

Alien mantids in a tropical paradise: First record of the giant mantis *Sphodromantis viridis* (Insecta, Mantodea) for the Canary Islands (Spain)

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Abstract

The presence of adults, nymphs, and oothecae of the African giant mantis *Sphodromantis viridis* Forsskål is for the first time recorded on the island of Tenerife, the largest and most populated of the Canary archipelago, an autonomous Spanish community in the Atlantic Ocean. The discovery took place in a popular water park rich in non-native plants in the municipality of Costa Adeje. It is possible that anthropogenic movements, particularly the massive movement of tourists and goods that continually cross this small archipelago, aided the dispersal to the area of this mantis, which for some years has also been expanding in many areas of the Mediterranean basin. A hypothesis on the ecological impact and the possible invasiveness of this extremely adaptable species is discussed and supported by the large number of sightings of oothecae and specimens that are, fortunately, still confined within the west coast of the island.

Keywords

Alien species, expansion, giant mantis, human-mediated introduction, Tenerife

Introduction

Sphodromantis Stål, 1871 is a genus of large sized mantids characterized by a robust body, well-developed flight organs in both sexes, thick head with round eyes and a small tubercle at the base of the antennae, and pronotum longer than fore coxae with well-marked supracoxal dilatation (Battiston et al. 2010). The 37 species currently included in this genus (Anderson 2022) live in various biotopes characterized by a warm climate, from equatorial forests to semi-desert regions. Their distribution includes the entire African continent, the Middle East, and part of southern Europe (Roy 2010).

Sphodromantis viridis Forsskål, 1775 (often known by the common name of giant African mantis) is the species of the genus with the northernmost distribution. It is common from the Middle East to the sub-Saharan region of some Central African countries

(Battiston 2020), while in Europe, it was believed that a stable population existed only in the south of Spain, where this mantis was reported a century and a half ago (Bolívar 1876). In recent years, there has been a significant expansion of the distribution range of this insect not only in other locations on the Iberian Peninsula (Marabuto et al. 2014, Cabanillas 2017, Oliveira and Ferreira 2019) but also on the Balearic Island of Mallorca (Canyelles and Alomar 2006), in Sardinia (Ruzzante and Leo 2012), Sicily and Greece (Battiston et al. 2020), and Croatia (Martinović et al. 2022). The data provided by these studies have shown that this species of mantis, despite being xerothermophilous and more closely linked to its distribution range than others of its own family, can be considered a generalist predatory insect capable of spreading rapidly even in heavily anthropized places, increasing the possibility of a human-mediated introduction in areas adjacent to its original habitat, including islands. Until now, the phenomenon seemed to involve mainly the Mediterranean area, but in this article, the presence of *Sphodromantis viridis* is reported for the first time on the island of Tenerife, the largest island of the Canary archipelago, located in the Atlantic Ocean off the African coast. This is also the first record of this mantis on a non-Mediterranean island.

Materials and methods

The production of this work started with the finding of *Sphodromantis viridis* in the south of Tenerife by one of the authors, who came to the Canary Islands for an expedition. All sightings occurred within the boundaries of the “Aqualand Costa Adeje” water park. One adult specimen and eight oothecae were collected (Fig. 1), carefully examined using the guidelines contained in Brannoch et al. (2017), and photographed with a Samsung Galaxy S10e equipped with a clip-on 100 mm HD macro lens for smartphone camera and a Nikon Coolpix b500. The collected material was identified and analyzed using the scarce but detailed scientific literature regarding this mantis. Further research was conducted using taxonomic, citizen science, and online platforms (Inaturalist,

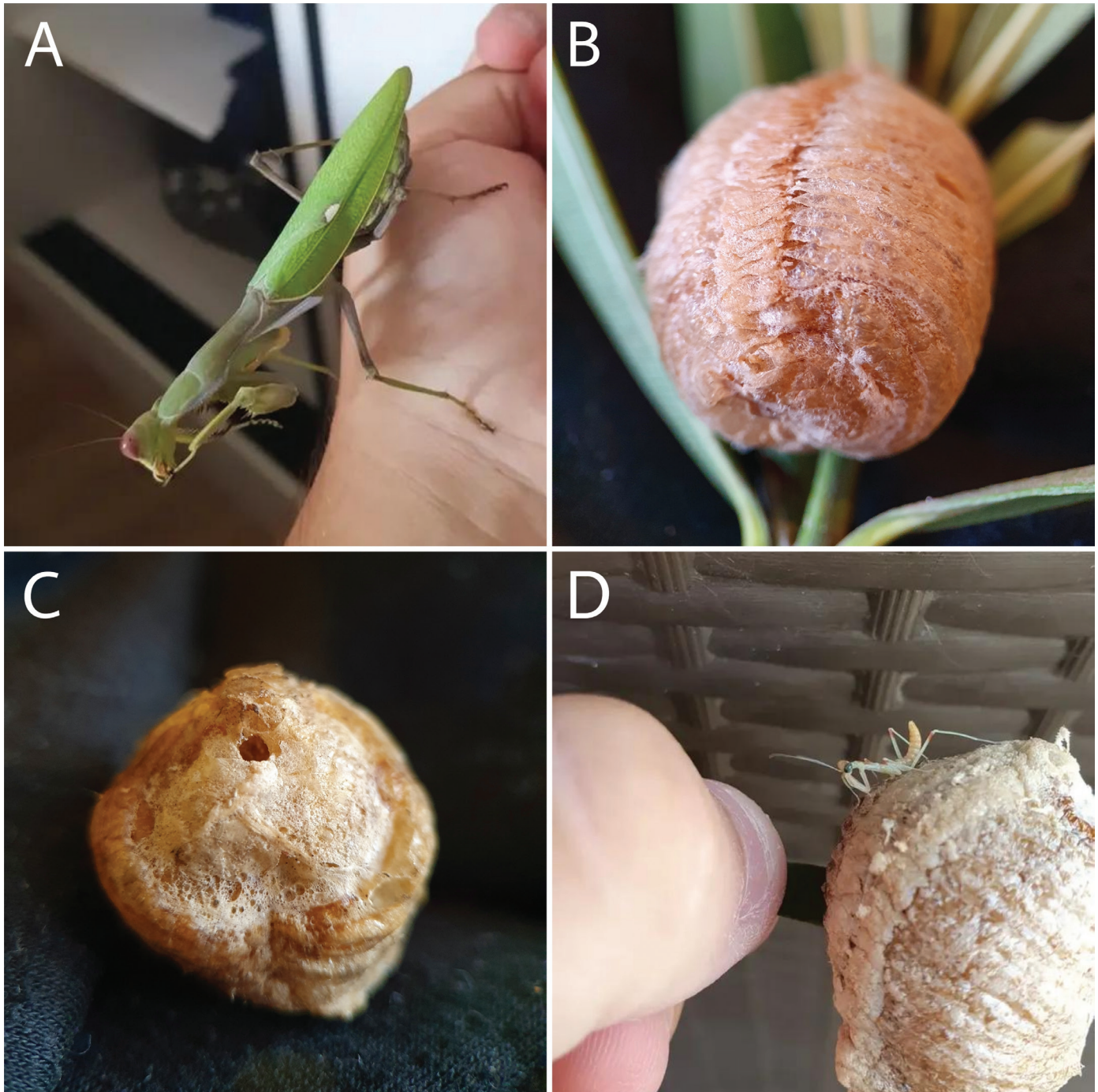


Fig. 1. Presence of *Sphodromantis viridis* within the Aqualand Costa Adeje Water Park. A. Adult female B. Ootheca laid on *Nerium oleander* L. C. Old, damaged ootheca D. Fertile ootheca with a recently hatched nymph. Photos by Alessio De Martino.

GBIF), and from tourists and workers within the water park. Observations of the plants in the park were made by the authors both directly on site and by looking at photos of the area available on some websites (Google maps, Aqualand.es). Identifications were conducted with the help of the Plants of the World website of the Kew Royal Botanic Gardens.

Results

Material examined.—SPAIN • 1 ♀, 1 sub-adult ♂, 5 unsexed nymphs and 13 oothecae; Canary Islands, Tenerife Island, Santa

Cruz de Tenerife province, Adeje municipality; Costa Adeje seaside community; 28°04'75"N, 16°43'68"W; 286 m a.s.l.; 24 Aug. 2022; Alessio De Martino leg.; found among the plants of "Aqualand Costa Adeje" water park, collected by hand and deposited in Antonio Fasano's collection.

The only adult specimen collected, an 8.2-cm female, was quickly identified based on the following characters: large head with rounded eyes and frontal sclerite barely longer than high; pronotum with metazone/prozone ratio > 2; supracoxal dilation well marked; strong fore legs, three coxal spines with a yellowish plate at the base, black femoral spines only at the tip; flight or-

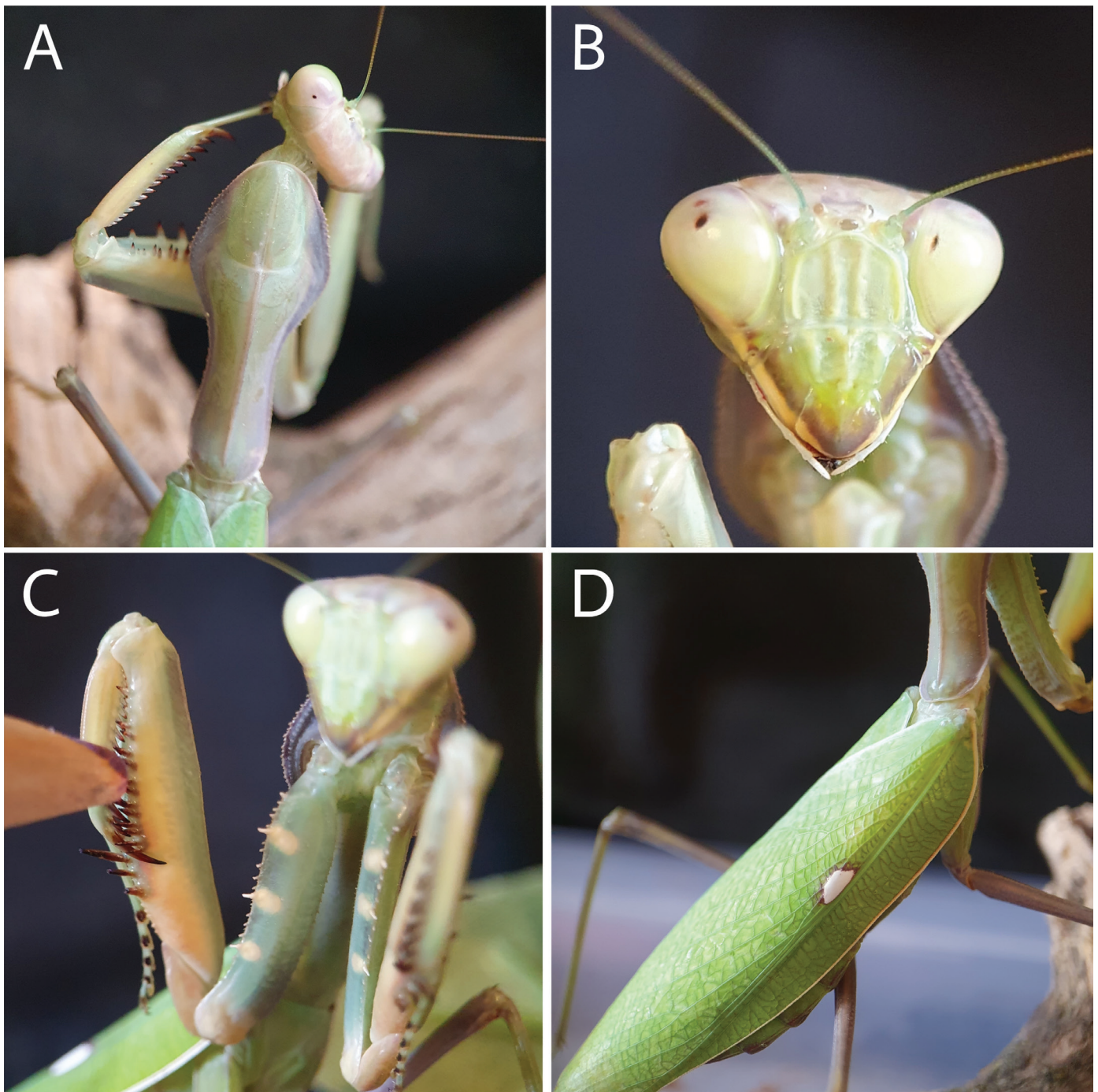


Fig. 2. Main features used for the identification of *S. viridis*. A. Pronotum with well-marked supracoxal dilatation. B. Head with rounded eyes and a tubercle near the base of antennae. C. Robust fore legs with coxal spines with yellowish plates. D. Bright white stigma on the tegminae. Photos by Alessio De Martino.

gans well developed, tegminae with clearly visible whitish stigma; and hind wings hyaline (Fig. 2). (Battiston et al. 2010, Battiston et al. 2019). The eight oothecae collected turned out to be from different periods: Some were approximately 1–2 years old, damaged, and hatched, and others were close to hatching. In addition to the collected material, many other oothecae and some young nymphs were observed, including a sub-adult male. Almost all the specimens and the oothecae were high on the plants used to decorate the park, which made it difficult to collect much material but confirmed the life and oviposition preferences of this species on

stems, branches, and leaves (Younes and Gabre 2003). The plants present in the park area are mostly non-native, some of which are common in areas where this mantis is widespread and all which are well adapted to warm and tropical climates (Table 1). The presence of numerous other insects was also noted, confirming the creation in this highly anthropized area of a microenvironment suitable for a large proliferation of *Sphodromantis viridis*. However, it has not been possible to trace a possible date on which this mantis arrived on the island, but it is hypothesized that it was a sudden appearance followed by a rapid expansion favored by the

Table 1. Non-native plants observed in the park with their native range and the presence/absence of oothecae and specimens of *Sphodromantis viridis*.

Plant	Origin	Presence of <i>S. viridis</i>
<i>Agave attenuata</i>	Mexico	No
<i>Agave tequilana</i>	Mexico	No
<i>Aloe arborescens</i>	Southern Africa	No
<i>Aloidendron dichotomum</i>	Namibia, South Africa	No
<i>Codiaeum variegatum</i>	Indonesia, Malaysia, Oceania	Oothecae
<i>Crassula ovata</i>	Southern Africa	No
<i>Eleagnus × submacrophylla</i>	Hybrid of Asian species	Oothecae
<i>Eucalyptus</i> sp.	Oceania, Philippines	No
<i>Euonymus</i> sp.	Asia, Europe	No
<i>Excoecaria cochinchinensis</i>	China, Southeast Asia, Taiwan	Oothecae, specimens
<i>Hibiscus rosa-sinensis</i>	Vanuatu	Oothecae
<i>Iresine diffusa</i> f. <i>herbstii</i>	Peru	Oothecae
<i>Lantana camara</i>	Central and tropical America	No
<i>Musa</i> sp.	Tropical Asia, Oceania	Oothecae
<i>Metrosideros excelsa</i>	New Zealand	No
<i>Nerium oleander</i>	Africa, Asia, Europe	Oothecae, specimens
<i>Polygala</i> sp.	Cosmopolitan	No
<i>Pandanus utilis</i>	Mascarene islands	Oothecae
<i>Schinus molle</i>	South America	No
<i>Tillandsia xerographica</i>	Central America	No
<i>Washingtonia</i> sp.	Mexico, United States	Specimens

environmental conditions of Tenerife, characterized by a subtropical climate (Juan et al. 2000).

Discussion

In recent years, there has been a rapid change in the spread of praying mantids around the world, with many native species expanding north due to higher global temperatures and many alien species introduced by humans in numerous territories, following the main trade routes such as the one that starts from Asia to get to Europe (Shcherbakov and Govorov 2020). Most alien mantids are members of the Mantidae family: extremely adaptable generalist predators of considerable size and capable of proliferating even in environments profoundly modified by human activities. *Sphodromantis viridis* also has these characteristics, with the difference that this mantid is more linked to xerothermophilic contexts and seems to expand in a more restricted way than other genera of mantis with which it is related, favoring places with a climate and environment similar to those of the species' origin. The beginning of the expansion of this mantid in the territories that are currently part of its distribution range probably occurred in the Pleistocene (La Greca 1966) during the end of the glaciation and warming of North Africa and the Euro-Mediterranean area. The subsequent isolation of some populations in different areas of Africa has allowed these mantids to fragment into different subspecies, each characterized by specific morphological and morphometric characteristics (La Greca and Lombardo 1987). The number and validity of the subspecies of *S. viridis* have always been the subject



Fig. 3. Map of *Sphodromantis viridis* observations in the Aqualand Costa Adeje water park; red triangles: damaged or hatched oothecae, green triangles: unhatched oothecae, yellow stars: unsexed nymphs, red star: sub-adult male, purple square: adult female. Base image from Google Maps 2022 © Google.

of discussion among scholars, and with the new distributions, it is probable that many are no longer considered valid precisely because the isolation of their populations is lacking (Battiston, personal communications). The discovery of these African giant mantids for the first time on the Canary Islands confirms the ability of these insects to spread and create stable populations even on islands located in the tropical belt of the Atlantic Ocean. The observation of many oothecae and specimens of all stages within the limit of the water park, if they are not the result of multiple introductions, could suggest rapid growth not controlled by any type of efficient predator, with a potentially incisive impact on the colonized area (Battiston 2020), which could end up hosting a huge number of specimens and oothecae in a relatively small space, at the same way as the invasion of *Hierodula tenuidentata* Saussure, 1869 in the countryside of Northern Italy (Battiston et al. 2018). The Canary Islands are the habitat for ten native species of praying mantids (Wieland 2014); many of these are endemic, while others, such as *Blepharopsis mendica* Fabricius, 1775 or *Hypsicorypha gracilis* (Burmeister, 1838), are also widespread in northern Africa and the Middle East (Battiston 2016a, Battiston 2016b). The island of Tenerife appears to be a central volcanic island, as suggested by some of its features such as large calderas, but the previous existence of land bridges that may have allowed some animals of the African continent on this archipelago is not excluded (Rothe 1974). Therefore, it cannot be totally excluded that *Sphodromantis viridis* arrived on the island of Tenerife on its own, even if this scenario is extremely unlikely. However, analyzing the possible causes of the spread of this species in Sardinia, Battiston et al. (2017) highlighted how the passive transport of oothecae is improbable due to the time it would take to reach the coasts of an island, a period not compatible with the annual life cycle of this mantid. Even the possibility that a female arrived alone in flight is not plausible since they are not mantids suitable for flying over such long distances. The most likely cause of the introduction is anthropogenic. This is supported by the fact that the first findings of this species took place in a tourist place characterized by a continuous flow of means of transport, goods, and people, with the presence of many non-native plants also coming from the Euro-Mediterranean area. Thanks to the data collected, it is possible to confirm the presence of *Sphodromantis viridis* in a restricted area of Tenerife (Fig. 3), but

it is not yet possible to establish whether its spread is truly limited. The authors hope that future studies will be conducted to continue monitoring the dynamics of this giant mantis population in the middle of the ocean to better understand their spread and whether they are a threat to native ecosystems.

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