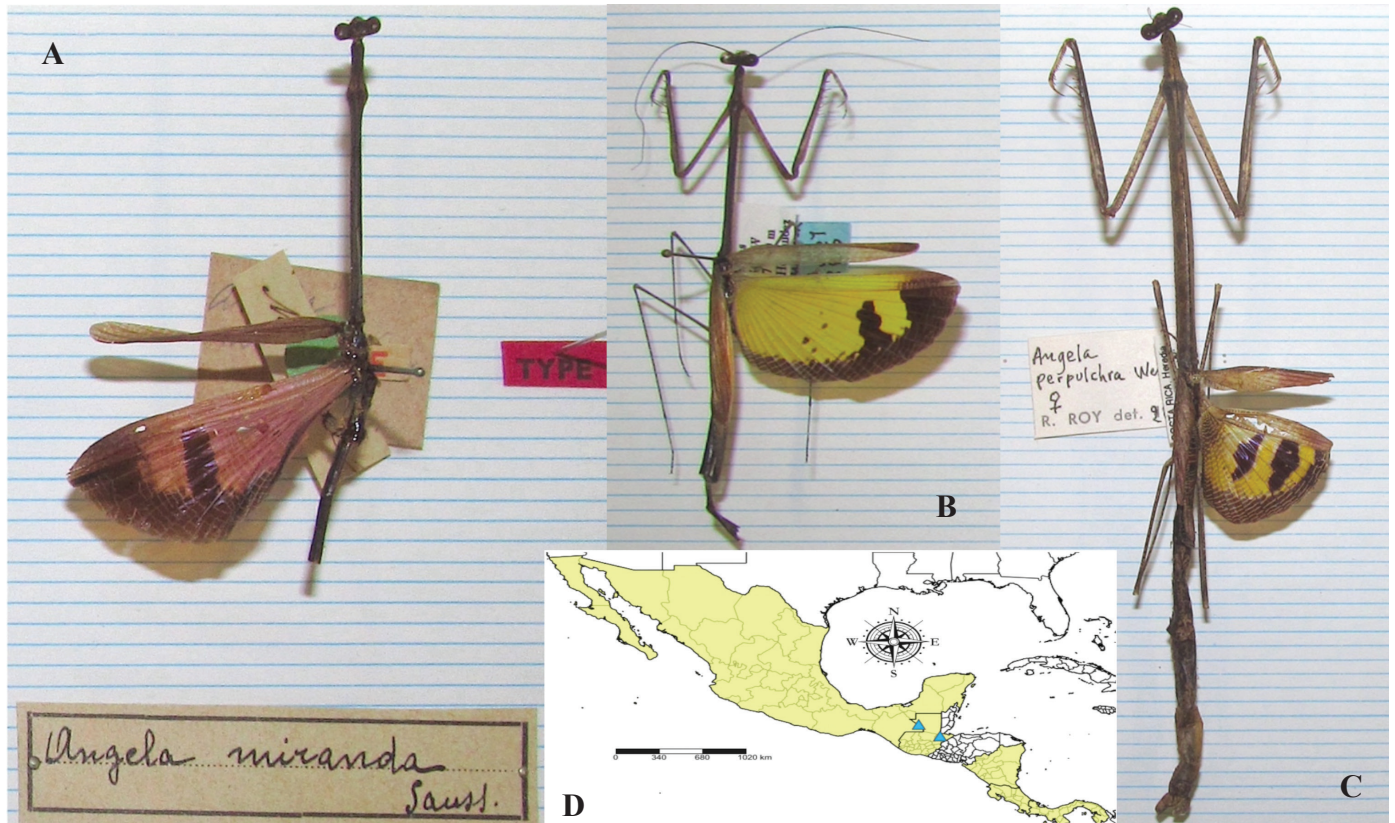


Fig. 3. *Angela miranda*, specimens deposited at the MNHN. A. Male holotype from “Mexique,” dorsal view. The specimen is damaged with one tegmina and hindwing missing along with all the legs and the abdominal middle and apical portions. B. Male specimen labeled as *Angela perpulchra*. C. Female specimen labeled as *Angela perpulchra*, at equal scale. Photos by Dr. Julio Rivera. D. Map of Mexico and Central America. Countries colored in yellow denote records of *Angela miranda* in said country (although not its presence in all the territory); blue triangles point to the new records.

the apex of the hindwing. Both the spot and dark margins exhibit considerable variability in width.

The hindwing of the female is very similar to that found in males (Fig. 3B–C), albeit much shorter due to the significantly larger size of the female. This aligns with known patterns of sexual dimorphism within this family and genus. The dorsal margin and center are opaque and light yellow in color (Fig. 3C). As observed in males, female variants include reddish and white hindwings. However, the female hindwing differs from that of the males in that the inner margin is darker and it features two dark spots, as opposed to one, in the central field. The first spot is situated in the middle of the hindwing, while the other is in the distal third, similar to the male. Additionally, the apex of the hindwing of the female exhibits a reddish tinge (Fig. 3C).

The proposed **junior synonyms** for *Angela miranda* (see discussion below):

- = *Angela championi* Saussure & Zehntner, 1894, **syn. nov.**
- = *Angela perpulchra* Westwood, 1889, **syn. nov.**

## Discussion

A comparison was made among hindwings in the illustrations of the male of *Angela perpulchra* by Saussure and Zehntner (1893–1899) (Fig. 2), the holotype of *Angela miranda* (Fig. 3A), and a photograph of the hindwing of a specimen of *Angela miranda* presented in the work of Rivera and Svenson (2020). They all exhibit virtually identical patterns, with the holotype of *Angela miranda* differing in color in that it was reddish instead of yellow. Additionally, both species are geographically close, as *Angela perpulchra* was described with material from Nicaragua and has been recorded in Costa Rica and Panama (Saussure and Zehntner 1893–1899, Westwood 1889, Rivera and Svenson 2020). With these considerations, it is proposed here that *Angela perpulchra* Westwood, 1889 is a **junior synonym** of *Angela miranda* Saussure, 1871.

While both *Angela miranda* and *Angela perpulchra* were described from male specimens, another Central American species, *Angela championi*, was described based on a female specimen from Guatemala. The female specimen described and illustrated in this study (Fig. 3C) is proposed as the female of *Angela miranda*. It aligns with the description of *Angela championi* found in Saussure and Zehntner (1883–1889) with an exception noted in the number of bands of the hindwing. Saussure and Zehntner (1883–1889) mention the presence of three dark (*splendide nigro-caeruleis*) and two orange (*laete aurantias*) bands, while the specimen described here (Fig. 3C) exhibits the reverse pattern. Considering this finding and description of the female of *Angela miranda*, along with consideration of the variability among females of *Angela*, it is proposed that *Angela championi* Saussure & Zehntner, 1894, is also a **junior synonym** of *Angela miranda* Saussure, 1871. Comprehensive DNA analysis and barcoding of specimens of this genus collected in various localities within Mexico and Central America should be conducted. This analysis, alongside a comparative examination of genital structures and captive rearing of oothecae obtained in the wild, contributes to confirming the hypothesis of conspecificity presented in this study.

A second species of this genus has been recorded for Central America, *Angela guianensis*. The first two-thirds of the hindwings of the males of this species are hyaline, while the last third is dark except for the very apex, which becomes smoky and subhyaline. The hindwings of the females are mostly dark and ornamented with

yellow blotches that form irregular tiger-like stripes (Schwarz et al. 2020). With the new synonyms in mind, the genus *Angela* is now comprised of 14 species, with *Angela miranda* recorded from Costa Rica, Guatemala, Mexico (in the state of Chiapas, not Tabasco), Nicaragua, and Panama (Fig. 3D).

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